

OVEROPTIMISTIC MANAGERS AND MARKET MISVALUATION: IMPLICATIONS FOR METHOD OF PAYMENT AND SUBSEQUENT RETURNS OF CORPORATE ACQUISITIONS *

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Abstract

I classify CEOs as overoptimistic based on their option exercise behavior, and find that overoptimistic CEOs are more likely to pay with cash when market-wide valuations are (moderately) above their long-term trend, but not when market valuations are low. In contrast to rational CEOs, overoptimistic CEOs view their stock as overly costly and prefer cash payment, even during times of high market valuation. I show that stock, but not cash acquisitions of overoptimistic CEOs therefore outperform those of rational CEOs during times of high market valuation. These findings suggest an important interaction between CEO overoptimism and market misvaluation when analyzing corporate decisions such as the method of payment in acquisitions.

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In the absence of frictions, basic models of corporate acquisitions have little to say about the method of payment. Empirically, however, the method of payment plays an important role for the subsequent returns to acquisitions.¹ Possible explanations include a wide range of potential frictions,² as well as deviations from the assumptions of traditional models, such as potential market misvaluation or behavioral biases of top executives.³ Loughran and Vijh (1997) first introduced the idea of stock market driven acquisitions and Shleifer and Vishny (2003) proposed a theory in which managers exploit market misvaluations by using their own overvalued shares to acquire relatively undervalued targets.⁴ Roll (1986), on the other hand, suggests that acquisitions are prone to be influenced by the hubris of some top executives and Malmendier and Tate (2008) find empirical evidence for the role of overoptimism in corporate acquisitions.⁵ In both strands of the literature, the beliefs of either the market or at least of some managers diverge from fundamental value. However, the previous literature has refrained from studying them jointly as doing so has often been deemed too complicated to yield clear testable predictions. In this paper I study the implications for corporate acquisitions when markets can deviate from fundamental value *and* some managers are consistently overoptimistic. These deviations of beliefs from fundamental value on both sides interact and yield clear and unique predictions about the method of payment and the subsequent returns to acquisitions not implied by any of the two assumptions alone. I confirm these predictions empirically. The results demonstrate how considering multiple deviations from standard beliefs refines the empirical predictions, allowing for more nuanced insights and relaxed identifying assumptions.

Overoptimistic managers overestimate the value of their firm and feel undervalued by the market, as long as investors do not share their overoptimistic beliefs about firm value. Rational managers understand their firm's true value and exploit any potential misvaluation by the market. When markets are overvalued, rational managers prefer to use their own overvalued stock as a method of payment, whereas when markets are undervalued, they prefer cash which is always correctly priced. In principle, overoptimistic managers would

¹See, Wansley, Lane, and Yang (1983), Travlos (1987), Loughran and Vijh (1997), Rau and Vermaelen (1998), Sudarsanam and Mahate (2003).

²See Betton, Eckbo, and Thorburn (2008) for a survey of the research on corporate acquisitions, including the method of payments. Papers focusing specifically on the method of payment include Harford, Klasa, and Walcott (2009), Faccio and Masulis (2005), Martin (1996), Brown and Ryngaert (1991), Eckbo, Giammarino, and Heinkel (1990), Amihud, Lev, and Travlos (1990).

³See Baker and Wurgler (2011) for an overview of this literature.

⁴See Rhodes-Kropf and Viswanathan (2004) for a model of why target shareholders may accept overvalued stock as payment.

⁵Several papers have previously argued that managerial objectives influence acquisitions, for instance Jensen (1986) or Morck, Shleifer, and Vishny (1990). Overoptimistic managers, however, believe that they are maximizing shareholder value, but their beliefs are systematically biased.

like to do the same. However, when markets are moderately overvalued, overoptimistic CEOs still believe their firm to be undervalued and act accordingly. They prefer to pay with cash, rather than with what they perceive to be undervalued stock. Therefore, both types of managers, rational and overoptimistic, agree on the preferred method of payment when market valuation is either very high (both recognize the overvaluation and prefer stock) or below fair value (both prefer cash due to their firms' undervaluation). At times of moderately high market valuations, however, only rational managers recognize the overvaluation and exploit it by paying with stock rather than cash. This difference in the preferred method of payment is the first prediction tested empirically in this paper. A key advantage of this refinement of the empirical predictions is its ability to distinguish overoptimism from alternative explanations as long as such alternatives do not predict the same co-movement with market valuation.

I use CEOs' personal portfolio decisions to measure overoptimism. [Malmendier and Tate \(2005a, 2008\)](#) show that some CEOs persistently hold options until expiration, even though it would have been better to exercise earlier. I follow this literature and classify CEOs as overoptimistic when they hold an option until expiration even though it exceeds exercise thresholds earlier on. To measure market valuation, my main specification follows [Bouwman, Fuller, and Nain \(2009\)](#). Market valuation is measured by how much the price-to-earnings ratio of the S&P500 lies above its long-term trend. As robustness checks, I consider alternative measures based on the index value of the S&P500 and median Q of firms listed in the S&P500. The results support the prediction about the preferred method of payment: In moderately high market settings, overoptimistic CEOs are significantly more likely than rational CEOs to pay with cash. As expected, this effect decreases in high market valuations, when even overoptimistic CEOs recognize the market's overvaluation. The result is robust to the inclusion of a variety of additional controls at the firm level (e.g. Tobin's Q), for characteristics of the given transaction (e.g. the size of the transaction) and for additional characteristics of the CEO's option holdings.

Having established the effect on the preferred method of payment, I turn to the implications for subsequent stock returns. Overoptimistic managers perceive their firm to be undervalued and are reluctant to use stock as the method of payment. These perceived cost of stock financing raise the threshold for an acquisition to be deemed profitable by an overoptimistic CEO. Hence, such acquisitions involving stock payment outperform those of their rational colleagues. This is not the case for pure cash acquisitions, for which the perceived cost of stock financing is irrelevant. Therefore, acquisitions by overoptimistic managers involving stock outperform, or underperform less than, those of their rational colleagues relative to cash acquisitions by both groups.

Market misvaluation can amplify the effect of overoptimism on subsequent returns. By preferring to pay with cash rather than stock at times of high market valuation, overoptimistic managers are making a mistake: had they paid with stock instead, they could have created additional value for their shareholders. This mistake is reflected in lower returns. On the other hand, paying with stock during market overvaluations is a signal of good decision making. This is positively received by investors, and is associated with subsequent outperformance. At times of high market valuations, cash acquisitions by overoptimistic CEOs are hence especially prone to underperform, whereas their acquisitions involving stock are likely to do particularly well. Returns to acquiring shareholders are assessed through long-run returns over one to three year horizons measured by a calendar time portfolio approach. For a complete picture, I also present announcement returns despite the difficulties of interpreting them in the presence of potential misvaluation. The data support the notion that the perceived cost of stock financing leads to higher thresholds for stock acquisitions of overoptimistic CEOs: Acquisitions involving stock payment by overoptimistic CEOs indeed outperform those of their rational colleagues at times of high market valuation. As predicted, this is not the case for cash acquisitions.

The findings in this paper contribute to the literature in several ways. First, I show how considering market valuation and overoptimism jointly yields straightforward predictions which arise uniquely from their interaction. The previous literature has focused on studying deviations from fundamental beliefs by either managers and market participants in isolation. Studying them jointly has often been deemed too complicated and unlikely to yield clear predictions not already gained from studying them separately. This paper demonstrates how clear predictions and additional insights can be gained by taking the interaction of market misvaluation and overoptimism into account. Specifically, the fact that managers differ in their preferred method of payment only at times of moderately high market valuation arises uniquely from their joint consideration and improves our understanding of the choice of method of payment in corporate acquisitions. In addition, less stringent identifying assumptions are necessary to interpret the presented results as further empirical support for both the theory of stock market driven acquisitions⁶ and the role of overoptimism in firms'

⁶Several papers find empirical evidence for stock market driven acquisitions: [Andrade, Mitchell, and Stafford \(2001\)](#) report that for a majority of mergers from the mid 70s to late 90s acquirers have higher price-to-earnings ratios than targets, an indication of acquirer overvaluation. [Rhodes-Kropf, Robinson, and Viswanathan \(2005\)](#) show that, as predicted by their earlier paper, mergers are undertaken when the acquirer is specifically overvalued and that targets tend to be undervalued relative to the acquirer. [Dong, Hirshleifer, Richardson, and Teoh \(2006\)](#) use two proxies for misvaluation, market-to-book ratios and market-to-value ratios based on analyst forecasts and find broad support of the misvaluation hypothesis. [Ang and Cheng \(2006\)](#) use analyst forecasts to calculate a fair value for the firm based on the residual income model and use this and the market-to-book ratio to measure misvaluation. They find that more overvalued firms are more likely to acquire with stock, acquirers are generally more overvalued than their targets and acquirer

takeover decisions. Rather than the absence of any confounding factors in the measurement of either market valuation or overoptimism, it is sufficient to assume for confounding factors to not systematically vary with the respective other measure.

Finally, the paper contributes to the literature on the relation between the method of payment and managerial overoptimism and returns to acquiring shareholders. Earlier research has found that cash mergers outperform stock mergers (e.g. [Loughran and Vijh \(1997\)](#), [Rau and Vermaelen \(1998\)](#)), but more recent research has shown that these findings often disappear once value weighted returns and a calendar time portfolio approach or more recent data is used (see [Fama \(1998\)](#)). [Bouwman, Fuller, and Nain \(2009\)](#), for instance, confirm the results for the 1980s but find that cash mergers in the 1990s underperform stock mergers.⁷ This paper explains why the market’s assessment of cash and stock acquisitions differ depending on the market valuation at the time and potential overoptimism of the acquiring CEO, contributing to a better understanding of the driving factors of long-run returns to corporate acquisitions.

The paper is organized as follows. The next section, Section 1, derives the predictions to be tested. Section 2 presents the data and explains how overoptimism and market valuation are measured. Section 3 presents results on the method of payment and section 4 on announcement and long-run returns following the acquisition. Section 5 discusses robustness checks and section 6 concludes.

1 Empirical Predictions

This section provides intuition for the interaction of overoptimism and market misvaluation and derives my empirical predictions. I abstract from other frictions that affect the method of payment chosen, such as information asymmetries, assuming that they do not vary systematically with managerial overoptimism or potential market misvaluation.

Overoptimism and Market Valuation

shareholders are better off than those of similarly overvalued firms. [Akbulut \(2013\)](#) and [Song \(2007\)](#) use insider trading to measure overvaluation and confirm that stock payment is more likely for highly overvalued acquirers, but find that acquiring firms earn negative abnormal returns afterward. [Friedman \(2004\)](#) shows that acquirer overvaluation increases target premia in stock but not in cash mergers as predicted by a theory of stock market driven acquisitions. [Savor and Lu \(2009\)](#) compare completed acquisitions with ones that failed for exogenous reasons to show that acquirers create long-term value for their shareholders by using their overvalued stock as a method of payment. [Fu, Lin, and Officer \(2013\)](#), however, argue that overvalued acquirers do not create value for their shareholders.

⁷[Moeller, Schlingemann, and Stulz \(2005\)](#) also illustrate differences between mergers in the 1980s and early 1990s and those of the merger wave of the late 1990s.

I focus on two types of CEOs, rational and overoptimistic.⁸ Overoptimistic CEOs systematically overestimate their managerial ability and, hence, the value of their firm.⁹ A rational manager correctly perceives his firm's value. In the long run, market valuation reflects a firm's true fundamental value, but in the short-run market valuation can differ from fundamental value for exogenous reasons. CEOs observe their firm's market valuation and based on their belief about the firm's true value, infer the firm's misvaluation. Overoptimistic CEOs overestimate their firm's true value, so their inference about their firm's misvaluation is biased downward: When undervalued, overoptimistic CEOs believe their firm to be even more undervalued than it really is. When overvalued, they perceive part of the firm's overvaluation as warranted and underestimate the extent of overvaluation. Rational CEOs correctly perceive their firm's value and, hence, correctly infer the extent of misvaluation.

Acquisitions and Method of Payment

I assume that opportunities for a firm to acquire another firm arrive exogenously and the distribution of potential acquisitions is the same for both types of managers. The value of an acquisition to the acquirer is the value of the potential target, plus the synergies captured by the acquiring firm, minus the cost of the payment. For simplicity, I assume that acquirer and target agree on a fair price which the acquirer has to pay either in cash or with stock valued at the current market price.¹⁰ When paying with cash, the cost of the payment to acquirer shareholders equals the actual amount. For stock payments, however, the long-run cost to acquirer shareholders depends on their fundamental value rather than the current, potentially misvalued market price.

In the absence of market misvaluation and other frictions, paying with cash or with stock is equivalent and both types of managers are indifferent between the two methods of payment. When managers believe markets to be misvalued, however, this is no longer true. If their stock is overvalued, the fundamental value of the stock used for payment is less than its current market value. Hence, paying with stock is a de-facto price discount and creates additional value for acquirer shareholders. If their stock is undervalued, the opposite holds.

⁸According to [Malmendier and Zheng \(2012\)](#), corporate acquisitions are primarily affected by CEO overoptimism rather than by biases of other top managers.

⁹Overoptimism is thought of as a fixed personality trait of the CEO which does not vary over time and is not directly influenced by outside factors. This assumption is in line with much of the previous literature on CEO overoptimism. See [Malmendier and Tate \(2005b\)](#) and [Baker and Wurgler \(2011\)](#) for discussions of overoptimism in the literature.

¹⁰[Rhodes-Kropf and Viswanathan \(2004\)](#) suggest a signal extraction framework for why target shareholders may accept overvalued stock as payment. In their model, misvaluation has a market wide component and a firm specific one, but each firm knows only their own true valuation. When receiving a bid for a stock merger, target managers try to assess the value of the offer by filtering out market valuation. When markets are overvalued, however, the target is more likely to underestimate the market wide component and overestimate the firm specific one, underestimating the overvaluation component of a bid.

Based on perceived market valuation, overoptimistic and rational managers use the same decision rules. Overoptimistic managers' misperception of their firm's value and the resulting misperception of market misvaluation, however, can lead them to make different choices even though they follow the same decision rule. When markets are truly undervalued, both rational and overoptimistic CEOs prefer to pay cash. Similarly, when actual market valuation is so high that it exceeds even the overoptimistic manager's assessment of firm value, both types of managers prefer to use stock to pay for their acquisitions. However, when markets are moderately overvalued, overoptimistic CEOs still perceive their own firm to be undervalued and prefer to pay with cash, whereas rational CEOs recognize the market's overvaluation and prefer to pay with stock. Hence, the preferred method of payment differs between overoptimistic and rational managers when markets are moderately overvalued.

Prediction 1 *When markets are moderately overvalued, rational managers prefer to include stock to pay for an acquisition, but overoptimistic managers still prefer to pay with cash.*

Note that in reality there are additional factors other than CEO preference, such as the availability of cash reserves, which affect the ultimate choice of method of payment. While the CEO's preference remains a key determinant, such additional factors can in some instances constrain the CEO and require him to use either cash or stock to undertake an acquisition. In the presence of potential market misvaluation, the method of payment available to the CEO therefore affects which acquisitions are undertaken in the first place, as illustrated in Figure 1. When paying with cash, all acquisitions with positive perceived synergies are undertaken, irrespective of market valuation. When paying with stock, acquisitions are undertaken only when perceived synergies *plus* the additional cost or benefit from stock payment are positive. Hence, when managers perceive markets to be undervalued, they forgo acquisitions with positive synergies if they are outweighed by the cost of having to pay with stock. Similarly, when they perceive their stock to be overvalued, managers undertake acquisitions with negative perceived synergies which are only profitable when paid for with overvalued stock.

Overoptimism and the Value Created

Managerial overoptimism not only affects how a CEO prefers to pay for an acquisition, but also how much value is created by an acquisition conditional on the method of payment chosen (either because of CEO preference or other constraints). Specifically, overoptimism leads managers to misperceive market misvaluation and therefore systematically overestimate the cost of paying with stock. For an acquisition to be considered profitable, the perceived synergies need to outweigh these higher perceived financing cost, raising the threshold for

a potential stock acquisition. The average value of stock acquisitions conditional on being undertaken is therefore higher for overoptimistic than for rational CEOs. The higher threshold, however, also leads overoptimistic managers to forgo some profitable acquisitions which their rational colleagues would have undertaken. For cash acquisitions, the market valuation at the time of the takeover does not matter. Relative to cash acquisitions, stock acquisitions by overoptimistic CEOs therefore outperform those of their rational CEOs.¹¹

Prediction 2 *The tendency of overoptimistic managers to overestimate the cost of paying with stock leads to a higher threshold for acquisitions involving stock. These acquisitions therefore outperform those of their rational colleagues relative to the cash acquisitions undertaken by both groups.*

At times of high market valuation, overoptimistic and rational CEOs are distinguished by their preferred method of payment. By following their preference for cash payment, however, overoptimistic managers are making a voluntary mistake since they could have created more value by paying with stock. This mistake does not necessarily manifest itself when comparing the value created by cash acquisitions of overoptimistic to those by rational CEOs. When rational managers have to pay cash rather than using their preferred method of payment stock, they are forced to make the same mistake overoptimistic managers make voluntarily and can not realize the benefits of paying with stock.

The question therefore becomes whether the fact that overoptimistic managers voluntarily make or avoid a mistake affects subsequent stock returns. At times of high market valuation the CEO's actions are indicative of the extent of his overoptimism and its effect on corporate policy. The CEO's choice of method of payment is therefore a valuable signal for investors who were ex ante uncertain¹² about the extent or effect of the CEO's bias.¹³

¹¹The previous literature has argued that overoptimism also leads managers to overestimate the perceived synergies of an acquisition. This would lower the threshold for an acquisition to be considered profitable by an overoptimistic CEO, leading overoptimistic managers to pursue acquisitions their rational colleagues would not. This effect would lower the value created by all acquisitions of overoptimistic CEOs, irrespective of whether they were paid for with stock or with cash. For cash acquisitions, overestimation of synergies would therefore lead acquisitions by overoptimistic manager to unequivocally underperform that of their rational colleagues. For acquisitions involving stock, the two effects of overoptimism, overestimation of synergies and underestimation of overvaluation, go into opposite directions. However, irrespective of which effect dominates empirically, acquisitions involving stock by overoptimistic managers outperform those of their rational colleagues *relative* to the cash acquisitions undertaken by both groups.

¹²It is likely that there is uncertainty about CEO overoptimism. Previous actions may not yet have revealed a CEO as overoptimistic or markets may have overestimated a CEO's overoptimism based on his past actions.

¹³For instance, even if markets know a CEO's overoptimism, the effectiveness of corporate governance in keeping it in check may be difficult to judge by the market: Corporate acquisitions are important decisions and one would expect that they are subject to special scrutiny and oversight, so it may be hard to infer the effectiveness of corporate governance from day to day business operations. The role of corporate governance

Specifically, making the mistake to pay with cash rather than stock shows that the CEO is indeed overoptimistic and his overoptimism negatively impacts firm policy. Avoiding this mistake on the other hand is a good sign: the CEO acts in the interest of shareholders, alleviating concerns about his overoptimism or its ability to affect corporate policy.¹⁴ Of course, the method of payment can reveal such information only if market participants can, at least to some degree, distinguish whether CEO preference or other constraints lead to the choice of method of payment. This, however, is very likely the case. For instance, constraints such as a strong preference for either stock or cash by the target shareholders or the extent of the firm's cash reserves are often known to market participants.¹⁵ In addition, rational managers have an incentive to cite constraints to justify their suboptimal choice of method of payment. Overoptimistic managers, on the other hand, genuinely believe they are maximizing shareholder value by paying with cash, so they would not want to claim such constraints for their choice of cash. High market valuation can therefore exacerbate the differences in subsequent stock returns between rational and overoptimistic CEO.

Prediction 3 *When markets are overvalued, the preferred method of payment distinguishes overoptimistic and rational CEOs and exacerbates differences in the value created between the two types of managers: Cash acquisitions by overoptimistic CEOs are especially prone to underperform since managers suboptimally choose to pay with cash. Acquisitions involving stock by overoptimistic CEOs are especially prone to outperform since the mistake of cash payment was avoided.*

Note that the effect of market valuation on subsequent returns no longer hinges on the distinction between moderately and high market settings: observing a CEO's preference for cash payment is bad news for investors. This is true in both high and moderately high market settings, though it is substantially less likely to occur in the former than the latter, when overoptimistic managers are more likely to still feel undervalued.

may be especially important when CEO overoptimism can benefit the firm, as well as hurt it. For instance, [Hirshleifer, Low, and Teoh \(2012\)](#) show that overoptimistic managers are better innovators and [Gervais, Heaton, and Odean \(2011\)](#) and [Goel and Thakor \(2008\)](#) argue that overoptimism can counteract risk aversion.

¹⁴[Kolasinski and Li \(2013\)](#) show that corporate governance can for instance counteract CEO overoptimism in corporate acquisitions and [Masulis, Wang, and Xie \(2007\)](#) show that corporate governance also affects the returns to acquisitions in general.

¹⁵[Ghosh and Ruland \(1998\)](#) argues that target managers who are seeking influence in the combined firm may prefer stock.

2 Methodology and Data

To measure overoptimism, I use data from Execucomp on CEO stock option holdings, supplemented by information on option exercise behavior from the Thompson Financial Insider Database. The SDC Platinum database contains information on mergers and acquisitions, balance sheet information is obtained from Compustat and stock price data from CRSP. This section describes the sample of CEOs and acquisitions, and explains how overoptimism and market valuation are measured.

2.1 Sample Selection

The starting sample consists of all firms for which Execucomp contains data on the current CEO between 1992 and 2008. Adding balance sheet information from Compustat, leaves 25,039 firm years and 2,514 unique companies with non-missing accounting data.¹⁶ I restrict attention to acquisitions¹⁷ with a transaction value of at least \$50 million, with information on the method of payment available and with non-missing balance sheet data of the acquirer at the time of acquisition. This yields 3,831 acquisitions for the regression analysis.¹⁸

2.2 Measuring Overoptimism

I follow [Malmendier and Tate \(2005a, 2008\)](#) and use CEO's personal portfolio decisions to measure overoptimism. [Malmendier and Tate \(2005a, 2008\)](#) show that some CEOs persistently keep options until expiration, even though they exceed exercise thresholds derived from models of optimal option exercise and the CEOs would have fared better had they exercised earlier. I classify CEOs as overoptimistic when they hold an option until expiration even though it was at least 40% in-the-money the year before expiration.¹⁹ This measure, called *Longholder* by [Malmendier and Tate \(2005a, 2008\)](#), is constructed as a CEO fixed effect.²⁰ In the robustness checks, I use an alternative measure for which I only classify CEOs as overoptimistic *after* they first held an option until expiration and exclude the option ex-

¹⁶The definition of variables based on accounting measures follows [Malmendier and Tate \(2008\)](#).

¹⁷I require the acquiring firm to own less than 50% of share before and at least 51% of share after the transaction. I also exclude transactions where the target is a subsidiary of the acquirer.

¹⁸There are an additional 49 acquisitions by an acquirers in my sample announced at the same day as another acquisition. In these cases, the smaller of the two acquisitions is dropped from the sample. Including both acquisitions announced by the same firm at the same day in the regression analysis does not alter the results.

¹⁹The threshold of 40% follows [Malmendier and Tate \(2008\)](#) who obtain it by calibrating the model in [Hall and Murphy \(2002\)](#).

²⁰[Kolasinski and Li \(2013\)](#) argue that overoptimism can potentially vary over time as CEOs experience trading losses in their own firm's stock.

ercise behavior of the CEO around the year an acquisition is announced. This ensures that factors influencing the method of payment chosen, such as market valuation at the time, do not simultaneously affect a CEO’s classification as overoptimistic.

The data, Thompson Financial Insider Filings, includes the exercise price and the expiration date of every option a CEO exercises, so I can identify every option exercised at the day of expiration and whether the option was at least 40% in the money a year prior. This data, however, does not easily allow to identify the relevant control group, i.e. the CEOs who could have held an option “too long”, but choose not to. I use data from Execucomp Annual Compensation table to identify them. CEOs are only included when they at some point hold options which they could have exercised but did not and whose average value lay above the exercise price, i.e. the average option was in-the-money. This ensures that the control group only includes CEOs who could have revealed themselves as overoptimistic but did not. It excludes CEOs who do not have stock options, whose stock options are not vested at any point in the sample or whose options are not in-the-money. Table 1 shows that of the 5,646 CEOs in my sample for whom I have some information on option holdings, the vast majority (5,418 out of 5,646) has unexercised options which are on average in-the-money at some point. Among these CEOs, I identify 20% as overoptimistic. Restricting the sample to CEOs with options that are on average 40% in-the-money reduces the sample size to 3,995 CEOs. Further requiring at least one option exercise by the CEO to be observed in the TNF Insider database leaves 3,511 managers. As the sample shrinks, the percentage of CEOs identified as overoptimistic increases from around 20% to just over 30%, since it eliminates CEOs who would not have been classified as overoptimistic. In the robustness checks, I show that the results are similar across these different samples.²¹

2.3 CEO Option Holdings

Table 2 shows the average yearly option holdings by CEO overoptimism. CEOs classified as overoptimistic have more options which they could exercise than non-overoptimistic CEOs, and these options are worth more on average. Overoptimistic CEOs also have slightly more unexercised, but not yet exercisable options than their rational colleagues, indicating that part of the higher option holdings of overoptimistic CEOs are driven by the fact that they are granted more options. In a typical year, the median overoptimistic CEO has about 254,000 unexercised options worth about \$2.1 million, about twice the number and five times the value held by non-overoptimistic CEOs. Overoptimistic CEOs hold about 50% more options which are not yet exercisable than their colleagues (140,000 compared to 100,000). The value

²¹Appendix A shows that overoptimistic CEOs have longer tenure, on average, and discusses the possible reasons for the relationship between CEO tenure and the likelihood of being classified as overoptimistic.

of these unexercisable options is about 3.5 times the value held by rational CEOs, compared to five times the value for exercisable options. Hence, the difference between the two groups is much larger for options that could be exercised than for those that could not. This indicates that the differences in option holdings are at least partially driven by differences in exercise behavior. The differences between the two types of managers are smaller, but still substantial, when comparing means instead of the median, indicating that amongst CEOs classified as not being overoptimistic, some have very high option holdings, as well.

2.4 Measuring Market Misvaluation

Measuring market misvaluation is inherently difficult. If it was easily observable and identifiable, markets would correct any misvaluation quickly. Most approaches in the literature therefore resort to measuring misvaluation by comparing certain indicators of fundamentals, such as market-to-book ratios or price-to-earnings (P/E) ratios, to their long-term or industry average. I follow the same approach, partly because of a lack of good alternatives, but also to keep my results comparable to the previous literature. My main approach follows [Bouwman, Fuller, and Nain \(2009\)](#) and is based on the price-to-earnings ratio of the S&P500. The empirical predictions derived above do not make any assumptions about the nature of potential misvaluation, i.e. whether it is market-wide or firm-specific and both types of measures could be used to test the empirical predictions. In this paper, I use market wide valuation measures, since they are less prone to capturing individual firms' growth opportunities and to confound the influence of firm-specific misvaluation with other firm specific characteristics.

Based on the price-to-earnings ratio of the S&P500 and its long-term trend, I classify each month as having high, neutral, or low valuation. I further distinguish high market valuation into high and moderately high valuation. [Figure 2](#) graphs the P/E ratio and its long-term trend from 1990 to 2008.²² Times with valuations above the long-term trend are sorted into three groups: The lowest quintile is considered to still be in the neutral range, the second and third quintile are classified as moderately high and the two highest quintiles are classified as high market valuations. [Figure 2](#) shows the classification into times of high market valuation (overvaluation=2), medium high market valuation (overvaluation=1) and no overvaluation (overvaluation=0). The graph shows that markets were overvalued relative to their long-term trend in the years leading up to the year 2000 before stock prices fell considerably. Markets also deviated from their long-term trend shortly in 2003, and some

²²I compute a long-term trend for the P/E ratio of the S&P500 by regressing the value of the given month and the 5 preceding years on a constant, a linear time trend and the long term interest rate. The long-term trend value for the P/E ratio is the fitted value from this regression.

minor deviations occurred early in the 1990s. The time period after the peak of the P/E ratio in 2000 is not classified as being overvalued. One could still argue that prices were too high, but since prices were already falling it seems likely that this time was not perceived as one of particularly high prices.²³

2.5 Acquisitions

Table 3 shows characteristics of the acquisitions in my sample. About a third of the acquisitions in the sample are undertaken by CEOs classified as overoptimistic who constitute 20% of CEOs. The acquisitions undertaken by the two types of CEOs look relatively similar. Acquisitions by overoptimistic CEOs are slightly larger both in absolute dollar value and relative to the acquirer size. Both types of managers pay with only cash in just over half of the acquisitions, and 15% of acquisitions are paid for entirely in stock. Similarly, about half of all acquisitions take place during times of high market valuation with a total of about 30% taking place during high market valuations, and around 20% during times of medium high market valuation.

Table 4 shows the method of payment by CEO overoptimism and market valuation. CEOs not classified as overoptimistic pay for 53.5% of their acquisitions with only cash when market valuation is low or normal. As market valuation rises, the share of pure cash acquisitions falls to 46.7% in medium high and 48.7% in high markets. When market valuation is low or normal, CEOs classified as overoptimistic pay 51.9% of their acquisitions with cash, slightly less than non-overoptimistic CEOs. However, as market valuation rises, the share of pure cash acquisitions increases to 58.3% for overoptimistic CEOs, before falling back to 51% at times of high market valuation. An analogous picture can be observed for acquisitions paid for entirely with stock. CEOs classified as overoptimistic do not increase but rather slightly decrease the share of acquisition paid for with stock as market valuation rises, from 15.1% to 13.5% and 14.6% at times of moderate and high market valuations. The opposite is true for non-overoptimistic CEOs. At times of normal or low market valuation they pay only 11.3% of acquisitions with stock, but this share rises to 18% in moderately high markets and 16% in high market settings. These summary statistics already suggest that when market valuation is above their long-term trend, managers classified as overoptimistic are more likely to pay with only cash rather than including some stock or paying entirely with stock compared to their non-overoptimistic colleagues. While Table 4 already suggests that overoptimistic

²³The implicit assumption in my measure of market valuation is that on average, markets are about right over 5 year time horizons (since the long-term trend is based on a five year period). Even if this is not the case, managers may believe it to be true, compare their valuation relative to what it was in the last couple of years and act accordingly. Therefore, as long as the misvaluation measure picks up on misvaluation as perceived by managers, the predictions for the preferred method of payments would remain.

CEOs are indeed more likely to use cash when market valuation is moderately high, the summary statistics do not control for differences in the composition of acquisitions between times of different market valuation. The regression analysis below will remedy this.

2.6 Measuring Value Consequences of Acquisitions

When markets are perfectly efficient, the expected value created by an acquisition and any information revealed by it will be reflected in stock prices as soon as the market learns about the acquisition. Returns to the acquirer's stock around the announcement day of the acquisition then reflect all information and the full value implications and are widely used in the literature to evaluate corporate events. The validity of this measure hinges on the assumption that markets incorporate new information immediately and correctly. The theoretic predictions tested in this paper, however, are based on the assumption of potential market misvaluation in the short run, so announcement returns can not be expected to fully reflect any value consequences. To address this issue, I present long-term returns over one, two and three years after announcement. In the presence of short term misvaluations, long-run returns are more likely to capture the value created and any information revealed, as long as markets recognize true value consequences eventually.

Measuring Announcement Returns

Abnormal announcement returns are measured as three day cumulative returns from the day before to the day after the announcement of the acquisition. Abnormal returns are calculated by taking the daily returns to the acquirer's stock and subtracting the daily return of the S&P500 value-weighted index.

Measuring Long-run Returns

I use a calendar time portfolio approach to measure long-run returns. This approach tracks the performance of an event portfolio in calendar time relative to some benchmark. It is strongly advocated by [Fama \(1998\)](#), and [Mitchell and Stafford \(2000\)](#) demonstrate that correlations between the long-run returns of event firms are automatically taken into account in the portfolio variance. Such correlations are likely to be a major factor when events cluster over time, as is the case for the acquisitions in my sample. To measure the long-run returns over a period of n months, calendar time portfolios are formed each month and include acquiring firms of all acquisitions announced in the last n months. The portfolio's monthly return is computed for each month using value-weighted portfolio returns. To measure abnormal returns, portfolio excess returns are regressed on the [Fama and French \(1993\)](#)

factors and the Carhart (1997) momentum factor, as in the following equation:

$$R_{p,t} - R_{f,t} = a_p + b(R_{m,t} - R_{f,t}) + sSMB_t + hHML_t + mMOM_t + \varepsilon_{p,t} \quad (1)$$

The Fama and French (1993) factors are the excess return of the market over the risk-free rate ($R_{m,t} - R_{f,t}$), the difference in returns of a portfolio of small versus big stocks (SMB), and the difference in returns of a portfolio of high and low book-to-market firms (HML). The Carhart momentum factor is the difference in returns between the portfolio of stocks with the highest 30% of lagged 11 month returns and those with the lowest 30% lagged returns. To assess the abnormal returns attributable to the corporate event, in this case the undertaken acquisition, the portion of returns explained by the four factors is filtered out and the average abnormal monthly return is captured by the intercept in the regression (a_p). To measure long-run returns for the different types of acquisitions, e.g. cash acquisitions versus non-cash acquisitions or acquisitions during high markets versus acquisitions during low markets, a calendar time portfolio is formed for each type of acquisition (p). In the regression, indicator variables for each type of acquisition (a_p) capture the different intercepts, and hence abnormal returns, for each portfolio.

2.7 Identification Assumptions

Considering overoptimism and market valuation simultaneously refines the predictions implied by both factors and leads to empirical predictions focused on the interaction effects of the two. Focusing on their interaction also substantially relaxes the identification assumptions necessary to interpret the results. Rather than assume that measures for overoptimism and market valuation do not capture any other factors, it is enough to assume that they do not capture other factors which co-vary systematically with the respective other measure. For instance, the measure for market valuation may be capturing not misvaluation but other factors making stock and cash payment differentially attractive at different times. However, as long as such other factors do not systematically differ for CEOs classified as overoptimistic, the interaction effect between the two can still be identified. Any alternative explanation for the results therefore needs to explain (i) why overoptimism leads to differences in behavior only at times of moderately overvalued markets and (ii) why market valuation affects CEOs classified as overoptimistic differently than their colleagues.

3 Results: Method of Payment

The first empirical prediction, Prediction 1, is the difference in the preferred method of payment between overoptimistic and rational CEOs when market valuation is moderately high: Rational managers prefer to use their overvalued stock whereas overoptimistic managers still feel undervalued and prefer to use cash. To test this prediction, I estimate the effects of overoptimism and market valuation on the probability of paying with cash, using equation 2. The dependent variable is an indicator for whether the acquisition was paid for entirely with cash and X includes additional firm and acquisition level controls:

$$\begin{aligned} \Pr(\text{Cash}) = & \alpha + \beta_1 * \text{overoptimisticCEO} + \beta_2 * \text{highMV} \\ & + \beta_3 * \text{overoptimisticCEO} * \text{highMV} + \beta_4 * X + \varepsilon \end{aligned} \quad (2)$$

Table 5 shows regression results of this equation. The results are presented as odds ratios which are equal to the exponentiated coefficient for the logistic regression used and make it easier to interpret the results. An odds ratio equal to 1 means that a variable has no effect on the outcome and an odds ratio above 1 indicates how much more likely a given variable makes the outcome. An estimated odds ratio of 1.5 for CEO overoptimism, for example, would indicate that CEOs classified as overoptimistic are 1.5 times as likely as non-overoptimistic CEOs to use cash as method of payment.

The first column of table 5 shows basic results and columns 2 to 4 add controls. The results are consistent throughout all specifications. As expected, overoptimistic CEOs are significantly more likely to use cash as method of payment than their rational colleagues when markets are moderately overvalued. When markets are highly overvalued, this difference becomes smaller and no longer statistically significant. This is consistent with the notion that even overoptimistic CEOs recognize the misvaluation and try to exploit it as market valuation becomes very high. There is no difference in the tendency to pay with cash during times of normal or low market valuation. Note that the overall effect of having an overoptimistic CEO on the probability of using only cash in either market settings is the combination of the direct effect of CEO overoptimism and the effect of the interaction of CEO overoptimism with market valuation. The direct effect of CEO overoptimism, however, is not significantly different from zero allowing to focus on the odds ratio of the interaction only.

The estimated effects of the control variables have the expected signs. A higher Q of the acquirer firm, both in absolute terms and relative to its industry average, decreases the likelihood of paying with cash. Firms with high Q are often younger, fast growing firms

which derive a large share of their value from intangibles assets. These firms are less likely to have large amounts of cash at hand to pay for an acquisition and are indeed estimated to be less likely to do so. The acquirer’s Q relative to its industry average is often also used as a proxy for acquirers’ idiosyncratic valuation. Consistent with this interpretation, a higher relative Q decreases the likelihood of paying with cash, whereas firms with below average Q are more likely to use cash, though these effects are far from statistically significant. A higher transaction value, both in absolute and relative terms, decreases the likelihood of cash payments significantly. This reflects that paying only with cash is more difficult when a transaction is large and may exceed the firm’s cash reserves. Higher cash holdings,²⁴ higher cash flow, higher dividends paid in the last year and lower leverage are indicators of a firm’s ability to access cash to use as method of payment and increase the likelihood of paying with cash. A CEO’s option holdings have no significant effect on the choice of the method of payment. In table A2 of the appendix I also add an indicator variable for cash rich firms following Harford (1999). Including this measure reduces the sample size substantially and less than 15% of all remaining acquisitions are undertaken by cash rich firms. The estimated effects of CEO overoptimism and its interaction with medium high markets are slightly higher than in the main specification at similar significance levels. The measure for cash richness has no significant effect, either on its own or interacted with CEO overoptimism and market valuation. Nevertheless, the point estimates are consistent with overoptimistic CEOs being more likely to use cash when they are cash rich. Finally, in unreported results I estimate equation 2 using a linear probability model and obtain very similar results.

4 Results: Returns to Acquiring Shareholders

Overoptimism and market valuation influence stock returns following an acquisition both directly and through the method of payment. As outlined in section 1, the tendency of overoptimistic CEOs to overestimate the cost of stock payment increases the expected value of their stock acquisitions, but not their cash acquisitions. Therefore, acquisitions involving stock by overoptimistic managers outperform those of their rational colleagues relative to both groups’ cash acquisitions (Prediction 2). At times of high market valuation, the method of payment distinguishes overoptimistic and rational CEOs and can inform markets about a CEO’s overoptimism and its effect on firm policy, amplifying the differences between overoptimistic and rational managers. Hence, cash acquisitions are especially likely to underperform, whereas acquisitions involving stock are more likely to outperform at times of

²⁴Including cash holdings as a percentage of capital does not change the results but has less explanatory power than the amount of cash held.

high market valuation (Prediction 3).

As outlined in section 2, the value implications of corporate events are often measured by the stock returns around the announcement of the event, which hinges on the assumption that markets incorporate new information immediately and correctly. The theoretical predictions, however, are based on the assumption of potential market misvaluation in the short run. It is therefore not clear what the immediate market reaction to the announcement of an acquisition should be and whether it captures all value implications.²⁵ For a broad picture of the returns to acquisitions, the next section presents both announcement returns and long-run returns.

Finally, I no longer distinguish between high and moderately high market valuation when estimating returns. First, returns are estimated separately by method of payment. Hence, acquisitions are compared conditional on the method of payment, irrespective of whether the method of payment chosen was the one preferred by the CEO or whether other factors influenced the ultimate choice. Moreover, the effect of market valuation on subsequent returns no longer hinges on the distinction between moderately high and high market settings: observing a CEO's preference for cash payment is bad news for investors, in both high and moderately high market settings. Overoptimistic managers, though, are a lot less likely to still prefer cash payment in high market settings than moderately high markets, when overoptimistic managers are more likely to still feel undervalued. While the effect is therefore likely stronger in moderately high than in high market settings, combining moderately high and high market settings ensures that there is a sufficient number of firms in each event portfolio (which are formed by method of payment, CEO overoptimism and market valuation).

4.1 Announcement Returns

Table 6 shows estimates of the effects of overoptimism and cash financing on announcement returns. The first column presents estimates for all acquisitions irrespective of the market valuation at the time of announcement. Cash acquisitions in general are positively received by the market with announcement returns that are 75 basis points higher than for acquisitions involving stock. Acquisitions by overoptimistic CEOs, both in general and if paid for with cash, have slightly lower announcement returns, though the estimates are small and not significant.²⁶

²⁵Even without assuming systematic market misvaluation, [Malmendier, Opp, and Saidi \(2012\)](#) show that a substantial fraction of announcement returns are driven by the revaluation of the target and can not be interpreted as value implications of the merger itself.

²⁶Not taking method of payment or market valuation into account, overoptimistic CEOs in my sample can expect announcement returns 9 basis points lower than their rational colleagues. This estimate is sub-

The second and third column of Table 6 show announcement returns estimated separately for times of high and low market valuations. Again, announcement returns do not differ significantly between overoptimistic and rational CEOs in either high or low market settings.²⁷

4.2 Long-run Returns

For a more comprehensive picture, especially in the presence of potential misvaluation, of the value implications of acquisitions, this section presents long-run returns to acquiring shareholders in addition to the announcement returns presented above. Abnormal returns are based on the calendar time portfolio approach as outlined in section 2.6 and returns are estimated for time horizons of 12, 24 and 36 month after the announcement of an acquisition.

Table 7 shows average abnormal monthly returns to acquiring shareholders holding portfolios formed for four types of acquisitions: cash acquisition by overoptimistic and rational CEOs and acquisitions involving stock by both types. The abnormal returns for each portfolio p are first estimated separately for times of high and low market valuation and then jointly by the following equation:

$$\begin{aligned}
R_{p,t} - R_{f,t} = & a_p + b(R_{m,t} - R_{f,t}) + sSMB_t + hHML_t + mMOM_t \\
& + a_c * cashonly + a_L * overoptimisticCEO + a_h * highMV \\
& + a_{cL}(cashonly * overoptimisticCEO) + a_{ch}(cashonly * highMV) \\
& + a_{hL}(highMV * overoptimisticCEO) + \\
& + a_{cLh}(cashonly * overoptimisticCEO * highMV) + \varepsilon_{p,t} \tag{3}
\end{aligned}$$

During times of high market valuations (columns 1, 4 and 7) cash acquisitions in general substantially smaller than the corresponding estimate in Malmendier and Tate (2008) and is not significantly different from zero. Malmendier and Tate (2008) study acquisitions between 1980 and 1994, whereas acquisitions in my sample took place between 1992 and 2008. Moeller, Schlingemann, and Stulz (2005) and Bouwman, Fuller, and Nain (2009), amongst others, show that acquisitions differ between these different time periods. Moreover, Malmendier and Tate (2008) also use more detailed data to classify CEOs as overoptimistic, which is available for a smaller sample of firms.

²⁷ The last column allows comparing estimates for high and low market settings. The triple interaction measures the marginal effect of cash payment by an overoptimistic CEO at times of high market valuation, which is positive with a p-value of 8.3%. Market participants therefore seem to perceive cash acquisitions by overoptimistic CEOs more favorably during times of high than during times of low market valuations. In the presence of short run misvaluation, this may not be surprising. At times of high market valuations, investors may be more inclined to believe the arguments of an overoptimistic CEO and share his optimistic beliefs about the prospects of the firm and the acquisition. Investors may only recognize the suboptimal decisions overoptimistic managers made by paying cash when market valuation returns to normal levels. Rosen (2006), for instance, finds higher announcement returns in “hot” merger markets when previous mergers have been well received, but reversal of such higher returns in the long run.

have positive abnormal returns though their magnitude decreases with longer time horizons and the estimates are not significantly different from zero. Acquisitions by overoptimistic CEOs outperform significantly during times of high market valuations. Cash acquisitions by overoptimistic CEOs, however, have negative marginal returns which are statistically significant for time horizons of 12 and 24 month. Note that the coefficient on CEO overoptimism and the interaction of CEO overoptimism with cash financing are very similar in magnitude for all three time horizons, but with opposite effects. During times of high market valuations, acquisitions involving stock²⁸ by overoptimistic CEOs therefore outperform those of their rational colleagues. For cash acquisitions, however, this is not the case (captured by the sum of the coefficient on overoptimism and the coefficient on its interaction with cash payment). The results indicate that overoptimistic managers indeed overestimate the cost of stock financing, leading to higher thresholds for these acquisitions and consequently higher subsequent returns. I do not find evidence that overoptimistic managers overestimate synergies from an acquisition, which would lead their cash acquisitions to underperform.

During times of low market valuation (columns 2, 5 and 8), none of the variables has significant influence on abnormal returns. Hence, any difference between overoptimistic and rational managers are driven by acquisitions taking place during times of high market valuation. Specifically, acquisitions by overoptimistic managers involving stock outperform those of their rational colleagues, though their cash acquisitions do not. The results are therefore consistent with Prediction 3: At times of low market valuation, there is no difference in the preferred method of payment between the two types of CEOs. Therefore, the choice of method of payment does not contain information about the CEO's type or the firm's ability to deal with CEO overoptimism. At times of high market valuation, however, overoptimistic managers, unlike rational managers, still prefer to pay with cash rather than their overvalued stock, as long as market valuation does not exceed their own overoptimistic expectations. Hence, including stock as payment indicates that this mistake was avoided, leading to higher long-run returns.

Finally, columns 3, 6 and 9 allow to compare the estimates for high and low market valuations. The coefficient on the triple interaction measures whether the marginal effect on returns to cash acquisitions for overoptimistic managers differ between times of high and low market valuation. For all three horizons the coefficient on the triple interaction is negative, indicating that cash acquisitions by overoptimistic managers underperform at times of high relative to times of low market valuation. The statistical significance of this difference,

²⁸The results include acquisitions paid entirely or partially with stock. The results are similar for just stock acquisitions, but less significant. This is primarily because of the lower number of stock acquisitions. As shown in table 4, about half of all acquisitions are paid with cash only, whereas pure stock payment is less than 15% of all acquisitions.

though, is compromised by the noise of the estimation during times of low market valuation. Overall, at times of high market valuation, acquisitions by overoptimistic managers involving stock outperform those of their rational colleagues but cash acquisitions do not. At times of low market valuations there are no significant differences between overoptimistic and rational managers or between different methods of payments.

4.3 The Whole Picture: Announcement and Long-run Returns

While not statistically significantly different from zero, announcement returns do not always go in the same direction as long-run returns. For instance, during times of high market valuation, cash acquisitions by overoptimistic CEOs have positive but statistically insignificant marginal announcement returns, but negative and statistically significant long-run returns.²⁹ When market valuation is high, acquisitions involving stock by overoptimistic CEOs have 40 basis points lower returns at announcement than those of their rational colleagues.³⁰ Over a 12 month period, however, they outperform by 1.4 percentage points monthly,³¹ corresponding to 17.2 percentage points over the whole year and outweighing the negative announcement returns substantially. Similarly, at times of high market valuation, cash acquisitions by overoptimistic CEOs have announcement returns 62 basis points higher than their stock acquisitions.³² Over a period of 12 month, however, they underperform by 70 basis points monthly,³³ corresponding to 8.4 percentage points over the whole year. The long-run effect therefore outweighs the effect on announcement returns and cash acquisitions by overoptimistic managers underperform relative to their acquisitions involving stock during times of high market valuations.

5 Robustness Checks

In the appendix, I conduct several robustness checks of the results presented. Appendix C shows alternative measures of market valuation and Appendix D alternative measures for overoptimism.

²⁹This is consistent with the results of [Bouwman, Fuller, and Nain \(2009\)](#), who find that acquisitions during times of low market valuations underperform at announcement, but outperform in the long-run whereas the opposite holds for acquisitions at times of high market valuation.

³⁰-.400 is the coefficient on “CEO overoptimism” in column 2 of table 6.

³¹1.433 is the coefficient on “CEO overoptimism” in column 1 of table 7.

³².619 = .191 + .428, i.e. the coefficient on “cashonly” plus the coefficient on the interaction of “cash” and “CEO overoptimism” in column 2 of table 6.

³³-.699 = .631 - 1.330, i.e. the coefficient on “cashonly” plus the coefficient on the interaction of “cash” and “CEO Overoptimism” in column 1 of table 7.

In the baseline specification, market valuation is measured by indicators for times of different market valuation based on the P/E ratio of the S&P500. First, I use the detrended P/E ratio directly as a measure of market valuation instead of splitting the measure into indicator variables (table A2). Overoptimistic managers are more likely to pay with only cash when market valuation is high. Including the square of market valuation to test whether this effect diminishes as market valuation becomes very high indicates that this is the case, but causes the direct effect of market valuation to become insignificant. Second, I use an alternative method to classify times into high and medium high market valuation. In the baseline specification, the two highest quintiles of all positive deviations of the P/E ratio from its long-term trend are classified as high and the second and third quintile as medium high (method 1). In the appendix, I also classify market valuation based on all instead of on only positive deviations. The top quintile of all deviations is classified as times of high market valuation and the second highest quintile as medium high market valuation (method 2). I also use the value of the S&P500 index and the median market-to-book ratio of all firms listed in the S&P500 instead of the P/E ratio to measure market valuation. The measures based on the P/E ratio and the value of the S&P500 index using either classification method 1 or 2 are highly correlated and classification into times of high and medium high markets are very similar (table A3). The measure based on the market-to-book ratio differs more from the two other ones with a correlation coefficient between 40% and 45%. The difference between the two measures is most pronounced in the years between 2000 and 2002. To show that the main results hold using alternative specifications, I repeat the regression in column 3 of table 5 for each of the alternative measures in table A4.³⁴ The odds ratio of the key coefficient of interest, the interaction of CEO overoptimism and medium high market valuation is very similar for any of the measures based on the S&P500. Using the median market-to-book ratio to measure market valuation, however, leads to lower estimates which are no longer statistically significant.

Next, I detrend the P/E ratio over time horizons of 3 and 7 years instead of over the 5 year horizon previously used (table A5). Using these alternative measures, the estimates for the interaction of CEO overoptimism and medium high markets ranges from 1.3 to 2.1. compared to 1.7 in the baseline specification. Except in one specification, the estimates are all statistically significant

Finally, I alter the regression specification. In table A6, I directly include indicator variables for normal and medium low market valuations instead of aggregating them into the excluded category. Using the P/E ratio to measure market valuation yields very similar

³⁴I include all firm and acquisition level controls. I do not include relative Q and the additional controls for the CEO's option holdings, but doing so does not alter the results.

results as before. When market valuation is measured with the market-to-book ratio, the effect of CEO overoptimism in medium high market settings is lower and less statistically significant with a p-value of 7.5%. However, in medium market valuations, there is a positive and statistically significant effect of CEO overoptimism on the probability of paying cash and this effect is similar in magnitude to the one observed at times of medium high market valuations when the P/E ratio is used.³⁵

Appendix D presents robustness checks using alternative measures of overoptimism. In the baseline specification, I classify a CEO as overoptimistic if he holds an option until expiration even though it was at least 40% in-the-money a year before expiration. The control group includes all CEOs who at some point have unexercised options which are in-the-money and could have been exercised. In addition to the baseline specification, I first require CEOs' options holding to be on average 40% in the money for the CEO to be included in the control group. Compared to the baseline this excludes managers with option holdings which are just barely in-the-money. Second, I require CEOs to also be observed at least once in the Thomson Financial Insider database to ensure that they are covered by the database. In table A7, I re-estimate the regression in table 5 with these alternative measures. The key variable of interest, the interaction of CEO overoptimism and medium high market valuations is significant in all specifications and only varies slightly in magnitude.

I also split the baseline measure of overoptimism into two variables: Overoptimism post classification is equal to one only in the years after the CEO held an option until expiration. Overoptimism prior classification is equal to one in the remaining years a CEO was previously classified as overoptimistic. Repeating the regression analysis with this alternative measures yields a slightly higher odds ratio for the interaction of overoptimism post classification with medium high market valuations, whereas the odds ratio for the interaction with overoptimism prior classification is smaller and no longer significant. This indicates the effect of overoptimism is strongest after a CEO has been classified as overoptimistic.

Finally, a recent acquisition by the firm or a planned acquisition in the near future could influence a CEO's option exercise decision. CEOs may want to avoid exercising options around an acquisition to avoid signaling information to the market or there may be other factors influencing both decisions. I therefore exclude acquisitions where the CEO was classified as overoptimistic around the same time the acquisition took place (in the same year, the same year or the year before and the same year and the year before and after). Re-estimating the basic regression results in table A8 yields only marginally lower and still

³⁵This suggests that the lower estimates when measuring market valuation based on the market-to-book ratio in the baseline specification was partly due to times of medium high market valuation being pooled into the excluded category despite the fact that overoptimistic CEOs are already more likely to use cash.

significant estimates than in the baseline regression.

6 Conclusion

This paper provide strong support for the idea that both market misvaluation as well as managerial overoptimism play an important role for the method of payment in corporate acquisitions. The fact that overoptimistic and rational managers differ in their preferred method of payment only at times when markets are moderately overvalued arises uniquely from the interaction of overoptimism and market misvaluation. The results therefore not only strengthen the evidence for both factors, but also illustrate an additional insight gained from taking interaction effects into account. The focus on the interaction of market valuation and overoptimism also requires weaker assumptions for the measures of overoptimism and market valuation: instead of the absence of any confounding factors, it is only necessary for such potentially confounding factors to not systematically vary with the respective other measure.

The results on subsequent returns to acquisitions are also consistent with the predictions of overoptimism and market misvaluation. Specifically, overoptimism leads managers to substantially overestimate their own firm value, which leads to higher returns to acquisitions by overoptimistic managers when paying with stock. The outperformance is especially strong at times of high market valuation, when avoiding the mistake of cash payment despite a CEO's overoptimism reveals good news to the market. Results on subsequent returns, however, need to be interpreted carefully when markets can not be assumed to accurately reflect fundamental value at all times. After all, at what point do returns reflect current, maybe misguided market sentiment, and when can they be interpreted as reflecting true value implications? Nevertheless, the results support the notion that overoptimistic managers are the ones whose beliefs are overly optimistic. Differences in the choice of method of payment do not allow to judge whose beliefs, those of managers labeled "overoptimistic" or those not labeled as such, are ultimately correct. However, the positive returns for overoptimistic CEOs of choosing stock rather than cash when markets are overvalued, indicates that the "rational" choice of stock is ultimately considered to be the right one by market participants and overoptimistic managers are indeed the ones whose beliefs are biased and overly optimistic.

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Figure 1: The Effect of Market Valuation and Overoptimism on Method of Payment

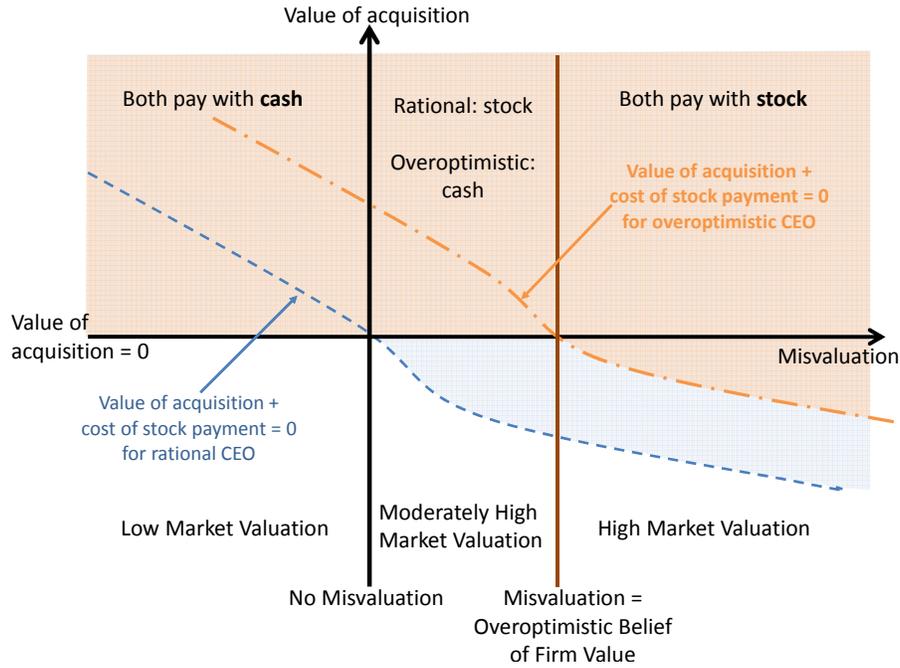
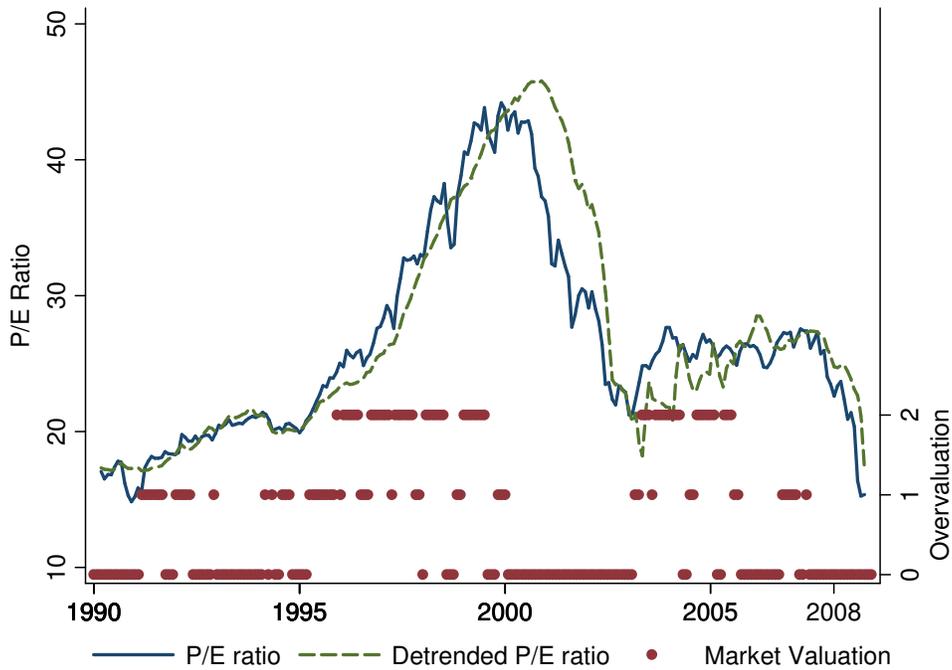


Figure 2: P/E Ratio and Classification of High and Medium High Market Valuation



The figure shows the actual and detrended price-to-earning ratio (P/E ratio) of the S&P 500 and the classification of times into normal or low, moderately high and high market valuation.

Table 1: CEOs Classified as Overoptimistic

	N	Overoptimistic (in%)
All CEOs	5,646	
Some unexercised exercisable options in-the-money	5,418	20.5
Avg value of options more than 40% in-the-money	3,995	24.8
Observed in TFN Insider data	3,511	30.8

The table shows the percentage of CEOs classified as overoptimistic using varying restrictions for the set of managers who could potentially be classified as such. Managers are classified as overoptimistic if they hold a stock option until the day of expiration despite the option being highly in the money a year prior. Managers are classified as not being overoptimistic if they did not hold an option until expiration, but could have done so and would be observed doing so.

Table 2: CEO Option Holdings by Overoptimism

Variable	Overoptimistic			Not Overoptimistic		
	mean	p50	sd	mean	p50	sd
Exercisable options						
# unexercised (in 1,000)	741.4	253.6	2271.4	456.2	128.0	1,926.5
Value unexercised options (\$million)	11.4	2.1	39.0	5.5	.41	28.9
Avg. value per option (\$)	16.4	11.6	22.6	12.7	7.0	96.4
Avg. value in-the-money (%)	39.7	38.7	32.4	33.5	27.9	203.2
Non-exercisable options						
# unexercised (in 1,000)	373.9	139.7	994.2	293.7	100.0	786.0
Value unexercised options (\$million)	3.5	.48	19.5	3.0	.14	98.7
Nr of observations (CEO-years)	11,717			30,557		

The table shows the mean, median and standard deviation for option holdings by CEO overoptimism. Managers are classified as overoptimistic if they hold a stock option until the day of expiration despite the option being highly in the money a year prior. Managers are classified as not being overoptimistic if they did not hold an option until expiration, but had options holdings such that they could have done so.

Table 3: Acquisition Characteristics by CEO Overoptimism

Variable	Overoptimistic			Not Overoptimistic		
	mean	p50	sd	mean	p50	sd
Transaction value (million \$)	750	210	2,018	801	175	3,627
Transaction value/ acquirer size	0.238	0.086	0.491	0.357	0.111	1.516
Q	2.964	1.859	3.694	3.072	1.756	6.446
Cash Only (%)	52.9			50.8		
Stock Only (%)	14.6			14.2		
High Market Valuation (%)	30.0			28.9		
Medium High Market (%)	19.7			20.0		
Number of observations	1,280			2,551		

The table shows the mean, median and standard deviation of acquisition characteristics by CEO overoptimism. Managers are classified as overoptimistic if they hold a stock option until the day of expiration despite the option being highly in the money a year prior. Managers are classified as not being overoptimistic if they did not hold an option until expiration, but had options holdings such that they could have done so. Times are defined as normal or low, moderately high and high based on the deviations of the P/E ratio of the S&P 500 from its long-term trend. All acquisitions took place during the sample period of 1992 to 2008.

Table 4: Method of Payment by Market Valuation and CEO Overoptimism

Market Valuation	Overoptimistic				Not Overoptimistic			
	% paid with				% paid with			
	Cash	Stock	Mixed	N	Cash	Stock	Mixed	N
Normal or Low	51.9	15.1	33.0	644	53.5	11.3	35.2	1304
Medium High	58.3	13.5	28.2	252	46.7	18.6	34.7	510
High	51.0	14.6	34.4	384	48.7	16.3	35.0	737
Total	52.9	14.6	32.5	1,280	50.8	14.2	35.0	2551

The table shows the percentage of acquisitions paid fully in cash, stock or mixed payment depending on market valuation at announcement and CEO overoptimism. Managers are classified as overoptimistic if they hold a stock option until the day of expiration despite the option being highly in the money a year prior. Managers are classified as not being overoptimistic if they did not hold an option until expiration, but had options holdings such that they could have done so. Times are defined as normal or low, moderately high and high based on the deviations of the P/E ratio of the S&P 500 from its long-term trend. All acquisitions took place during the sample period of 1992 to 2008.

Table 5: Effect of Overoptimism and Market Valuation on Method of Payment

	Dependent Variable: Cash Only			
	(1)	(2)	(3)	(4)
Overoptimistic CEO	0.935 (0.657)	0.890 (0.347)	0.883 (0.313)	0.904 (0.425)
High Market Valuation	0.825 (0.110)	0.789* (0.037)	0.788* (0.034)	0.817+ (0.076)
High Market Valuation *Overoptimistic CEO	1.174 (0.331)	1.260 (0.167)	1.211 (0.269)	1.089 (0.624)
Medium High Market	0.760* (0.033)	0.766* (0.033)	0.748* (0.020)	0.770* (0.047)
Medium High Market *Overoptimistic CEO	1.710** (0.002)	1.735** (0.002)	1.750** (0.002)	1.559* (0.017)
Q		0.921* (0.018)	0.904** (0.006)	0.891** (0.002)
Q / industry avg. Q		0.791+ (0.056)	0.796+ (0.066)	0.794+ (0.082)
Q below industry avg.		1.082 (0.579)	1.061 (0.677)	1.072 (0.640)
Transaction value		0.985** (0.001)	0.987** (0.003)	0.987** (0.004)
Transaction value (as % of acquirer size)		0.049*** (0.000)	0.045*** (0.000)	0.047*** (0.000)
10% largest deals		3.512*** (0.000)	3.589*** (0.000)	3.317*** (0.000)
Cash holdings		1.015*** (0.000)	1.020** (0.002)	1.023** (0.003)
Cash flow / total capital			1.011** (0.002)	1.023 (0.291)
Dividends / total capital			1.243 (0.227)	1.497 (0.291)
Leverage			0.693+ (0.095)	0.661+ (0.072)
# of unexercised options (exercisable)				1.005 (0.706)
Average value of options				1.004 (0.103)
Industry Fixed Effects	.	✓	✓	✓
N	3,831	3,829	3,713	3,376

Estimates of equation 2 are expressed as odds ratios. P-values of standard errors clustered at the firm and month-of-acquisition level are in parentheses with significance indicated as follows: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Managers are classified as overoptimistic if they hold a stock option until the day of expiration despite the option being highly in the money a year prior. Market valuation is measured by the deviations of the P/E ratio of the S&P 500 from its long-term trend. Control variables are constructed following [Malmendier and Tate \(2008\)](#) and the 48 Fama/French industry classification. Acquisitions took place during the sample period of 1992 to 2008.

Table 6: Announcement Returns by Overoptimism, Method of Payment and Market Valuation

	Dependent Variable: Announcement Return (CAR)			
	(1) all times	(2) MV=high	(3) MV=low	(4)
Cash only	0.745** (0.009)	0.191 (0.612)	1.523** (0.005)	1.523** (0.005)
Overoptimistic CEO	-0.0222 (0.951)	-0.400 (0.388)	0.852 (0.220)	0.852 (0.220)
Cash*Overoptimistic CEO	-0.156 (0.725)	0.428 (0.453)	-1.325 (0.113)	-1.325 (0.113)
High Market Valuation				1.928** (0.001)
High Market Valuation *Cash				-1.332* (0.044)
High Market Valuation *Overoptimistic CEO				-1.252 (0.134)
High Market Valuation *Cash*Overoptimistic CEO				1.754+ (0.083)
Constant	0.0494 (0.835)	0.776* (0.011)	-1.152* (0.013)	-1.152* (0.013)
N	3429	1673	1263	2936

P-values are shown in parentheses with the following significance indicators: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The table shows announcement returns depending on the market valuation at the time of announcement and whether or not the acquiring CEO was classified as overoptimistic. Announcement returns are measured as three day cumulative returns from the day before to the day after the announcement of the acquisition. Abnormal returns are calculated by taking the daily returns to the acquirers stock and subtracting the daily return of the S&P500 value weighted index. Managers are classified as overoptimistic if they hold a stock option until the day of expiration despite the option being highly in the money a year prior. Managers are classified as not being overoptimistic if they did not hold an option until expiration, but had options holdings such that they could have done so. Times are defined as normal or low, moderately high and high based on the deviations of the P/E ratio of the S&P 500 from its long-term trend. All acquisitions took place during the sample period of 1992 to 2008.

Table 7: Long-run Returns to Acquisitions by Overoptimism, Method of Payment and Market Valuation

	Returns over 12 months			Returns over 24 months			Returns over 36 months		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	MV=high	MV=low		MV=high	MV=low		MV=high	MV=low	
Cashonly	0.631 (0.106)	-0.521 (0.446)	-0.519 (0.446)	0.470 (0.176)	0.219 (0.627)	0.215 (0.629)	0.119 (0.737)	0.199 (0.618)	0.205 (0.601)
Overoptimistic CEO	1.433 ** (0.004)	-0.187 (0.829)	-0.190 (0.833)	1.408 ** (0.004)	0.524 (0.436)	0.530 (0.437)	0.995 * (0.043)	0.612 (0.326)	0.610 (0.340)
Cashonly *Overoptimistic CEO	-1.330* (0.038)	1.201 (0.294)	1.171 (0.308)	-1.437* (0.020)	0.0438 (0.962)	0.0477 (0.958)	-0.708 (0.237)	-0.0715 (0.933)	-0.0899 (0.916)
High Market			-0.896 (0.165)			-0.173 (0.678)			-0.0112 (0.978)
High Market *Cash			1.132 (0.151)			0.265 (0.639)			-0.0873 (0.869)
High Market *Overoptimistic CEO			1.621 (0.113)			0.880 (0.293)			0.382 (0.634)
High Market *Cash*Overoptimistic CEO			-2.490 ⁺ (0.059)			-1.496 (0.175)			-0.616 (0.554)
Constant	-0.357 (0.210)	0.545 (0.313)	0.571 (0.312)	-0.268 (0.326)	-0.180 (0.573)	-0.141 (0.664)	-0.0577 (0.850)	-0.0850 (0.768)	-0.0607 (0.837)
Fama-French and momentum factor	✓	✓	✓	✓	✓	✓	✓	✓	✓
Portfolio-Months	500	394	894	632	490	1122	707	562	1269

P-values are shown in parentheses with the following significance indicators: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The table shows long-run abnormal returns depending on the method of payment, market valuation at the time of announcement and whether the acquiring CEO was classified as overoptimistic. Equation 4.2 shows the regression equation. Long-run returns are value weighted and measured by the calendar time portfolio approach as outlined in section 2.6. Returns are estimated for time horizons of 12, 24 and 36 month after the announcement of an acquisition. Times are defined as low or high market valuation based on the deviations of the P/E ratio of the S&P 500 from its long-term trend. Managers are classified as overoptimistic if they hold a stock option until the day of expiration despite the option being highly in the money a year prior. Managers are classified as not being overoptimistic if they did not hold an option until expiration, but had options holdings such that they could have done so. All acquisitions took place during the sample period of 1992 to 2008.

Appendices

A Classification of overoptimism

Table A1 shows that CEOs qualified as overoptimistic are on average observed for 3.5 more years than those not classified as overoptimistic.³⁶ CEOs classified as overoptimistic have also served for almost 10 years on average compared to 7.5 years for non-overoptimistic CEOs. There are several possible explanations for why CEOs observed for longer appear to be more likely to be classified as overoptimistic. First, managers who are observed longer generally have more options that expire during the sample period and therefore have more opportunities to reveal themselves, correctly or incorrectly as overoptimistic. It could also be that managers become overoptimistic over time. Being successful as the CEO of a large company may lead them to start overestimating their ability over time. I define overoptimism on an executive level rather than the firm-executive level, but relatively few executives switch firms. CEOs not classified as overoptimistic are more likely to have switched to another company with .18 switches compared to only .13 for overoptimistic CEOs. Of the CEOs classified as overoptimistic who do switch, only about half were classified as overoptimistic before their first switch and there are consequently few CEOs who have been classified while working for one firm and then take this status with them to another one.

B Robustness of Method of Payment Results

The first three columns of table A2 add an indicator variable for cash rich firms following Harford (1999), as well as its interactions with CEO overoptimism and market valuation. This measure of cash richness has no significant effect on the probability of using only cash to pay for an acquisition.³⁷ Columns 4 and 5 include the detrended P/E ratio directly as a measure of market valuation instead of splitting the measure into indicator variables. Column 5 also includes the square of market valuation to test whether the effect diminishes as market valuation increases. This is indeed the case, though the direct effect of market valuation becomes statistically insignificant, whereas the direct effect of CEO overoptimism increases to marginal significance levels (with a p-value of 6.5%).

³⁶I observe some managers even before they become CEO, while others already hold their post once I start observing them.

³⁷Unreported results show that the effect of cash richness remains the same when other controls for a firm's ability to pay with cash (cash reserves, cash flow/ capital, dividends / capital and leverage) are excluded.

C Alternative Measures of Market Valuation

In the baseline measure, I classify the two highest quintiles of all positive deviations from the long-term trend as high and the second and third quintile as medium high (method 1). In this section I classify market valuation based on all deviations from the trend, not only positive deviations: The top quintile of all deviations of the P/E ratio from its long-term trend is classified as times of high valuation and the second highest quintile as medium high market valuation (method 2). I also use the value of the S&P500 Index and the median market-to-book ratio of firms in the S&P500 instead of the P/E ratio to compute the same two measures of market valuation just described. Table A3 shows the correlation between the different measures of market valuation. The measures using the P/E ratio or index value of the S&P500 are highly correlated and classification into times of high and low market valuation are very similar. The misvaluation measure based on market-to-book values differs more from the two other ones. Its correlation with the other measures lies between 40% and 45% and the classification into high and medium high markets therefore differs considerably.

C.1 Regression Results with Alternative Measures for Market Valuation

I repeat the regression in column 2 of table 5 for each of the alternative misvaluation measures, including all firm and acquisition level controls, except for the CEO's option holdings. Compared to the baseline specification in the first column, columns 2 to 4 show that the coefficient on the interaction of CEO overoptimism with medium high markets is barely affected the method used to classify times of market valuation. When market valuation is based on the median market-to-book ratio in columns 5 and 6, the effect is smaller and no longer significant.

C.2 Market Misvaluation - Alternative Detrending Horizon

In the original specification the P/E ratio is detrended over a time horizon of 5 years. Instead of 5 years, I use 3 and 7 years in this section. The first three columns of table A5 use method 1 to define high and medium high market valuations, the second three use method 2. Using a 3 or 7 year horizon to detrend the P/E ratio leads to a lower estimated effect than a 5 year horizon when method 1 is used but considerably higher estimates when using method 2, though all except the lowest estimate are still statistically significant. The table shows that the detrending horizon influences the results, but the deviations from the baseline specification go in both directions with lower estimates in some and higher estimates in other

cases.

C.3 Market Misvaluation - Alternative Specifications

In the baseline specification, I include dummy variables for times of high and medium high market valuations and defined all other times as the excluded category. In this section, I further include dummy variables for times of medium and medium low market valuations and define only the times with very low market valuations as the excluded category. Unlike for all other regression tables, I do not report odds ratios in this table, but the actual coefficients. My key interest lies in the effect an overoptimistic CEO has on the probability of using cash as a method of payment at times of different market valuations. This overall effect is the combined effect of the direct effect of CEO overoptimism and the interaction with the respective indicator for market valuation. So far, the direct effect was not significantly different from zero, so I could focus on the effect of the interaction in which case odds ratios are easier to interpret. In table A6, however, the direct effect is no longer indistinguishable from zero and needs to be taken into account to assess the total effect. Unlike odds ratios, coefficients can be added up, so I report coefficient to make this easier. The first column of table A6 contains the baseline specification, but reports coefficients instead of odds ratios. The second column further includes dummy variables for medium and medium low market valuations in addition to dummy variables for high and medium high market settings. In the baseline specification the overall effect of an overoptimistic CEO in medium high market settings was 0.42 ($-0.100 + 0.524$). In the new specification in column 2 the effect is the same ($0.42 = -0.347 + 0.769$), even though the individual coefficients differ. In columns 3 and 4 of table A6, the median market-to-book value (M/B) of all firms in the S&P500 is used to determine market valuation instead of the P/E ratio. Column 4, shows that a similar effect as previously seen at times of medium high market valuation can be seen in medium market valuations. The overall effect of having an overoptimistic CEO in this setting is 0.47

D Alternative Measures of Overoptimism

In the baseline specification, I classify CEOs as overoptimistic if they hold an option until expiration even though it was at least 40% in-the-money the year before expiration. The control group includes all CEOs who at some point have unexercised options which are in-the-money and could have been exercised. In this section I show that the results hold up to additional requirements for CEOs to be included in the control group. I also split the measure for CEO overoptimism into two: Overoptimism post classification is equal to one only in

the years after the CEO held an option until expiration. Overoptimism prior classification is equal to one in the remaining years a CEO was previously classified as overoptimistic.

Table A7 shows the baseline specification in the first column. The second column only includes CEOs who at some point have unexercised options which are on average 40% in-the-money. The third column requires that CEOs are observed in the Thomson Financial Insider database at least once to ensure that they would have been observed had they held an option until expiration. The final column uses the baseline definition for CEO overoptimism, but splits the measure into overoptimism post and prior classification. The table shows that the key coefficient of interest, the interaction between CEO overoptimism and medium high markets, is significant in all specifications and only varies slightly in magnitude. The last column shows that the effect of overoptimism is indeed most pronounced after the CEO has held an option until expiration.

Finally, a recent acquisitions by the firm or a planned acquisition in the near future could influence a CEO's option exercise decision. Table A8 therefore excludes acquisitions where the CEO was classified as overoptimistic around the same time the acquisition took place. Column 1 excludes all CEOs who qualified in the same year as the acquisition was announced. Column 2 also excludes those qualifying the same or the year before and column 3 excludes CEOs qualifying the same year, the year before or the year after the announcement of the acquisition. The effect of the key regressor of interest, the interaction of overoptimism and medium high market valuation is very similar to previous results.

Table A1: Years in Sample by CEO Overoptimism

Variable	Overoptimistic			Not Overoptimistic		
	mean	p50	sd	mean	p50	sd
Years observed	11.16	11.00	3.95	7.62	7.00	4.06
Years observed as CEO	7.20	7.00	4.02	4.89	4.00	3.29
Years as CEO	9.84	8.00	7.96	7.42	5.00	7.34
Switches firms	0.13	0.00	0.34	0.18	0.00	0.38
Switches after classification	0.07	0.00	0.25			
Years after classification	5.99	5.00	3.76			
Number of observations	1,112			4,306		

The table shows the mean, median and standard deviation for how long managers are observed in the sample and whether they switch firms. Summary statistics are split by whether the manager was classified as overoptimistic. Managers are classified as overoptimistic if they hold a stock option until the day of expiration despite the option being highly in the money a year prior. Managers are classified as not being overoptimistic if they did not hold an option until expiration, but had options holdings such that they could have done so.

Table A2: Robustness of Effect on Method of Payment

	Dependent Variable: Cash Only				
	(1)	(2)	(3)	(4)	(5)
Overoptimistic CEO	0.843 (0.244)	0.822 (0.194)	0.823 (0.209)	1.082 (0.446)	1.232 ⁺ (0.065)
High Market Valuation	0.928 (0.543)	0.928 (0.542)	0.947 (0.674)		
High Market Valuation *Overoptimistic CEO	1.153 (0.472)	1.152 (0.473)	1.129 (0.578)		
Medium High Market	0.732* (0.025)	0.731* (0.025)	0.687** (0.010)		
Medium High Market *Overoptimistic CEO	2.007** (0.002)	2.007** (0.002)	2.052** (0.002)		
Market Valuation				0.991 (0.505)	0.947* (0.024)
Market Valuation Squared					0.990* (0.016)
Market Valuation *Overoptimistic CEO				1.074** (0.002)	1.006 (0.878)
Market Valuation Squared *Overoptimistic CEO					0.987* (0.049)
Cashrich	0.964 (0.804)	0.904 (0.558)	0.863 (0.545)		
Cashrich *Overoptimistic CEO		1.260 (0.547)	1.199 (0.707)		
Cashrich *Medium High Market			1.601 (0.225)		
Cashrich *High Market Valuation			0.867 (0.688)		
Cashrich * Overoptimism *Medium High Market			0.936 (0.931)		
Cashrich * Overoptimism *High Market Valuation			1.169 (0.819)		
Controls as in table 5, column (3)	✓	✓	✓	✓	✓
Industry	✓	✓	✓	✓	✓
N	2,600	2,600	2,600	3,713	3,713

Estimates of equation 2 are expressed as odds ratios. P-values of standard errors clustered at the firm and month-of-acquisition level are in parentheses with significance indicated as follows: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Managers are classified as overoptimistic if they hold a stock option until the day of expiration despite the option being highly in the money a year prior. Market valuation is measured by the deviations of the P/E ratio of the S&P 500 from its long-term trend. Control variables are constructed following Malmendier and Tate (2008) and the 48 Fama/French industry classification. Controls include Q, Q relative to industry Q, an indicator for Q below industry average, absolut transactionvalue, as well as relative to acquirer size, an indicator for the 10% largest deals, cash holdings, cash flow (as % of capital), dividends (as % of capital) and leverage. Acquisitions took place during the sample period of 1992 to 2008.

Table A3: Correlation between different measures of market valuation

		P/E ratio		S&P500		median M/B	
		Method 1	Method 2	Method 1	Method 2	Method 1	Method 2
P/E ratio	Method 1	1					
	Method 2	0.971	1				
S&P500	Method 1	0.969	0.951	1			
	Method 2	0.946	0.947	0.971	1		
Median M/B	Method 1	0.439	0.452	0.456	0.425	1	
	Method 2	0.432	0.445	0.449	0.412	0.977	1

The table shows the correlation between different methods of measuring market valuation. Market valuation is measured based on deviations from their long-term trend of the P/E ratio of the S&P 500, the index value of the S&P 500 (columns 3 and 4) or the median market-to-book ration (M/B) of firms listed in the S&P 500. Method 1 classifies the two highest quintiles of all positive deviations from the long-term trend as high and the second and third quintile as medium high. All remaining times are classified as normal or low valuation. Method 2 classifies the top quintile of *all* deviations from the long-term trend as times of high valuation and the second highest quintile as medium high market valuation. All remaining times are classified as normal or low valuation.

Table A4: Alternative Measures of Misvaluation

	Dependent Variable: Cash Only					
	(1)	(2)	(3)	(4)	(5)	(6)
	P/E ratio		S&P500 Index		median M/B	
	method 1	method 2	method 1	method 2	method 1	method 2
Overoptimism of CEO	0.883 (0.313)	0.905 (0.391)	0.878 (0.286)	0.896 (0.361)	1.066 (0.582)	1.040 (0.734)
High Market	0.788* (0.034)	0.825+ (0.087)	0.814+ (0.070)	0.820+ (0.086)	0.870 (0.259)	0.861 (0.216)
High Market* *Overoptimism	1.211 (0.269)	1.158 (0.423)	1.269 (0.192)	1.254 (0.248)	0.730 (0.130)	0.751 (0.158)
Medium High Market	0.748* (0.020)	0.790+ (0.073)	0.843 (0.177)	0.891 (0.353)	0.848 (0.218)	0.777+ (0.067)
Medium High *Overoptimism	1.750** (0.002)	1.748** (0.006)	1.568* (0.016)	1.468* (0.038)	1.221 (0.306)	1.367 (0.125)
Standard Controls	✓	✓	✓	✓	✓	✓
N	3,713	3,713	3,713	3,713	3,713	3,713

Standard errors are clustered at the firm and month-of-acquisition level and p-values are shown in parentheses with the following significance indicators: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A5: Different Detrending Horizon

	Dependent Variable: Cash Only					
	(1)	(2)	(3)	(4)	(5)	(6)
	Detrending based on					
	Method 1 over			Method 2 over		
	5 years	3 years	7 years	5 years	3 years	7 years
Overoptimism of CEO	0.883 (0.313)	0.900 (0.368)	0.920 (0.511)	0.905 (0.391)	0.975 (0.811)	0.972 (0.797)
High Market	0.788* (0.034)	0.778* (0.025)	0.846 (0.127)	0.825+ (0.087)	0.848 (0.232)	0.879 (0.221)
High Market *Overoptimism	1.211 (0.269)	1.505* (0.047)	1.286 (0.162)	1.158 (0.423)	0.992 (0.977)	1.030 (0.875)
Medium High Market	0.748* (0.020)	0.809 (0.110)	0.978 (0.875)	0.790+ (0.073)	0.770+ (0.068)	0.784 (0.188)
Medium High *Overoptimism	1.750** (0.002)	1.505* (0.013)	1.257 (0.237)	1.748** (0.006)	2.095** (0.002)	1.888** (0.004)
Standard Controls	✓	✓	✓	✓	✓	✓
N	3713	3713	3713	3713	3713	3713

Standard errors are clustered at the firm and month-of-acquisition level and p-values are shown in parentheses with the following significance indicators: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A6: Alternative Regression Specifications

	Dependent Variable: Cash Only			
	Market Valuation Based on P/E Ratio		Median M/B	
	(1)	(2)	(3)	(4)
Overoptimistic CEO	-0.124 (0.313)	-0.333 ⁺ (0.053)	0.064 (0.582)	-0.105 (0.432)
High Market	-0.239* (0.034)	-0.141 (0.290)	-0.140 (0.259)	-0.207 (0.117)
Medium High Market	-0.290* (0.020)	-0.190 (0.191)	-0.165 (0.218)	-0.233 (0.099)
Medium Market		0.181 (0.336)		-0.161 (0.251)
Medium Low Market		0.121 (0.446)		-0.081 (0.603)
High Market *Overoptimistic CEO	0.191 (0.269)	0.402 ⁺ (0.051)	-0.315 (0.130)	-0.147 (0.506)
Medium High *Overoptimistic CEO	0.560** (0.002)	0.767*** (0.000)	0.200 (0.306)	0.369 ⁺ (0.075)
Medium Market *Overoptimistic CEO		0.345 (0.232)		0.527* (0.011)
Medium Low *Overoptimistic CEO		0.467* (0.033)		0.146 (0.462)
Standard Controls	✓	✓	✓	✓
N	3,713	3,713	3,713	3,713

Standard errors are clustered at the firm and month-of-acquisition level and p-values are shown in parentheses with the following significance indicators: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table A7: Alternative Definitions of Overoptimism

	Dependent Variable: Cash Only			(4)
	(1) Baseline	(2) 40% in-the-money on average	(3) Observed option exercise	
Overoptimistic CEO	0.883 (0.313)	0.868 (0.271)	0.917 (0.540)	
Overoptimistic CEO prior classification				1.036 (0.841)
Overoptimistic CEO post classification				0.833 (0.225)
High Market Valuation	0.788* (0.034)	0.830 (0.135)	0.761 ⁺ (0.058)	0.789* (0.035)
High Market *Overoptimistic CEO	1.211 (0.269)	1.235 (0.275)	1.243 (0.263)	
High Market *Overoptimistic CEO prior				1.063 (0.821)
High Market *Overoptimistic CEO post				1.265 (0.262)
Medium High Market	0.748* (0.020)	0.769* (0.047)	0.692* (0.021)	0.749* (0.020)
Medium High Market *Overoptimistic CEO	1.750** (0.002)	1.687** (0.009)	1.891** (0.001)	
Medium High Market *Overoptimistic CEO prior				1.493 ⁺ (0.078)
Medium High Market *Overoptimistic CEO post				1.853** (0.005)
Standard Controls	✓	✓	✓	✓
N	3,713	3,135	2,798	3,713

Column 1 shows estimates of equation 2 using the baseline measure for overoptimism. Estimates are shown as odds ratios. Standard errors are clustered at the firm and month-of-acquisition level and p-values are shown in parentheses with the following significance indicators: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Column 2 only includes CEOs with unexercised options on average 40% in-the-money. Column 3 requires CEOs to be observed in the Thomson Financial Insider database at least once. Column 4 splits the overoptimism measure into prior and post classification.

Table A8: No classification of overoptimism around announcement

	(1)	(2)	(3)
	Dependent Variable: Cash Only		
		Exclude CEOs qualifying	
	same year	prior or same year	prior, same or year after
Overoptimistic CEO	0.912 (0.445)	0.922 (0.516)	0.934 (0.605)
High Market Valuation	0.786* (0.032)	0.784* (0.030)	0.783* (0.030)
High Market Valuation *Overoptimistic CEO	1.131 (0.471)	1.142 (0.467)	1.120 (0.572)
Medium High Market	0.753* (0.023)	0.757* (0.025)	0.757* (0.025)
Medium High Market *Overoptimistic CEO	1.632** (0.007)	1.597** (0.005)	1.547** (0.022)
Standard Controls	✓	✓	✓
N	3,601	3,475	3,369

Standard errors are clustered at the firm and month-of-acquisition level and p-values are shown in parentheses with the following significance indicators: + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.