The effect of the interplay between CEO and CFO overconfidence on a firm's M&A strategy

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The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

Abstract

This paper examines the effect of the interplay between CEO and CFO overconfidence on a firm's mergers and acquisitions strategy by using a sample of 1,497 M&A transactions and 838 S&P 1500 firms between 2007 and 2018. Managerial overconfidence is measured by an altered version of the *Holder67* method (Malmendier & Tate, 2005), which classifies an executive as overconfident from the point in time onwards when the average value of vested but unexercised stock options are more than 67% in the money (Hirshleifer, Low & Teoh, 2012). The empirical results indicate that there exists no significant interaction effect between CEO and CFO overconfidence when it comes to a firm's M&A activity or short-term deal performance. However, the results do show that it is CFO overconfidence, rather than CEO overconfidence, that significantly explains both a firm's M&A activity and the market's reaction surrounding a deal announcement. This inference becomes even more clear when the CFO has relatively more power within the organization. Lastly, the results suggest that both CEO and CFO overconfidence are positively related to an acquirer's cumulative abnormal announcement returns for a two-day [0, +1] and three-day [-1, +1] event window.

Keywords: *CEO overconfidence, CFO overconfidence, CEO-CFO commonalities, M&A activity, diversifying deals, cross-border deals, cash-only deals, market reaction*

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1. Introduction

"Sure, I am a religious man who is also passionate about conserving the environment. But I am also a CEO, with all the bad habits and attitudes that are natural to the species. . . . I am still as naturally self-interested, overconfident, full of pride, and eager to control a meeting as any CEO in America. Every day, I struggle with my ego" – Tom Chappell in Managing Upside Down: The Seven Intentions of Values-Centered Leadership (1999)

Because of the high level of self-esteem and the high degree of overconfidence exhibited by Chief Executive Officers (CEO) in the United States,[1] there has been published a substantial amount of literature on how CEOs affect mergers and acquisitions (M&A) activity,[2] the type of M&A deals[3] undertaken and the market reaction surrounding M&A announcements.[4] These studies refer to both positive and negative effects of CEO overconfidence on M&A. On the one hand, overconfident CEOs undertake relatively more mergers and acquisitions than their non-overconfident counterparts (Ferris, Jayaraman & Sabherwal, 2013). On top of that, overconfident CEOs engage in riskier deals, which have higher upside potential. As a result, they are often seen as better innovators than their non-overconfident peers (Hirshleifer, Low & Teoh, 2012). On the other hand, due to their ability to over-estimate future returns, Malmendier and Tate (2008) established that overconfident CEOs undertake relatively more value-destroying mergers than rational CEOs. Still, overconfident CEOs can be restrained when, for instance, there is less abundant cash available to do acquisitions (Malmendier & Tate, 2008), when there is a strong and independent board (Kolasinski & Li, 2013) or when there is at least one female executive present in the board (Huang & Kisgen, 2013).

However, previous studies have barely dealt with the potential impact of Chief Financial Officer (CFO) overconfidence on M&A decisions. Nonetheless, CFOs play a pivotal role in identifying targets, monitoring the due diligence process and arranging funding (Ferris & Sainani, 2021). Therefore, to begin with, understanding the link between CFO overconfidence and its effect on M&A strategy could help in explaining why some firms undertake more acquisitions or why certain deals have a greater chance of success. Even more importantly, research to date has not yet determined how the interplay between CEO and CFO overconfidence could affect a firm's M&A strategy. Potentially, the effects could be similar to the findings of Shi and Chen (2019), who investigated the relationship between CEO-CFO relative optimism on M&A decisions. For a U.S. dataset, Shi and Chen (2019) found that firms

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[1] Using either ExecuComp or Thomson Insider data, around 40% of all U.S. CEOs can be classified as overconfident (Malmendier & Tate, 2015)
[2] See e.g. (Malmendier & Tate, 2008); (Doukas & Petmezas, 2007); (Kolasinski & Li, 2013) ; (Ferris, Jayaraman & Sabherwal,2013)
[3] See e.g. (Malmendier & Tate, 2008); (Doukas & Petmezas, 2007); (Ferris, Jayaraman & Sabherwal, 2013);
[4] See e.g. (Malmendier & Tate, 2008); (Billett & Qian, 2005); (Doukas & Petmezas, 2007); (Kolasinski & Li, 2013)

with low levels of CEO-CFO relative optimism were less engaged in M&A transactions than firms with high levels of CEO-CFO optimism. Moreover, a high level of CEO-CFO relative optimism is negatively associated with announcement returns, implying relatively worse deal performance when both executives are overly optimistic. In both the event of M&A activity and performance, the most rational outcomes were obtained when the CFO was relatively less optimistic than the CEO. Taken together, it seems that overly optimistic CEOs can be restrained by relatively pessimistic CFOs. Although optimism in some cases is regarded as equal to overconfidence,[5] these cognitive biases are not the same. While optimism should be perceived as an overestimation of a certain outcome, overconfidence should mainly be recognized as an underestimation of volatility (Baker & Wurgler, 2013; Ben-David, Graham & Harvey, 2007). Furthermore, in contrast to the commonly used option-based measures to classify an executive as overconfident (Malmendier & Tate, 2015), Shi and Chen (2019) used quarterly conference call transcript data to identify whether an executive uses relatively more optimistic words compared to pessimistic words. Besides Shi and Chen (2019), an increasing number of papers assessed different types of CEO-CFO commonalities on several related issues in corporate finance.[6] However, the causal relationship between the interplay between CEO and CFO overconfidence on a firm's M&A strategy remains speculative.

Besides academic relevance, this thesis aims to generate fresh insights for all stakeholders involved, such as shareholders, employees, board members and (potential) clients. For instance, the negative consequences of the acquisition of Homebase by Wesfarmers in 2016 are often attributed to overconfident executives (Forbes, 2018; Livewire Markets, 2018). Initially, the transaction was represented by a deal value of around 700 million dollars. However, since then, Homebase has lost 300 million dollars and attracted impairments of around 1 billion dollars. Consequently, almost 1,500 out of 11,000 jobs were at risk. Already in May 2018, Wesfarmers resold Homebase to Hilco Capital, a distressed debt investor (FT, 2018). Hence, the implications of this thesis could help stakeholders to make better decisions during, for example, annual shareholder meetings, job interviews, CEO/CFO appointments and whether or not to initiate projects. This study aims to contribute to both scientific and social enrichment of knowledge by exploring the effects of CEO-CFO overconfidence on a firm's M&A strategy. The research question is as follows:

What is the effect of the interplay between CEO and CFO overconfidence on a firm's M&A strategy in the United States?

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[5] See e.g. (Lee, Hwang & Chen, 2017)
[6] See e.g., (Belot & Waxin, 2019) ; (Chen, Gores, Nasev & Wu, 2018) ; (Hsieh, Wang & Demirkan, 2018); (Malmendier, Pezone & Zheng, 2020)

The analysis is based on a sample of 6,519 firm-year observations between 2007 and 2018, 838 unique firms that were listed at least once on the S&P 1500 during the sample period, 1287 different CEOs, 1376 different CFOs and 1724 unique CEO-CFO pairs. "M&A strategy" will be broken down into M&A activity, M&A deal type (diversifying, cross-border, cash-only) and M&A performance. The interplay will be measured by taking the interaction term between CEO overconfidence and CFO overconfidence. As a proxy for overconfidence, the altered version of the *Holder67* stock options method (Malmendier & Tate, 2005) will be used. This altered version was used first by Campbell, Johnson, Rutherford and Stanley (2009) and Hirshleifer, Low and Teoh (2012). It implies that when the average moneyness of a CEO's or CFO's current stock option packages exceeds the threshold of 67% in the money for the first time during the sample period, an executive will be classified as overconfident for the remaining period in the sample. Intuitively, overconfident managers are generally underestimating risk, so also the risk of under-diversification. This makes them more likely to keep the company's stock, even though the options are more than 67% in the money (Malmendier & Tate, 2005). Lastly, the analysis is focused on U.S. firms, as the U.S. has the largest M&A market globally (IMAA, 2021) and executives are relatively to a large extent compensated with option packages (Bachelder, 2014). This facilitates the process of classifying a manager as overconfident.

The empirical results indicate that there does not exist a significant interaction between CEO and CFO overconfidence with respect to the propensity of doing at least one (diversifying, cross-border, cash-only) deal and on acquirer's cumulative abnormal returns. Nonetheless, the following implications can be deduced from the empirical findings. When analyzed in isolation, both CEO and CFO overconfidence positively affect the propensity of doing a (diversifying, cross-border, cash-only) deal and short-term deal performance. However, for all models with both CEO and CFO overconfidence included, it was established that only CFO overconfidence remains statistically and economically relevant. Therefore, it seems that it is CFO overconfidence, rather than CEO overconfidence, which explains how many deals a firm undertakes or how the market responds to a merger announcement.

The remainder of this thesis is structured as follows. Section 2 is concerned with a review of prior literature. In section 3, the data sources, data transformations, descriptive statistics and research methodology will be elaborated. Section 4 presents the findings of this research, focusing on three main elements: the effect of managerial overconfidence on the number of M&A deals, on M&A deal type and on M&A performance. Additionally, these results will be validated by performing several robustness checks. Finally, in section 5, the results will be summarized and interpreted in the conclusion & discussion section.

2. Prior literature and hypothesis development

As previously indicated, "M&A strategy" in the research question: *What is the effect of the interplay between CEO and CFO overconfidence on a firm's M&A strategy in the United States?* will be broken down into M&A activity, M&A deal type (diversifying, cross-border, method of payment) and M&A performance (acquirer's announcement effects). Consequently, five hypotheses can be constructed. The remainder of this section will define managerial overconfidence and will explain how the hypotheses can contribute to a deeper understanding of the research question.

2.1 Defining managerial overconfidence

According to the Cambridge Dictionary (2020), overconfidence can be defined as: "the quality of being too certain of your abilities or your chances of success". Over the last decades, scholars endeavored to construct an analogous definition for managerial overconfidence. For instance, Chen, Crossland and Luo (2015) defined managerial overconfidence as: "the extent to which managers tend to overestimate the accuracy of their knowledge and judgments". Apart from trying to capture overconfidence in a single-sentence definition, overconfidence is often subdivided into two underlying effects: 1) the better-than-average effect and 2) miscalibration (Skala, 2008). Firstly, the better-than-average effect is in line with the "overestimation of their knowledge and judgments" part in the definition of overconfidence from Chen et al. (2015).[7] Secondly, managerial miscalibration relates back to the "accuracy" part in the definition of Chen et al. (2015), as overconfident executives overestimate the precision of their own beliefs. In other words, overconfident individuals underestimate risk (Ben-David et al., 2007).[8]

In order to construct an appropriate proxy of managerial overconfidence, it is essential to ascertain whether managerial overconfidence is a persistent trait. On the one hand, Klayman, Soll, Gonzalez-Vallejo and Barlas (1999) established that overconfidence varies between individuals, but that it remains stable over time per individual, implying that overconfidence is a persistent trait. On the other hand, Billett and Qian (2005) demonstrated that, if managerial overconfidence is created because of positive experiences, it is likely that managerial overconfidence is driven by self-attribution bias. This bias refers to an individual's tendency to think that success originates from their own skillset and abilities and that any failure is beyond their control (Miller & Ross, 1975). Hirshleifer (2001) linked self-attribution bias to overconfidence by describing that: "overconfidence and biased self-attribution are

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[7] An example of the better-than-average effect was described by Weinstein (1980), who demonstrated that the majority of individuals predict that their chances of experiencing positive life events is above the average, such as having a salary over $40,000 a year, living past 80, no night in a hospital, etc.
[8] In a more statistical manner, Bazerman and Moore (2012) argued that overconfident managers tend to place too low error bounds around their estimates of events.

static and dynamic counterparts; self-attribution causes individuals to *learn to be overconfident* rather than converging to an accurate self-assessment". Subsequently, Billett and Qian (2005) and Doukas and Petmezas (2007) found evidence that managerial overconfidence is also driven by self-attribution bias in an M&A setting. For a manager's first deals, nonnegative announcement returns were found. In contrast, high-order acquisitions[9] were associated with negative (long-term) wealth effects. Still, a manager can perceive undertaking a deal as a successful experience, which, in turn, increases M&A activity (Billett & Qian, 2005). This claim in particular allows for a "hybrid approach" regarding the persistence of overconfidence, as "success" can be perceived differently by overconfident managers compared to rational managers. Thus, for the sake of this thesis, it will be assumed that overconfidence is a managerial trait that could be developed, and then continues to persist. This is perfectly in line with the Holder67 measure of overconfidence (Malmendier & Tate, 2005).

2.2 Hypothesis development

Using a stock options approach, Malmendier and Tate (2008) demonstrated that overconfident CEOs overestimate the future returns of their target and, in turn, undertake more M&A deals than their non-overconfident peers. Nonetheless, these deals are, measured by announcement effects of acquirers, relatively more value-destroying. On top of that, overconfident managers are also likely to overestimate long-term synergies and the potentially disruptive effects of mergers (Ferris, Jayaraman & Sabherwal, 2013). Still, it was established that overconfident CEOs can be restrained when there is less abundant cash available to do acquisitions (Malmendier & Tate, 2008), when there is a strong and independent board (Kolasinski & Li, 2013) or when there is at least one female executive present on the board (Huang & Kisgen, 2013). However, the potential impact of CFO overconfidence and the influence of the interplay between CEO and CFO overconfidence on M&A activity has remained unclear in the scientific literature. To test whether there is a causal relationship between CEO-CFO overconfidence and M&A activity, the first hypothesis will be used:

Hypothesis 1 (H1): *Firms with an overconfident CEO are even more likely to undertake mergers and acquisitions when they also have an overconfident CFO*

The interplay will be measured by taking the interaction term between CEO overconfidence and CFO overconfidence. Hence, it can be stated that the interplay represents a CEO-CFO commonality with respect to overconfidence. When analyzing the effect of other CEO-CFO commonalities on M&A, it was demonstrated that when CEOs and CFOs obtained their degree at the same university (Belot &

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[9] Many deals executed by the same manager within a selected timeframe

Waxin, 2019) or used a similar language style during conference calls (Shi, Zang & Hoskisson, 2019), the respective firm undertakes more acquisitions. Potentially, this mutually reinforcing mechanism can be explained by the False Consensus Theory, which states that people tend to expose themselves to others with closely related traits and beliefs (Ross, Green & House, 1977). Even more closely related to hypothesis 1, Shi and Chen (2019) established that also firms with a high level of CEO-CFO optimism are positively associated with M&A activity. Optimism can be defined as "an upward bias in beliefs about future outcomes" (Bouwman, 2014) or "someone who systematically overestimates the future outcome of an event" (Chen & Lin, 2013). Because these definitions are closely related to the earlier elaborated definitions of overconfidence, some scholars use managerial optimism and overconfidence interchangeably.[10] Although optimism can be seen as a similar cognitive bias[11] to overconfidence, there remain differences. Both Baker and Wurgler (2013) and Ben-David et al. (2007) argued that optimism should be perceived as an overestimation of mean ability, whereas overconfidence should mainly be perceived as an underestimation of volatility. Consequently, the definition of optimism is in line with the better-than-average effect, while the definition of overconfidence is more in correspondence with the (risk-based) miscalibration effect. Another difference is that this thesis will use the option-based Holder67 measure to classify managers as overconfident, whereas Shi and Chen (2019) used quarterly conference call transcript data to identify whether an executive uses relatively more optimistic words compared to pessimistic words. Therefore, by focusing on CEO-CFO overconfidence rather than optimism and by using a stock option-based proxy for overconfidence, this thesis will investigate whether the positive effect of CEO (CFO) overconfidence is amplified when the CFO (CEO) is overconfident as well. Further, this thesis will contribute to the growing body of literature that assesses the impact of the interplay of several CEO-CFO commonalities (Belot & Waxin, 2019; Hsieh et al. (2018); Shi & Chen (2019); Shi et al. (2019)).

To interpret the results, it is crucial to understand how CEOs and CFOs differ and how interpersonal ties caused them to end up in top management positions. Based on four traits: general ability, execution focus vs. interpersonal focus,[12] charismatic personality vs. analytical personality, and strategic focus vs. managerial focus,[13] Kaplan and Sorensen (2017), identified how CEOs and CFOs differ. It was found that CEOs have, on average, more talent, a higher level of execution, more charisma and a more strategic focus, while CFOs, on average, are less talented than CEOs, are more open to feedback, have a more analytical personality and are more focused on people management. All indicators can be useful when predicting the future career path for either the CEO or the CFO.

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[10] See e.g. (Lee, Hwang & Chen, 2017)
[11] The term "cognitive bias" was introduced by Kahneman and Tversky (1972) and refers to individuals who systematically irrationally respond to problems.
[12] To which extent criticism/feedback from others is being heard and whether this is implemented (Kaplan & Sorensen, 2017)
[13] Whether a manager is more focused on long-term strategic perspectives or more on people management (Kaplan & Sorensen, 2017)

Firms select overconfident managers for two reasons: matching and board-failure (Banerjee, Dai, Humphery-Jenner & Nanda, 2015a). Firstly, based on the matching hypothesis and consistent with Hirshleifer et al. (2012), firms select overconfident managers because they believe that increased risk-taking results in a higher level of investment and more innovation, which, in turn, leads to improved firm performance. Secondly, based on the board-failure hypothesis, overconfident executives are elected because of board inattention, focusing on the negative impacts of overconfidence on firm performance (McCarthy, Oliver & Song, 2017; Tang & Tang, 2007). Moreover, it can be assumed that CEOs and CFOs are also able to influence each other's appointment decisions by, for instance, getting involved in a nominating committee (Shivdasani & Yermack, 1999). Similar to Belot & Waxin (2019), Malmendier, Pezone and Zheng (2020) reported that overconfident CEOs are more likely to hire an equally overconfident CFO. This social dependency does not only arise from a similar level of expected overconfidence but also from educational ties (Belot & Waxin, 2019), military ties, the region of provenance, industry-specific preferences or previous employment (Hwang & Kim, 2009). Next to hiring decisions, close CEO-CFO ties are negatively associated with redundancies. Belot and Waxin (2019) found that CEOs with close educational ties with CFOs are relatively less likely to be fired. A potential explanation can be found in the board composition. When there is a close link between the two members of the Top Management Team (TMT), CFOs are significantly more likely to have a board position and, in turn, are more likely to influence recruitment or dismissal decisions . Still, Campbell, Johnson, Rutherford and Stanley (2009) reported that, on average, overconfident executives are more likely to be fired than their non-overconfident counterparts. Therefore, it can only be concluded that close CEO-CFO ties result in a relatively higher level of managerial entrenchment.

In sum, it can be concluded that the characteristics of a CEO and a CFO differ enormously, even in case they are both classified as overconfident. Moreover, CFOs have traits that are the complete opposite of CEO-like characteristics. Therefore, it can be argued that boards should seek a CEO-CFO pair that is complementary to each other. In this way, the impact of negative personal traits can be mitigated, which will lead to increased firm performance (Hennes, Leone & Miller, 2008). In terms of overconfidence, it seems that the CFO will have this "mitigating role". For instance, Chen, Gores, Nasev and Wu (2018) investigated the effect of managerial overconfidence on cost reporting behavior and found that 60% of CEOs are overconfident, whereas 50% of CFOs are overconfident.[14] Additionally, in contrast to financial reporting decisions, there is, in general, a larger role for the CEO compared to the CFO when it comes to M&A decisions (Graham, Harvey & Puri, 2015). Taken together, it can be expected that CEO overconfidence has a higher level of significance and a more economically

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[14] Based on executives that did not exercise their at least 67% in the money options at least once

pronounced effect on M&A strategy than CFO overconfidence. Therefore, hypotheses 1-5 are compiled from the CEO's point of view. In the part that follows, the remaining four hypotheses will be constructed. These hypotheses elaborate on the previously explained definitions of managerial overconfidence, different behavioral traits of CEOs and CFOs and the effects of different levels of CEO-CFO commonalities on M&A decisions. As a result, the paragraphs accompanying the hypotheses only describe additional information needed to form specific expectations.

Hypothesis 2 (H2): *Firms with an overconfident CEO are even more likely to undertake diversifying mergers and acquisitions when they also have an overconfident CFO*

For diversifying deals, transactions in which the target is in a different industry group than the acquirer, the effect of CEO overconfidence on the number of diversifying deals were found to be even more economically pronounced (Malmendier & Tate, 2008; Ferris et al., 2013). The rationale behind this finding is that diversifying deals are even riskier than deals in a related sector. Hence, the difference between a "rational manager", who can perfectly assess risk, and an overconfident manager, who has a lower perception of risk, is expected to be even larger for diversifying deals.

Hypothesis 3 (H3): *Firms with an overconfident CEO are even more likely to undertake cross-border mergers and acquisitions when they also have an overconfident CFO*

The effect of cross-border acquisitions is twofold. On the one hand, the upside potential of M&A returns is higher in case of a cross-border merger compared to a domestic merger (Andries & Vîrlan, 2017), as the acquirer and the target are able to profit from their diverse set of routines and skills (Morosini, Shane & Singh, 1998). On the other hand, Stahl and Voigt (2008) emphasized that cultural diversity could hinder post-merger integration. Nonetheless, Dikova and Sahib (2013) reported that these negative effects of cultural distance depend on the level of cross-border experience of the acquirer. Targets will be better integrated when the acquirer has international M&A experience. Overall, it can be expected that cross-border deals are relatively riskier. Therefore, the economic magnitude of CEO-CFO overconfidence is expected to be larger for cross-border transactions.

Hypothesis 4 (H4): *Firms with an overconfident CEO are even more likely to undertake cash-only mergers and acquisitions when they also have an overconfident CFO*

Cash offers are often associated with less negative or nonnegative announcements returns and are perceived as less risky compared to stock offers (Billett & Qian, 2005). Rational managers might prefer cash over a stock offer when: 1) the target is relatively undervalued (Myers & Majluf, 1984); 2) the target has low growth opportunities (Martin, 1996); 3) the target shareholders have to pay relatively high taxes on the profits they made on selling their shares (Ismail & Krause, 2010). Due to the better-than-average effect and miscalibration, overconfident managers may not be able to make an appropriate assessment of these considerations. Malmendier & Tate (2008) found that, compared to rational managers, overconfident CEOs are more likely to finance an acquisition by cash. Hence, it is expected that firms with an overconfident CEO are even more likely to undertake cash-only mergers and acquisitions when they also have an overconfident CFO.

Hypothesis 5 (H5): *Firms with an overconfident CEO are even more likely to undertake value-destroying mergers and acquisitions when they also have an overconfident CFO*

A high level of commonality among CEOs and CFOs in terms of overconfidence is negatively associated with announcement returns (Belot & Waxin, 2019; Shi et al., 2019). The rationale behind this finding is that the level of diversity between CEOs and CFOs significantly affects strategic corporate decision-making. According to Milliken and Martins (1996), different educational backgrounds or unique previous experiences of executives will lead to a more complete assessment of a particular issue. This beneficial effect of diversity is also endorsed by numerous studies that carried out the effect of board diversity on strategic decision-making (Bernile, Bhagwat, & Yonker, 2018; Carter, Simkins & Simpson, 2003; Erhardt, Werbel & Shrader, 2003). Moreover, previous literature found that deal success is negatively related to managerial overconfidence (Doukas & Petmezas, 2007; Malmendier & Tate, 2005). Still, the negative impact of overconfident CEOs on announcement returns could be attenuated by having a strong and independent board (Kolasinski & Li, 2013), hiring female executives (Huang & Kisgen, 2013), having a CFO whose language style is different from the CEO (Shi, Zhang & Hoskisson, 2019) or having a relatively less optimistic CFO compared to the CFO (Shi & Chen, 2019). Taken together, if the level of commonality among the CEO and the CFO is higher, mergers and acquisitions are even more likely to be value-destroying. In order to test whether this conclusion also holds for a high level of CEO-CFO overconfidence, hypothesis 5 was constructed.

3. Data & Methodology

3.1 Data

The data is retrieved from merging ExecuComp, Compustat, BoardEx and ThomsonOne databases. The structure of the data section is as follows. Firstly, in section 3.1.1, the measures of overconfidence will be elaborated. Secondly, in section 3.1.2, the main data selections and transformations will be explained. Finally, in sections 3.1.3 and 3.1.4, descriptive statistics will be discussed.

3.1.1 Measuring overconfidence

Overconfidence will be measured by using a stock options approach. Stock options enable executives to buy shares at a fixed price, prior to a given date. Hence, managers profit when the company's share price increases. As a result, managers tend to act in the long-term interest of the firm. Executives who are compensated with stock options are to a large extent exposed to firm-specific idiosyncratic risk. Nonetheless, a significant amount of them still chooses to hold their options, even when the current stock price exceeds the strike price (called "in the money") (Malmendier & Tate, 2005). Potential reasons to hold rather than to exercise can be attributed to the previously explained better-than-average effect and miscalibration (Chen et al., 2015).

The results in this paper will be measured by using an altered version of the Holder67 method. The original Holder67 method (Malmendier & Tate, 2005) implies that, when a CEO's or CFO's stock options are 67% in the money at the fifth year[15], and the executive still chooses to keep his stock options at least twice before or during the fifth year, an executive is classified as overconfident.[16] In contrast to Malmendier and Tate (2005), data cannot be obtained from Hall and Liebman's (1998) proprietary dataset, which includes detailed data on option holdings and exercise prices for each individual option grant. Therefore, the results will be estimated using the altered "average moneyness Holder67 method", as introduced by Campbell et al. (2009) and Hirshleifer et al. (2012). Specifically, the altered Holder67 measure will be approximated as follows. Firstly, for each CEO or CFO, the realizable value per option will be calculated by dividing the total realizable value of unexercised exercisable options held in a specific year by the number of exercisable options. Secondly, the average exercise price will be estimated by subtracting the realizable value per option from the firm's fiscal year-end stock price. Lastly, the average moneyness is calculated by dividing the fiscal year-end stock price by the average exercise price.[17] As a result, an executive can be classified as overconfident when

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[15] On the assumption that stock options usually vest after four years

[16] The threshold of 67% was obtained by calibrating Hall and Murphy's (2002) framework, assuming a risk aversion of three in a constant relative risk-aversion (CRRA) utility framework and a percentage of wealth in the company equal to 66% (Malmendier & Tate, 2005).

[17] See table 6.1 for ExecuComp names

the average moneyness of his or her option packages exceeds the threshold of 67% for the second time during his or her tenure. Subsequently, from this point in time onwards, the executive remains overconfident for the rest of the sample period.[18] Alternatively, a significant number of researchers already classify an executive as overconfident based on the Holder67 method if the executive exhibits the pre-specified exercise behavior at least once.[19] Hirshleifer et al. (2012) demonstrated that their results are robust to the findings of Malmendier & Tate (2005) when using their "Holder67once" method. Hence, this thesis will use Holder67once as the main variable of interest but will test for Holder67twice as well to validate the results.

Moreover, in the robustness checks section, the results will be validated by using the *Longholder* measure, as introduced by Malmendier and Tate (2005). Longholder is a binary variable that equals one when the executive ever during his or her tenure kept options until the last year of expiration, given that these options were at least 40% in the money (Malmendier & Tate, 2008).[20] Thus, this option-based measure differs from Holder67 in two ways. Firstly, Longholder focuses on the last year before expiration, whereas Holder67 focuses on the average moneyness of a set of unexercised but exercisable options. Secondly, the Longholder measure endorses the view of Kaneyman et al. (1999) that overconfidence is a persistent trait, rather than allowing for a hybrid approach used in this thesis.[21] Especially because measuring overconfidence heavily relies on assumptions, Holder67 will be compared to Longholder in the data section as well.

3.1.2 Data selection and transformations

In order to analyze hypotheses 1-4, data is obtained from merging ExecuComp, Compustat, BoardEx, and ThomsonOne databases. The final dataset consists of 6,519 firm-year observations between 2007 and 2018, 838 unique firms that were listed at least once on the S&P 1500 during the sample period, 1287 different CEOs, 1376 different CFOs and 1724 unique CEO-CFO pairs. Utility companies (SIC: 4900-4999) and financial firms (SIC: 6000-6999) were removed from the sample, as these firms operate under a different (regulatory) environment (Fama & French, 1992). An overview of all variables can be seen in Table 6.1. Although ExecuComp has already started reporting on CFO stock option packages in 2006, 2007 is used as a starting point for the final sample, as the construction of Holder67twice requires the executive to appear at least twice in the sample. As a result, data from

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[18] See "hybrid approach as explained in section 2.1.1. Overconfidence could arise from perceived success, i.e., self-attribution bias (Billett & Qian, 2005; Doukas & Petmezas, 2007) and once overconfidence manifests itself, it will be a persistent trait (Klayman et al., 1999).

[19] See e.g.: (Ahmed, & Duellman, 2013; Chen et al., 2018; Chen, Ho, & Yeh, 2020; Hirshleifer et al., 2012; Kramer & Liao, 2016)

[20] Once an executive has been classified as overconfident based on the Longholder measurement for one specific year, this will also be extended to all other years the manager is present in the sample

[21] In order to deviate from the managerial fixed effect measure (longholder), but still being able to focus on the last year before expiration, Malmendier and Tate (2008) introduced Pre-longholder and Post-longholder measures

the year 2006 will initially be extracted but was removed after the construction of the Holder67twice variable. A more economic reason for this timeframe is the implementation of FAS 123R, which caused an exogenous shock when it comes to potential accounting benefits of stock options (Hayes, Lemmon & Qiu, 2012). FAS 123R, effective from 2006 onwards, was a new accounting standard that required companies to annually deduct the share-based equity payment granted to all their employees (Financial Accounting Standards Board, 2004). Accordingly, in anticipation of the new rules, firms increasingly switched from option-based compensation to fixed compensation already from 2002 onwards (Chu, Liu, Ma & Li, 2020; Hayes et al., 2012; Valenti, 2013). Nonetheless, no change in managerial risk-taking was found as a result of FAS 123R (Hayes et al., 2012). This is in favor of using an option-based overconfidence measure, as it endeavors to classify managers as overconfident based on their level of managerial risk-taking.

Subsequently, M&A data was obtained from ThomsonOne. The following set of requirements was used to select the deals:

a) Deal was announced and completed between 01/01/2007 and 31/12/2018
b) The acquirer is listed on a U.S. stock exchange
c) Deal value is at least USD 1 million
d) Deal value represents at least 1% of the acquirer's previous year total assets
e) The deal is a "disclosed dollar value deal", as reported by ThomsonOne
f) The acquirer owned less than 50% of the target's shares before the transaction, and owned 100% after the announcement

The requirements described in c) up to and including f) are set to ensure that only "change of control" mergers are analyzed (Malmendier & Tate, 2008). In all other cases, it is likely that the impact of CEO-CFO overconfidence on M&A activity and deal type will be negligible. Moreover, it can be expected that small deals, either caused by a (relatively) low deal value or by a relatively small stake, are less likely to affect an acquirer's stock price at the announcement date. Finally, by using this dataset, the propensity of doing at least one (diversifying/cross-border/cash-only) deal per firm per year can be tested (hypotheses 1-4).[22]

In order to analyze hypothesis 5, an additional deal restriction will be imposed:
g) In case two deals were announced on the same date by the same firm, the deal with the largest deal value will remain in the dataset

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[22] For instance, if a company buys a U.S. target in the same industry paid in stocks in September 2010 and also buys a Dutch target in another industry paid fully in cash in December 2010, the firm will get an "one" for the variables M&A activity, Diversifying deal, Cross-border deal and Cash-only deal for firm-year 2010 (see also Table 6.1and methodology section 2.2.1 and 2.2.2).

This M&A performance dataset differs from the dataset to estimate the effect of managerial overconfidence on M&A activity. While the M&A activity dataset is measured at a firm-year level, the M&A performance is measured at a deal level. Imposing all deal requirements, obtaining cumulative abnormal returns from the WRDS Event Study Tool[23] and merging with the already obtained combined ExecuComp, BoardEx and Compustat dataset, results in 1,497 M&A transactions between 2007 and 2018, 480 unique bidders that were listed at least once on the S&P 1500 during the sample period, 603 different CEOs, 626 different CFOs and 695 unique CEO-CFO pairs.

3.1.3 Descriptive statistics: M&A activity

Table 3.1 provides summary statistics for the variables used in the regressions to test hypotheses 1-4. Similar to Chen et al. (2018) and Malmendier et al. (2020), it can be observed that, irrespective of the overconfidence measure used, a larger part of CEOs is classified as overconfident compared to CFOs. On top of that, the portion of Holder67once CEOs (62%) and Holder67once CFOs (54%) seems in line with the previously found percentages of Chen et al. (2018).[24] Moreover, the average values of CEOHolder67twice (42%) and CEOLongholder (47%) are also consistent with previous literature.[25] When comparing the overconfident measures, Table 6.2 reveals that Longholder is much more stable than Holder67once and Holder67twice. In contrast to Holder67, Longholder (retrospectively) classifies an executive as overconfident or non-overconfident for the full sample period, which explains the more stable trendline. Table 6.3 shows the frequency of different combinations of CEO-CFO Holder67twice throughout the sample period. Although "CEO overconfident, CFO overconfident (15%, 2007)" and "CEO non-overconfident, CFO non-overconfident (65%, 2007)" are the most frequent combinations for every year in the sample, the underlying proportions of these two popular combinations converge as time progresses. Panel B in Table 3.1 presents summary statistics for the dependent variables used to test hypotheses 1-4. Between 2007 and 2018, there was at least in 1,278 out of 6,519 firm-year observations (20%) one merger or acquisition undertaken by a firm, given that this deal meets the requirements as previously explained in section 3.2.2.[26] Intuitively, the percentage of firm-years with at least one acquisition drops when imposing restrictions regarding deal characteristics. From Figure 6.5, it can be seen that, in each year, at least one out of three combinations of CEO-CFO overconfidence outperform the "CEO non-overconfident, CFO non-overconfident" combination. Surprisingly, in five out of twelve sample years, the combination

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[23] See section 3.2.3 for a detailed overview of risk model, estimation window and event window to compute CARs. In case the announcement day was on a weekend or on a public holiday, the next trading day was set as the announcement day.

[24] Based on the Holder67once measure, Chen et al. (2018) found that 59.3% of CEOs and 51% of CFOs can be classified as overconfident for a sample of 20,280 observations between 1992-2015.

[25] Based on the Holder67twice measure, Ahmed and Duellman (2013) and Malmendier and Tate (2005) classified 35.1% and 51.3% of CEOs as overconfident. Based on the Longholder method, Malmendier and Tate (2005) classified 12.9% of CEOs as overconfident. Note that Malmendier and Tate (2015) calculated Longholder with ExecuComp data and found a percentage of ca. 40% of Longholder CEOs (see Figure 1).

[26] The proportion of 20% corresponds with Belot and Waxin (2019) and Malmendier and Tate (2008), who found 20% and 22% of firm-year observations with at least one deal respectively

Table 3.1: Descriptive statistics M&A activity dataset

This table reports the number of observations, mean, standard deviation, minimum, median and maximum for the variables of interest (Panel A), dependent variables (Panel B) and control variables (Panel C-E). For all variable definitions, see Table 6.1

Variable Name	Observations	Mean	Std dev.	Minimum	Median	Maximum
Panel A: CEO-CFO overconfidence measures						
CEOHolder67once	6,519	0.62	0.49	0	1	1
CEOHolder67twice	6,519	0.42	0.49	0	0	1
CFOHolder67once	6,519	0.54	0.50	0	1	1
CFOHolder67twice	6,519	0.35	0.47	0	0	1
CEOLongholder	6,519	0.47	0.50	0	0	1
CFOLongholder	6,519	0.29	0.45	0	0	1
Panel B: Dependent deal variables						
M&A activity	6,519	0.20	0.40	0	0	1
Diversifying deal	6,519	0.09	0.28	0	0	1
Cross-border deal	6,519	0.06	0.23	0	0	1
Cash-only deal	6,519	0.13	0.34	0	0	1
Panel C: Firm-specific accounting data						
Firm size	6,519	7.78	1.63	2.45	7.68	13.18
ROA	6,519	0.06	0.11	-1.60	0.07	0.99
Tobin's Q	6,519	2.17	1.38	0.72	1.75	8.26
Capital	6,519	2,561.61	6,278.07	1.90	374.29	39,934.00
Cash flow	6,519	952.81	2,405.49	-356.00	207.99	17,711.00
Normalized cash flow	6,519	0.93	1.89	-7.84	0.58	10.35
Cash ratio	6,519	0.73	0.89	0.01	0.42	5.08
Leverage	6,519	0.21	0.18	0	0.19	0.87
Panel D: Board-specific controls						
Nationality mix	6,519	0.10	0.17	0.00	0	0.90
Gender ratio	6,519	0.86	0.11	0.33	0.88	1
Number of directors	6,519	9.30	2.13	3	9	18
Optimal board size	6,519	0.92	0.27	0	1	1
Panel E: CEO-CFO characteristics						
CEO age	6,519	57	7.14	30	57	84
CFO age	6,519	52	6.34	31	52	71
CEO gender	6,519	0.97	0.16	0	1	1
CFO gender	6,519	0.89	0.31	0	1	1
Relative power CEO	6,519	2.99	1.36	1.01	2.74	6.66
CEO fixed pay ratio	6,519	0.23	0.18	0.02	0.17	1
CFO fixed pay ratio	6,519	0.31	0.17	0.04	0.27	0.96
CEO turnover	6,519	0.08	0.27	0	0	1
CFO turnover	6,519	0.10	0.31	0	0	1

"CEO non-overconfident, CFO overconfident" leads to the highest chance of undertaking at least one deal during a fiscal year. Panel C, D and E of Table 3.1 report descriptive statistics of firm-specific, board-specific and CEO-CFO control variables. Regarding the firm-specific variables, it can be observed that the averages are slightly higher than reported by Malmendier and Tate (2008). This can potentially be explained by the different timeframes used.[27] Moreover, the board-specific variables seem in line with recent trends. For instance, the board is, on average, represented for 86% by males

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[27] 2007-2018 in this thesis versus 1980-1994 in Malmendier and Tate (2008). For instance, for a more recent sample of S&P 1500 index firms between 1992 and 2015, Malmendier et al. (2020) found a Tobin's Q of 2.4, which is comparable to the average Tobin's Q of 2.2. found in this thesis (see Table 3.1).

and for 14% by females, which is in line with recent Russell 3000 Gender Diversity Indices.[28] Finally, when analyzing the CEO-CFO control variables, it can be observed that CEOs are remunerated on average three times more than CFOs, which corresponds to the median CEO-CFO relative pay ratio for a sample of S&P 500 companies (Compensation Advisory Partners, 2016). By the same token, a CFO's total compensation package is represented by a relatively larger portion of fixed pay than the CEO.

Lastly, in order to detect multicollinearity, all pairwise correlations between the independent variables were estimated. The (untabulated) results indicate that the significant[29] correlation coefficient between CEOHolder67twice and CEOLongholder (0.22) is in line with the previously found significant correlation of 0.25 (Malmendier & Tate, 2005). Moreover, the correlation matrix suggests a significantly positive correlation between CEO and CFO overconfidence (0.49), implying that both should be included in the model to test the effect of managerial overconfidence on M&A activity (Chen et al., 2018). No variables were deleted because of multicollinearity, as no significant correlations exceeding the threshold of 0.80 were found (Berry, Feldman & Stanley, 1985).

3.1.4 Descriptive statistics: M&A performance

Table 3.2 provides summary statistics for the dependent main variables of interest used in the regressions of the M&A performance sample. Figure 6.7 shows that this sample is similar to data of the IMAA (2020), as, over the years, the number of transactions is slightly decreasing, whereas deal volume is increasing. The descriptive statistics of the control variables, which are roughly similar to the controls used in the M&A activity dataset, can be found in the Appendix (Table 6.4). It can be deduced that, regardless of how overconfidence is measured, the average value of overconfidence is larger in the M&A performance sample (Table 3.2, Panel A) compared to the M&A activity sample (Table 3.1, Panel A). Panel B of Table 3.2 shows that the cumulative abnormal returns (CARs) of five different event windows all indicate positive announcement effects of approximately 1% for the acquirer. Generally, CARs surrounding M&A transactions are usually centered around zero (Alexandridis, Petmezas & Travlos, 2010). Dependent on the deal, the cumulative abnormal return can either be slightly positive or negative.[30] Only in 2009, as indicated by Table 6.6, an average CAR of -1% was found. Figure 6.9 provides a graphical representation of the average cumulative abnormal returns based on a [-10, +10] event window for the sample of S&P 1500 companies. Especially between [-1, 0] and [0, +1] the graph shows that there has been a steep increase in the reported abnormal returns (ARs). Lastly, Table 6.8 shows that all CARs, regardless of the event window chosen, are significantly different from zero at the 0.01 level.

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[28] Percentage of female board members this paper versus Russell 3000 Gender Diversity Index (2020) (in parentheses): 2017: 19% (16%); 2018 21% (17%)
[29] In this paragraph, correlation coefficients are denoted as significantly different from zero from the 10% level onwards.
[30] See e.g. (Alexandridis et al., 2010) ; (Bruner,2002); (Fuller Netter & Stegemoller, 2002)

Table 3.2: Descriptive statistics M&A performance dataset

This table reports the number of observations, mean, standard deviation, minimum, median and maximum for the main variables of interest (Panel A), dependent variables (Panel C) and control variables (Panel B; Panel D). for the M&A performance dataset. The sample consists of 1,497 M&A transactions between 2007 and 2018, 480 unique bidders that were listed at least once on the S&P 1500 during the sample period, 603 different CEOs, 626 different CFOs and 695 unique CEO-CFO pairs. For all variable definitions, see Table 6.1

Variable Name	Observations	Mean	Std dev.	Minimum	Median	Maximum
Panel A: CEO-CFO overconfidence measures						
CEOHolder67once	1,497	0.67	0.47	0	1	1
CEOHolder67twice	1,497	0.46	0.50	0	0	1
CFOHolder67once	1,497	0.59	0.49	0	1	1
CFOHolder67twice	1,497	0.40	0.49	0	0	1
CEOLongholder	1,497	0.49	0.50	0	0	1
CFOLongholder	1,497	0.31	0.46	0	0	1
Panel B: Deal performance						
CAR [0, +1]	1,497	0.01	0.05	-0.28	0.01	0.37
CAR [-1, +1]	1,497	0.01	0.05	-0.27	0.01	0.37
CAR [-2, +2]	1,497	0.01	0.06	-0.31	0.01	0.38
CAR [-5, +5]	1,497	0.01	0.07	-0.43	0.01	0.62
CAR [-10, +10]	1,497	0.01	0.09	-0.51	0.01	1.29

3.2 Methodology

3.2.1 M&A activity & CEO-CFO overconfidence

The effect of managerial overconfidence on M&A activity will be measured using the methodology of Malmendier & Tate (2008). This implies that the dependent variable takes the value 1 if a firm undertakes at least one merger within a specific firm-year. Then, the relationship between CEO-CFO overconfidence and M&A activity will be estimated by a 1) logistic regression, 2) a logistic random effects regression and 3) a conditional[31] logistic fixed effects regression. Firstly, a logistic model makes use of cross-sectional, within-firm and within-executive variation. Although it uses all types of variations, a drawback of a logit model is that it treats observations independently. As a result, the structure of the panel dataset is ignored. In order to make use of all types of variation and simultaneously account for the structure of the panel dataset, a random effects logit model can be estimated. A random effects model makes the assumption that unobserved effects are distributed independently of the regressors. The impact of these variables is then included as a random effect in the error term (Greene 2008). Alternatively, to relax this strong assumption, a conditional fixed effects model assumes that unobserved controls are allowed to be correlated with the regressors. The conditional logistic fixed effects regression only makes use of within-firm variation. As a result, only firms that had at least one successful merger bid and different levels of managerial overconfidence will be included in the logistic fixed effects regression, which downgrades the sample size used for the analysis. Although it introduces selection bias, an advantage of this procedure is that the effect of time-invariant firm characteristics will cancel out, and, in turn, the fixed effects model does not suffer

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[31] In order to address the incidental parameters problem, conditional fixed effects will be used.

from omitted variable bias with regard to time-invariant variables. For each firm i, in sample year t, the conditional fixed effects logit model can be described as:

$$\Pr\{M\&A\ Activity_{it} = 1\ |OCEO_{it}, OCFO_{it}, V_{it,} W_{it,} X_{it}, \alpha_i, \delta_t\} = G(\ \beta_1 OCEO_{it} + \ \beta_2 OCFO_{it} + \quad (3.2.1)$$
$$\beta_3 OCEO_{it} * OCFO_{it} + \ \beta_4 U_{it} + \ \beta_5 V_{it} + \ \beta_6 W_{it} + \beta_7 X_{it} + \ \alpha_i + \ \delta_t)$$

In this model, G represents the logistic distribution, O is the overconfidence measure based on the Holder67once method, U represents a set of time-varying CEO-specific control variables, which include*, CEO age, CEO fixed pay ratio and CEO turnover; V reveals a set of CFO-specific controls which seamlessly correspond with the CEO-specific controls, meaning that CFO age, CFO fixed pay ratio and CFO turnover will be added to the regression;* W represents a set of time-varying firm-specific control variables, which include *Firm size, Tobin's Q, ROA, Normalized cash flow, Cash ratio, Leverage, Number of board members, Percentage of female directors, and Board nations ; X represents a set of time-varying CEO-CFO commonalities controls,* which include *CEO-CFO same gender* and the ratio of the CEO's compensation relative to the CFO's compensation (denoted as *CEO relative power*). The firm-specific intercept (firm fixed effect) is denoted by α_i and controls for unobserved time-invariant firm-specific variables. Moreover, year fixed effects (δ_t) will be added to control for shocks that affect firms in the same year in the same way. Finally, standard errors are clustered at the firm level and are therefore robust to heteroskedasticity and unspecified within-firm correlation.

Note that when interpreting the results of equation (3.2.1), the coefficients exemplify the change in log odds when the independent variable increases by 1 level. Subsequently, the odds ratio will be calculated by using equation (3.2.2):

$$Odds\ ratio\ = \ e^{\beta} \qquad\qquad (3.2.2)$$

An odds ratio greater than 1 indicates a positive association and an odds ratio lower than 1 indicates a negative association between CEO-CFO overconfidence and M&A activity.

In the results section, only the most stringent specification, i.e. the conditional fixed effects model, will be tabulated. The results of the logit and random effects models will be reported in case the implications are not robust across all estimation procedures. In order to improve the internal validity of both alternative specifications, industry fixed effects will be added to control for shocks that affect firms in the same industry in the same way. As a proxy for different industries, the Fama and French (1997) 12-industry classification will be used.[32] All results will be estimated using a three-step approach. Firstly, the effect of CEO and CFO overconfidence on M&A activity will be measured

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[32] See Table 6.1Panel F for a complete overview of industries

independently from each other. In this way, both the statistical significance and the economic magnitude of CEO overconfidence can be compared to Malmendier and Tate (2008). To assess the joint effect of CEO and CFO overconfidence on M&A activity, two more steps are required (Crawford, Jussim & Pilanski, 2014). Secondly, a model will be estimated, which includes both CEO and CFO overconfidence. In this model, both the main effects of CEO and CFO overconfidence can be analyzed. This model shows the effect of CEO (CFO) overconfidence on M&A activity, keeping the level of CFO (CEO) overconfidence constant. This second step corresponds to the methodologies used by Chen et al. (2018) and Malmendier et al. (2020) . Thirdly, in the final model, an interaction term between CEO and CFO overconfidence will be added to the model. In this model, the main effects of CEO and CFO overconfidence should be interpreted as conditional main effects, i.e., the coefficient CEO (CFO) overconfidence reveals the impact of CEO (CFO) overconfidence on M&A activity when the CFO (CEO) overconfidence is non-overconfident. A significant positive (negative) interaction term indicates whether the individual impact of CEO or CFO overconfidence is amplified (mitigated) when both executives are overconfident.

Finally, CEO-CFO-specific and firm-specific control variables were added to reduce the impact of time-varying omitted variable bias. Concerning the CEO-CFO controls, age and gender were added to control for general characteristics of executives. It was found that older (Prims & Moore, 2007) executives of the male gender (Huang & Kisgen, 2013) are more likely to be overconfident. Moreover, Chava and Purnanandam (2010) found that the compensation structure of CEOs and CFOs affects M&A decisions. Therefore, CEO-CFO fixed pay ratio and the compensation of a CEO relative to the compensation of a CFO (CEO relative power) were added to the regressions. Dutta, MacAulay and Saadi (2011) found that firms with more powerful CEOs are more likely to undertake an acquisition. Furthermore, consistent with Belot and Waxin (2019), CEO and CFO turnover will be added to the model to account for changes in CEO-CFO pairs. Among the firm-specific controls, it can be expected that firm size (Haleblian, Devers, McNamara, Carpenter & Davison, 2009), ROA (Carper, 1990) and cash flow and cash ratio (Duchin, 2010) are positively associated, while Tobin's Q (Malmendier & Tate, 2008) and leverage (Duchin, 2010) are negative associated with M&A activity. The rationale behind the precited signs of these firm-specific controls is that firms with more internal resources are more likely to undertake at least one deal. Finally, three types of board-specific variables are added. It was found that small boards (Eisenberg, Sundgren & Wells 1998), boards represented by females (Chen, Leung, Song & Goergen, 2019) and boards which are represented by at least one foreign member (Cao, Ellis & Li, 2019) are less likely to perform at least one merger during a particular fiscal year.

3.2.2 M&A deal type & CEO-CFO overconfidence

In order to test hypotheses 2-4, deal type will be exemplified by the following dummy variables: whether a firm performed at least one diversifying deal (different SIC code based on two digits), whether at least one cross-border deal was executed and whether the deal was a pure cash deal for each firm i, in sample year t. Similar to equation (3.2.1), these dependent variables are also binary variables. Hence, the same procedure will be followed, implying that a logit regression, a random effects logistic regression and a fixed effects logistic regression are performed to estimate the propensity of doing a diversifying, cross-border or pure cash deal. Again, the three-step approach will be used to build the model.

The conditional fixed effects model to estimate the propensity of performing a specific type of deal can be described as:

$$\Pr\{Deal\ proxy_{it} = 1\ |OCEO_{it}, OCFO_{it}, V_{it}, W_{it,}\ X_{it}, \alpha_i, \delta_t\} = G(\ \beta_1 OCEO_{it} +\ \beta_2 OCFO_{it} +$$
$$\beta_3 OCEO_{it} * OCFO_{it} +\ \beta_4 U_{it} +\ \beta_5 V_{it}\ +\ \beta_6 W_{it}\ +\ \beta_7 X_{it}\ +\ \alpha_i\ +\ \delta_t)$$

(3.2.3)

In this logistic regression, G represents the logistic distribution, O reveals the coefficient for executive overconfidence based on the *Holder67* method, and U, V, W and X represent a set of CEO-specific, CFO-specific, firm-specific and CEO-CFO commonalities control variables, respectively, in a way that these control variables seamlessly correspond with the controls used in equation (3.2.1). Finally, firm fixed effects and year fixed effects are denoted by α_i and δ_t, respectively. Standard errors are clustered at the firm level.

3.2.3 Deal success & CEO-CFO overconfidence

Thirdly, to access whether there is success, short-term measures of M&A performance will be constructed. To measure the short-term impact of a deal, cumulative abnormal returns (CARs) of the acquiring firm will be analyzed. Based on previous M&A research concerning abnormal returns for acquirers a [-1, +1] event window will be used (Baker, Dutta, Saadi & Zhu, 2012; Billett & Qian, 2008; Boateng, Du, Bi & Lodorfos 2019; Masulis, Wang & Xie, 2007). As a robustness check, the results will be validated by using [0, +1]; [-2, +2]; [-5, +5] and [-10, +10] event windows. The formula for calculating the abnormal return equals:

$$AR_{it} =\ R_{it}\ - E(R_{it})$$

(3.2.4)

Where R_{it} is the actual return of stock_i at time t and $E(R_{it})$ is the expected return of stock_i based on the AR market model using a 150-day estimation window. In previous M&A literature, many different estimation periods and gaps between the estimation period and the event window are

chosen.[33] According to Armitage (1995), results are not sensitive to varying estimation periods as long as at least 100 trading days will be taken into account. Hence, in this paper, an estimation period of [-170, -21] will be used. Graphically, this looks as follows:
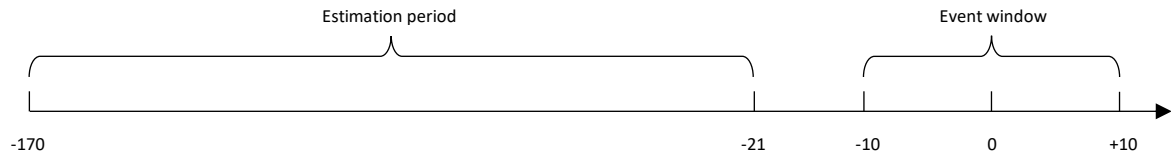
Subsequently, CARs are estimated by using equation (3.2.5):

$$CAR_i(T_1, T_2) = \sum_{T=T_1}^{T_2} AR_{it}$$

(3.2.5)

Equation (3.2.5) shows that the CAR is just a summation of the individual ARs calculated in equation (5). Then, the effect of CEO-CFO overconfidence on the three different CARs can be measured by the OLS regression in equation (3.2.6):

$$CAR_i = \gamma_1 + \gamma_2 OCEO_i + \gamma_3 OCFO_i + \gamma_4 OCEO_i * OCFO_i + X_i G + \varepsilon_i$$

(3.2.6)

Where O reveals managerial overconfidence (Holder67once) and X represents a set of control variables, in a way that these control variables correspond to the model used by Malmendier & Tate (2008). However, Malmendier and Tate (2008) used a sample that is mainly focused on larger firms. Therefore, also firm-specific controls will be added to $X_i G$. The following controls are expected to positively affect the acquirer's CAR: cross-border deals (Otto, 2017), cash-only financed deals (Asquith, Bruner & Mullins, 1990), the logarithm of total assets (Haleblian et al., 2009), ROA (Das & Kapil, 2012), Tobin's Q (Heron & Lie, 2002), cash flow and cash ratio (Bruner, 1988), the proportion of female board members (Goergen, 2019), whether the CEO is also the chairman of the board (Belot & Waxin, 2019) and CEO-CFO ownership of stocks and vested options (Malmendier & Tate, 2008). In contrast, the following controls are expected to negatively affect the acquirer's CAR: deal value (Das & Kapil, 2012), diversifying targets (DeLong, 2001) listed targets (Faccio, McConnell & Stolin, 2006), leverage (Andriosopoulos, Yang & Li, 2016), CEO-CFO age (Malmendier & Tate, 2008). Furthermore, a high level of CEO relative power cause more volatile announcement returns, as firms with more powerful CEOs take less deliberate M&A decisions (Kilian & Schindler, 2014). Lastly, the interaction between industry and year fixed effects will be added to the model to control for merger waves and clustered transactions based on industry. The industry fixed effects are based on the Fama and French's (1997) 12-industry group classification. In all models, standard errors will be clustered at the announcement date and are robust to heteroskedasticity.

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[33] See e.g., Boateng et al. (2019), who used an estimation period of [-240, -21] ;See e.g., Belot and Waxin (2019), who used an estimation period of [-160, -11]

4. Results

The results section will be subdivided into four parts. Firstly, the effect of CEO and CFO overconfidence on merger activity will be tested (hypothesis 1). Secondly, the relationship between managerial overconfidence and M&A deal type will be assessed, which comprises hypotheses 2, 3 and 4. Thirdly, it will be investigated how the interplay between CEO and CFO overconfidence might affect M&A deal success (hypothesis 5). Fourthly, robustness checks will validate the baseline results and will provide a deeper understanding of how CEO-CFO overconfidence affects a firm's M&A strategy.

4.1 Managerial overconfidence on M&A Activity

Columns (1) and (2) of Table 4.1 assess the independent effect of CEO overconfidence and CFO overconfidence on M&A activity in absence of control variables. It can be observed that both CEO overconfidence and CFO overconfidence are significantly positively related to M&A activity. More specifically, the odds ratio of CEO overconfidence, 1.51, implies that the odds of an overconfident CEO to make at least one merger bid during a firm-year are 1.51 times the odds of a non-overconfident CEO, *ceteris paribus*. Hence, the economic relevance of CEO overconfidence seems lower compared to Malmendier and Tate[34] (2007) (odds ratio = 2.52, significant at 5%). The magnitude of CFO overconfidence (1.46) is similar to the economic impact of CEO overconfidence (1.51). In Columns (3) and (4) of Table 4.1, firm-specific, board-specific and CEO-CFO-specific control variables are added to the models of columns (1) and (2). On top of that, also year fixed effects are added to the model. While both the magnitude and the significance level of the CEO overconfidence coefficient are similar to model (1), the odds ratio of CFO overconfidence has increased from 1.46 in model (2) to 1.53 in model (4), indicating an even stronger relationship between CFO overconfidence and M&A activity.

Among the firm-specific controls, it can be observed that firm size and the portion of debt to equity[35] positively affect the propensity of doing at least one merger, whereas the cash ratio negatively affects M&A activity. In both models (3) and (4), the effects of return on assets, Tobin's Q and cash flow were insignificant. In contrast to Table 4.1, one would expect that a lower leverage level and a higher cash ratio would lead to increased M&A activity, as more internal resources would be available to conduct a merger or acquisition (Duchin, 2010). Alternatively, in line with the signs of the coefficients in Table 4.1, one could argue that a higher level of leverage and a relatively low cash ratio (low liquidity) increases shareholder and investor scrutiny. As a result, this increasing pressure might make firms

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[34] In a previous version of the paper of Malmendier and Tate in 2008, both Longholder and Holder67 were used as proxies for overconfidence. Holder67 is based on exercise behavior twice and estimated using a conditional fixed effects specification. The conclusion on economic magnitude still holds when comparing to CEOHolder67twice in this paper (odds ratio 1.22, significant at 5%)

[35] Note that the economic impact of Debt to Equity seems larger than it actually is. In this case, a 'one unit increased implies that the ratio of debt to equity has increased by 100%. The effect of an 1% increase corresponds to an odds ratio of 1.029 ($e^{(2.29/100)}$)

Table 4.1: CEO-CFO overconfidence on M&A activity

This table reports estimates from a fixed effects logistic regression. The binary dependent variable is equal to one if a company performed at least one deal in a particular firm-year. Holder67once is a binary variable that equals one if the average moneyness of a CEO's/CFO's options exceed the threshold of 67% at least once. Firm size is the natural logarithm of total assets. Return on assets represents the ratio of a firm's net income to average total assets. Normalized cash flow equals the ratio of a firm's cash flow dived by property, plant and equipment. Tobin's Q is the ratio of market value of assets over book value of assets. Cash ratio represents the ratio of a firm's cash divided by total current liabilities. Leverage is measured as total debt divided by total assets. Nationality mix represents the ratio of foreign directors. Gender ratio indicates the percentage of male directors of a firm. Optimal board is a binary variable that equals one when a firm's board size is between 4 and 12 members. CEO/CFO age denotes the age of the executive in years. CEO/CFO fixed pay indicates the proportion of fixed pay as a percentage of total compensation. CEO/CFO turnover is a binary variable that indicates whether there was a change in a firm's CEO or CFO in year t. CEO-CFO same gender is a binary variable that equals one when the CEO and CFO are of the same gender. CEO relative power is the proportion of the CFO's total compensation dived by the CEO's total compensation. In parentheses are z-statistics based on standard errors clustered at the firm level. Asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)	(6)
CEOHolder67once	1.505***		1.335**		1.172	1.276
	(3.85)		(2.34)		(1.22)	(1.53)
CFOHolder67once		1.462***		1.529***	1.455***	1.668**
		(3.58)		(3.37)	(2.84)	(2.39)
CEO*CFOHolder67once						0.819
						(-0.83)
Firm size			1.967***	1.950***	1.968***	1.974***
			(3.77)	(3.75)	(3.72)	(3.72)
ROA			1.600	1.539	1.426	1.417
			(0.62)	(0.58)	(0.47)	(0.47)
Tobin's Q			0.946	0.923	0.914	0.915
			(-0.80)	(-1.15)	(-1.26)	(-1.24)
Normalized cash flow			1.023	1.022	1.018	1.018
			(0.40)	(0.38)	(0.32)	(0.31)
Cash ratio			0.711***	0.701***	0.706***	0.706***
			(-3.49)	(-3.49)	(-3.43)	(-3.44)
Leverage			9.907***	11.096***	10.604***	10.544***
			(3.69)	(3.86)	(3.77)	(3.76)
Nationality mix			1.487	1.549	1.561	1.623
			(0.69)	(0.77)	(0.77)	(0.84)
Gender ratio			2.161	2.330	2.500	2.491
			(1.01)	(1.11)	(1.19)	(1.19)
Optimal board size			1.263	1.258	1.255	1.258
			(1.29)	(1.26)	(1.24)	(1.25)
CEO age			0.995		0.997	0.997
			(-0.47)		(-0.28)	(-0.25)
CEO turnover			0.874		0.851	0.851
			(-0.88)		(-1.04)	(-1.04)
CEO fixed pay ratio			0.891		1.023	1.020
			(-0.31)		(0.04)	(0.04)
CFO age				0.975**	0.976**	0.976**
				(-2.16)	(-2.07)	(-2.06)
CFO turnover				1.005	0.999	0.994
				(0.04)	(-0.00)	(-0.05)
CFO fixed pay ratio				0.763	0.770	0.773
				(-0.72)	(-0.51)	(-0.50)
CEO-CFO same gender					0.691	0.672
					(-0.31)	(-0.34)
CEO relative power					1.004	1.004
					(0.07)	(0.07)
Firm fixed effects	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	NO	YES	YES	YES	YES
Observations	4,199	4,199	4,199	4,199	4,199	4,199
Number of firms	482	482	482	482	482	482

want to take action to perform well in the future, which, in turn, could increase M&A activity (Harrison, Hart & Oler, 2014). None of the board-specific controls seems significantly associated with merger activity. Finally, when analyzing the CEO-CFO specific control variables, it can be derived that when a firm has a relatively older CFO, the odds of completing a merger are significantly lower.

Columns (5)-(6) of Table 4.1 reveal the combined impact of CEO and CFO overconfidence on M&A activity. All controls used in the preceding models are still included. Additionally, also CEO-CFO same gender and the ratio of a CEO's total compensation relative to a CFO's total compensation (CEO relative power) are added to account for relatedness within a CEO-CFO dyad. Model (5) assesses the main effects of CEO and CFO overconfidence when both variables are present in the model. From model (5), it can be deduced that the impact of CEO overconfidence becomes statistically insignificant, whereas CFO overconfidence retains both its statistical and economic magnitude. The odds of an overconfident CFO to make at least one merger bid during a firm-year are 1.46 times the odds of a non-overconfident CFO, ceteris paribus. In column (6) the interaction effect between CEO and CFO overconfidence is added. The coefficient of CFO overconfidence displays the impact of CFO overconfidence (odds ratio=1.67), conditional on having a non-overconfident CEO. Furthermore, model (6) reveals that only the conditional main effect of CFO overconfidence is significant, whereas the conditional main effect of CEO overconfidence and the interaction effect are insignificant. Therefore, it seems that the effect of CEO (CFO) overconfidence is neither magnified nor mitigated when the CFO (CEO) is overconfident as well . Still, it might be interesting to depict this interaction effect graphically, considering that the sign of the effect is opposite to what was previously expected based on previous literature on CEO-CFO commonalities (Belot & Waxin, 2019; Shi & Chen, 2019). Figure 4.1 reveals the interaction plot based on estimates of the marginal effects at representative levels. It indicates that the change from CEOHolder67once from 0 to 1 is less steep when CFOHolder67once equals 1 (upper line) compared to when CFOHolder67once equals 0 (dashed line). Furthermore, Figure 4.1 shows that if both CEOHolder67once and CFOHolder67once are equal to 1, the probability of doing at least one deal is around 22%, which represents the highest probability of all CEO-CFO overconfidence level combinations.[36] However, because the regression coefficients of CEO overconfidence (model (5)) and the interaction effect (model (6)) are insignificant, there is not enough evidence in favor of hypothesis 1, which states firms with an overconfident CEO are more likely to undertake mergers and acquisitions when they also have an overconfident CFO.

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[36] Recall from Table 3.1 that the probability of doing at least one deal for the full sample is on average 20%, which is similar to Belot and Waxin (2019) (20%) and Malmendier and Tate (2008) (22%)
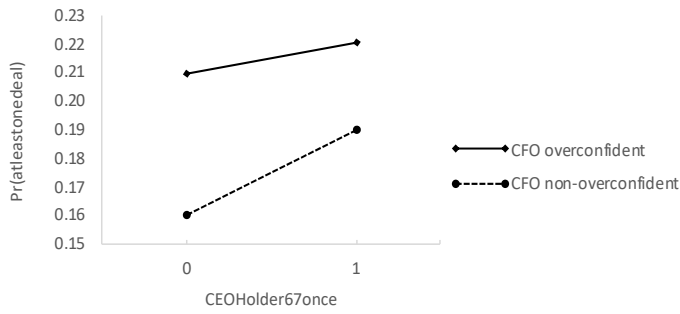
Figure 4.1: Interaction plot based on margins at representative levels (RE logit estimation mirrors column (6) in Table 4.1)

In sum, it seems that the impact of CEO overconfidence is less relevant than endorsed by Malmendier and Tate (2008), as the odds ratio is smaller. Additionally, the significant and (even larger) positive impact of CFO overconfidence in model (5) suggests that more attention should be paid to CFO overconfidence with respect to M&A activity. Still, these inferences should be interpreted with caution. Table 6.10, Panel A, indicates that, for a fixed effects specification, using the Holder67twice measure results in an insignificant coefficient for CFO overconfidence.[37]

Table 4.2: CEO-CFO overconfidence on diversifying deals

This table reports estimates from a fixed effects logistic regression. The binary dependent variable is equal to one if a company performed at least one diversifying deal in a particular firm-year. Holder67once is a binary variable that equals one if the average moneyness of a CEO's/CFO's options exceed the threshold of 67% at least once. All controls are identical to Table 4.1. In parentheses are z-statistics based on standard errors clustered at the firm level. Asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)	(6)
CEOHolder67once	1.439**		1.270		1.069	1.002
	(2.47)		(1.47)		(0.40)	(0.01)
CFOHolder67once		1.627***		1.620***	1.606***	1.440
		(3.27)		(2.93)	(2.74)	(1.18)
CEO*CFOHolder67once						1.172
						(0.46)
Controls	NO	NO	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	NO	YES	YES	YES	YES
Observations	2,565	2,565	2,565	2,565	2,565	2,565
Number of firms	285	285	285	285	285	285

4.2 Managerial overconfidence on M&A deal type

According to hypothesis 2, firms with an overconfident CEO are more likely to undertake diversifying mergers and acquisitions when they also have an overconfident CFO. This prediction will be tested by estimating equation (3.2.3). Simultaneously, the exact same procedure that was used to test the effect of managerial overconfidence on M&A activity will be applied. In these regressions, a binary dependent variable will be used that equals one if a firm undertakes a merger in a different industry,

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[37] Only the (untabulated) results for the less stringent logit and random effects specifications still hold when using the Holder67twice measure.

based on the difference between the two-digit SIC codes of the acquirer and the target. The results in columns (1)-(2) of Table 4.2 demonstrate that, when analyzed in isolation, both CEO and CFO overconfidence are found to significantly increase the propensity to undertake at least one diversifying deal. However, compared to the propensity of doing a deal in general (Table 4.1), it does not seem that overconfident CEOs and CFOs are even more likely to undertake a diversifying deal.

Columns (3)-(4) indicate that only CFO overconfidence remains statistically significant after adding the controls. Model (5) assess the main effects of CEO and CFO overconfidence when both independent variables are present in the model. It can be deduced that both the statistical and economic impact of CEO overconfidence becomes negligible, whereas CFO overconfidence retains both its statistical and economic magnitude. In Model (6) the interaction term is added. In this model, both the conditional main effects and the interaction effect are positively associated with the propensity of doing at least one successful diversifying bid. However, the magnitude of the interaction effect seems small and the z-statistics are below conventional levels of significance. When re-estimating equation (3.2.3) using the Holder67twice measure, it can be derived from Table 6.10, Panel B that the main results still hold. However, the positive interaction effect in model (6) becomes negative (although still insignificant). Additionally, CFO overconfidence has now a significant and positive conditional main effect at the 5% level in model (6) of Table 6.10. Thus, it can be concluded that CFO overconfidence seems to have a strongly positive impact on the likelihood of performing a diversifying merger. No conclusions can be drawn on whether a firm with an overconfident CEO is more likely to undertake diversifying M&A deals when the firm also has an overconfident CFO (i.e., we fail to reject the second hypothesis).

Table 4.3: CEO-CFO overconfidence on cross-border deals

This table reports estimates from a fixed effects logistic regression. The binary dependent variable is equal to one if a company performed at least one cross-border deal in a particular firm-year. Holder67once is a binary variable that equals one if the average moneyness of a CEO's/CFO's options exceed the threshold of 67% at least once. All controls are identical to Table 4.1. In parentheses are z-statistics based on standard errors clustered at the firm level. Asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)	(6)
CEOHolder67once	2.001***		1.889***		1.616***	1.810**
	(4.09)		(3.31)		(2.32)	(2.34)
CFOHolder67once		1.888***		1.950***	1.694***	2.084**
		(3.44)		(3.06)	(2.33)	(2.15)
CEO*CFOHolder67once						0.751
						(-0.75)
Controls	NO	NO	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	NO	YES	YES	YES	YES
Observations	2,211	2,211	2,211	2,211	2,211	2,211
Number of firms	243	243	243	243	243	243

Hypothesis 3 states that firms with an overconfident CEO are more likely to undertake cross-border mergers and acquisitions when they also have an overconfident CFO. Table 4.3 reveals that, in all models, both CEO and CFO overconfidence have a significant positive effect on the propensity of doing at least one cross-border merger. Compared to Table 4.1, which reveals the effect of managerial overconfidence on performing an acquisition in general, the odds ratios for CEO and CFO overconfidence are considerably higher.[38] The positive and significant coefficients of CEO and CFO overconfidence in model (5) and the (untabulated) margins at representative levels of model (6) provide ample room to assume that a firm with both an overconfident CEO and an overconfident CFO conducts more cross- border mergers. Nonetheless, the negative interaction effect in column (6) of Table 4.3 is still insignificant. In addition, the results do not hold when substituting the Holder67once for the Holder67twice measure (see Table 6.10, Panel C, Column (5)). Therefore, there is not enough statistical evidence to support the third hypothesis.

Table 4.4: CEO-CFO overconfidence on pure cash deals

This table reports estimates from a fixed effects logistic regression. The binary dependent variable is equal to one if a company performed at least one pure cash deal in a particular firm-year. Holder67once is a binary variable that equals one if the average moneyness of a CEO's/CFO's options exceed the threshold of 67% at least once. All controls are identical to Table 4.1.In parentheses are z-statistics based on standard errors clustered at the firm level. Asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)	(6)
CEOHolder67once	1.523***		1.191		1.030	0.949
	(3.66)		(1.30)		(0.21)	(-0.29)
CFOHolder67once		1.580***		1.560***	1.536***	1.348
		(3.83)		(3.19)	(2.95)	(1.28)
CEO*CFOHolder67once						1.213
						(0.71)
Controls	NO	NO	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	NO	YES	YES	YES	YES
Observations	3,456	3,456	3,456	3,456	3,456	3,456
Number of firms	392	392	392	392	392	392

Hypothesis 4 predicts that firms with an overconfident CEO are more likely to undertake pure cash mergers and acquisitions when they also have an overconfident CFO. Column (3) of Table 4.4 indicates that, CEO overconfidence does not significantly affect the propensity of doing a cash-only deal. From columns (2), (4) and (5), it can be derived that CFO overconfidence significantly explains cash-only mergers. When analyzing the conditional main effects and the interaction term in column (6), no significant coefficients were found with respect to CEO and CFO overconfidence. On top of that, when substituting the Holder67once for the Holder67twice measure (see Table 6.10, Panel D, Column (5)), the main conclusion that only CFO overconfidence retains its statistical and economic magnitude does

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[38] From column (5), it can be observed that the odds ratios for CEO and CFO overconfidence are 1.62 and 1.69, respectively. By comparison, for doing at least one deal in general, the odds ratios for CEO and CFO overconfidence are 1.17 and 1.46, respectively (Column (5) of Table 4.1).

not hold for a fixed effects specification. However, the results are robust to substituting the Holder67once for the Holder67twice measure when analyzing less stringent logit and random effects specifications. Overall, there is not enough evidence in favor of the fourth hypothesis.

4.3 Managerial overconfidence on M&A performance

According to hypothesis 5, firms with an overconfident CEO are more likely to undertake value-destroying mergers and acquisitions when they also have an overconfident CFO. This hypothesis will be tested by using an OLS estimation (equation (3.2.6)). All standard errors were clustered at the announcement date and are therefore robust to cross-sectional correlation of stock returns. Columns (1) and (2) of Table 4.5 reveal the effect of CEO overconfidence and CFO overconfidence (in isolation) on M&A performance. In contrast to hypothesis 5, it can be deduced that both CEO and CFO overconfidence are associated with higher, rather than lower (Malmendier & Tate, 2008), announcement returns. More specifically, relative to a non-overconfident CEO (CFO), an overconfident CEO (CFO), on average, realizes a 0.6% (0.7%) higher announcement return, ceteris paribus. Although the sign is reversed compared to Malmendier and Tate (2008), the economic magnitude is similar. Among the controls, it seems that the market pays a premium for larger deals. When deal size increases by 1%, the cumulative abnormal return increases by 0.008%, keeping all other variables constant. The market significantly discounts merger bids for targets in unrelated sectors, foreign countries and targets listed on the stock market. Among the firm-specific and board-specific controls, only firm size and leverage seem to significantly affect an acquirer's cumulative abnormal return over a three-day event window. While firm size is negatively related to announcement returns, a higher ratio of debt to equity appears to result in a positive market reaction, all else equal. Columns (3) and (4) indicate that the conclusions regarding CEO-CFO overconfidence in isolation still hold when adding CEO-CFO age and CEO-CFO vested options to the model.

Columns (5) and (6) of Table 4.5 report the combined impact of both CEO and CFO overconfidence on M&A performance. Besides previously used controls, CEO-CFO stock ownership, CEO chairman and CEO relative power are added to the model. However, as less data was available on CEO-CFO stock ownership and whether the CEO is also the chairman of the board, the sample sized is reduced from 1,497 to 1,011 observations. From column (5), it can be derived that the impact of CEO overconfidence becomes insignificant and economically smaller, whereas CFO overconfidence retains both its statistical and economic magnitude. However, when adding the interaction effect to the model (column (6)), the conditional main effect of CFO overconfidence becomes statistically insignificant. Still, no conclusions can be drawn regarding the interplay between CEO and CFO overconfidence , as the t-value is under conventional levels of significance.

Table 4.5: CAR [-1, +1] Market reaction to CEO-CFO overconfidence

This table reports estimates of OLS regressions. The dependent variable represents the acquirer's CAR for a three-day event window (CAR[-1, +1]). The CARs are estimated using a market model, an estimation period of 150 trading days, with a gap of 20 trading days between the announcement date and the start of the estimation period. Holder67once is a binary variable that equals one if the average moneyness of a CEO's/CFO's options exceed the threshold of 67% at least once. For definitions of the controls, see Table 6.1. Industry fixed effects are constructed based on Fama and French's 12-industry group classification. To account for cross-sectional correlation of stock returns, SEs are clustered at the announcement date. Asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level.

	(1)	(2)	(3)	(4)	(5)	(6)
CEOHolder67once	0.006*		0.006*		0.002	0.001
	(1.91)		(1.87)		(0.37)	(0.18)
CFOHolder67once		0.006**		0.006**	0.007*	0.006
		(2.17)		(2.30)	(1.90)	(0.86)
CEO*CFOHolder67once						0.002
						(0.18)
Deal value (log)	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***
	(4.65)	(4.70)	(4.70)	(4.67)	(3.84)	(3.82)
Diversifying deal	-0.009***	-0.009***	-0.009***	-0.009***	-0.009***	-0.010***
	(-3.05)	(-3.09)	(-3.09)	(-3.09)	(-2.75)	(-2.74)
Cross-border deal	-0.009***	-0.009***	-0.008***	-0.008***	-0.008*	-0.008*
	(-2.67)	(-2.68)	(-2.61)	(-2.68)	(-1.80)	(-1.78)
Cash-only deal	0.002	0.002	0.002	0.002	0.004	0.004
	(0.66)	(0.65)	(0.64)	(0.66)	(1.05)	(1.04)
Listed target	-0.014***	-0.014***	-0.013***	-0.014***	-0.017***	-0.017***
	(-3.27)	(-3.32)	(-3.20)	(-3.30)	(-3.38)	(-3.38)
Firm size	-0.009***	-0.009***	-0.010***	-0.009***	-0.009***	-0.009***
	(4.76)	(4.79)	(-5.03)	(-4.73)	(3.70)	(3.67)
ROA	-0.004	-0.005	-0.005	-0.004	0.040	0.041
	(-0.14)	(-0.19)	(-0.18)	(-0.15)	(1.21)	(1.22)
Tobin's Q	-0.003	-0.002	-0.003	-0.003	-0.004*	-0.004*
	(-1.64)	(-1.61)	(-1.60)	(-1.68)	(-1.88)	(-1.88)
Normalized cash flow	0.001	0.001	0.001	0.001	-0.001	-0.001
	(0.74)	(0.69)	(0.78)	(0.67)	(-0.31)	(-0.31)
Cash ratio	-0.001	-0.001	-0.001	-0.001	0.000	0.001
	(0.63)	(-0.57)	(-0.59)	(-0.54)	(-0.21)	(-0.24)
Leverage	0.017*	0.018*	0.018*	0.018*	0.025**	0.025**
	(1.78)	(1.89)	(1.80)	(1.89)	(2.05)	(2.05)
Gender ratio	0.022	0.021	0.021	0.020	0.031	0.032
	(1.31)	(1.28)	(1.26)	(1.21)	(1.44)	(1.45)
CEO age			0.000		0.000	0.000
			(1.05)		(0.45)	(0.44)
CEO vested options			-0.153		-0.069	-0.069
			(-0.67)		(-0.22)	(-0.22)
CFO age				-0.000	-0.000	-0.000
				(-0.55)	(-0.80)	(-0.81)
CFO vested options				-0.416	0.895	0.889
				(-0.40)	(0.72)	(0.71)
CEO stock ownership					0.000	0.000
					(0.46)	(0.46)
CFO stock ownership					-0.010	-0.010
					(-0.95)	(-0.95)
CEO chairman					0.004	0.004
					(0.93)	(0.92)
CEO relative power					0.000	0.000
					(0.05)	(0.05)
Year*Industry fixed effects	YES	YES	YES	YES	YES	YES
Observations	1,497	1,497	1,497	1,497	1,011	1,011
R-squared	0.18	0.18	0.18	0.18	0.21	0.21

Altogether, based on Table 4.5, there is no evidence in favor of the hypothesis that firms with an overconfident CEO are more likely to undertake value-destroying mergers and acquisitions when they also have an overconfident CFO. Still, it was found that, in contrast to Malmendier and Tate (2008), both CEO and CFO overconfidence, when analyzed independently, positively affects an acquirer's cumulative abnormal return. Moreover, it can be concluded that more attention should be paid to the overconfidence level of the CFO. This inference becomes even stronger when replicating the results using the Holder67twice measure. The results (Table 6.10, Panel E) indicate that CFOHolder67twice remains significant across all specifications of the model, whereas CEOHolder67twice is only significant when analyzed independently from CFO overconfidence.

4.4 Robustness checks and alternative explanations

Hitherto, it can be concluded that, when analyzed independently, both CEO and CFO overconfidence significantly affect the number of (diversifying, cross-border and cash-only) transactions and the corresponding CARs of the acquirer. Further, when both CEO and CFO overconfidence are present in the model, only the coefficient of CFO overconfidence remains its statistical and economic magnitude. Still, it cannot be concluded that the level of CEO (CFO) overconfidence is contingent on the level of CFO (CEO) overconfidence, as interaction effects in all model specifications were statically insignificant. Finally, it should be noted that these inferences to a large extent rely on assumptions. When Holder67once measures are replaced by Holder67twice measures, the results remain valid when using logit and random effects specifications on the one hand but become invalid for the majority of models when the more stringent fixed effects models are used.

In this section, the results will be validated using: 1) different model specifications; 2) different proxies for managerial overconfidence; 3) sub-samples based on the relative power of the CEO 4) sub-samples based on the size and corporate governance structure of the acquirer; 5) alternative event windows and different deal types. For brevity, all models will mirror column (6) of Table 4.1 and will only report the estimates of the variables of interest.[39]

4.4.1 Different model specifications

The models used for the baseline results could suffer from 1) inappropriately measured variables, 2) distorting standard errors, 3) reverse causality or 4) omitted variable bias from unobserved time-varying variables. Hence, in this sub-section, robustness checks will be performed with respect to

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[39] Mirroring column (6) of Table 4.1 implies the use of fixed effects. However, I will deviate from this for sub-sample analyses. Firstly, the inferences of the main models were the same when using either random effects or fixed effects models. Secondly, when analyzing sub-samples using quartiles, a fixed effects regression is not feasible, as eliminating any time-invariant firm effect on the dependent variable will results in some sub-samples with too few identifiable cases.

alternative model specifications. Firstly, in the (untabulated) random effects regressions, industry fixed effects based on Fama and French's (1997) 12-industry group classification were used to control for shocks that affect firms in the same industry in the same way. When firms are allocated to a certain industry based on a more stringent two-digit SIC code classification, identical results were obtained for the M&A activity and deal type samples. Concerning the M&A performance sample, it can be deduced that the main results from the most saturated model without the interaction effect (column (5) of Table 4.5) should be interpreted with more caution. While the coefficient of CFOHolder67once reveals the same economic impact (+0.7% increase of acquirer's CAR) as in the baseline regressions, the p-value in a model with more stringent industry fixed effects is now slightly below conventional levels of significance (0.11).

Secondly, to analyze the statistical impact of an independent variable, using appropriately measured standard errors is essential. In the results section, standard errors were clustered at the firm level to account for heteroskedasticity. However, observations could be even more correlated on the CEO-CFO dyad level. Therefore, the M&A activity and deal type regressions were re-estimated by using clustered standard errors on the CEO-CFO pair level. Still, all main inferences hold.

Thirdly, the Holder67once measure classifies an executive as overconfident if he/or she passes the threshold of 67% in-the-money options for the first time. However, for a selection of executives, passing the 67% threshold (for the first time) could be correlated to higher stock returns as a result of the completion of the merger. Therefore, it is important to assess whether the results are subject to reverse causality. In order to mitigate reverse causality concerns, all models were re-estimated using a lag of Holder67once. The results and main inferences regarding M&A activity, deal type and performance are all robust to using this lag of Holder67once.

Fourthly, the obtained results could be confounded by unobserved variables that affect both managerial overconfidence and M&A activity / performance (omitted variable bias). In 2015, Malmendier and Tate recognized that many researchers, including Hirschleifer et al. (2012) and Campbell et al. (2009), started to replicate their results using Holder67once and Holder67twice measured based on ExecuComp data. As previously noted, in contrast to the proprietary dataset of Hall and Liebman (1998), ExecuComp data only allows estimating the "average moneyness" of an option package. As moneyness is associated with an increase or decrease in stock price, it is of paramount importance to include controls for past stock returns (Malmendier & Tate, 2008, 2015). Moreover, the variation in stock prices within the same firm could potentially confound the obtained

results. As a result, the results were verified by adding a firm's lagged annualized stock price volatility[40] to the baseline models (Malmendier & Tate, 2008). It can be concluded that either adding three lags of stock returns[41] or adding the lag of annualized stock price volatility does not affect the results.

4.4.2 Different overconfidence proxies

Each proxy for managerial overconfidence heavily relies on assumptions. Both Holder67once and Holder67twice assume that overconfidence is a managerial trait that could be developed and then will continue to persist. However, it can also be argued that overconfidence is a persistent trait (Klayman et al., 1999). In this case, the coefficients could be estimated using the Longholder measure[42] or the Net Buyer measure[43] (Malmendier & Tate, 2005). Compared to the Holder67 measure, both persistent measures of overconfidence, which remain constant for each executive-firm combination over the whole sample period, are less prone to reverse causality concerns. Table 6.11, columns (1)-(2) and (3)-(4) contain the results when using the Longholder and Net Buyer measure, respectively. Firstly, the baseline results are not robust to substituting the Holder67once measure for the Longholder measure. All coefficients in columns (1) and (2) of Table 6.11 are statistically insignificant, indicating that there is not enough evidence to state that there exists a joint effect of or an interplay between CEO and CFO overconfidence when it comes to M&A activity, deal type and performance. Secondly, the results for substituting the Holder67once measure for the Net Buyer measure remain only valid for the M&A activity (Panel A) and cash-only (Panel D) sample.

Furthermore, in order to appropriately assess the difference in the absolute level of overconfidence among CEOs and CFOs, the results should be validated by using a continuous rather than a binary measure of overconfidence (Banerjee, Humphery-Jenner, Nanda & Tham, 2018; Li, Minnis, Nagar & Rajan, 2014; Schrand & Zechman, 2012). In this robustness check, the first continuous measure is estimated by dividing the intrinsic value of an executive's unexercised exercisable options by the total value of the executive's holdings (see Table 6.1 for ExecuComp names) (Li et al., 2014). As a result, this continuous measure captures to which extent an executive holds unexercised exercisable options. Moreover, it was argued by Banerjee, Humphery-Jenner and Nanda (2014) that option-based measures do not reflect how important the options are to an executive. Therefore, Banerjee et al. (2014) proposed an adjusted version of the continuous measure of overconfidence called "Value to Compensation" (VtC), which is measured by taking the logarithm of one plus the total value of vested

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[40] Annualized stock price volatility (%) is calculated using CRSP's standard deviation of stock returns adjusted for stock splits and dividends multiplied by the square root of trading days
[41] 2 lags of stock returns in case of the cross-sectional CAR regressions
[42] See Table 6.1 for the definition and construction of the Longholder measure
[43] See Table 6.1 for the definition and construction of the Net Buyer measure

but unexercised options called by an executive's total compensation for a particular firm-year (see Table 6.1 for ExecuComp names). Table 6.11, columns (5)-6) and (7)-(8) indicate that the results of the continuous and VtC measure, respectively, are identical. In contrast to the baseline results, the main effect of CFO overconfidence becomes insignificant. Nonetheless, similar to the baseline regressions, both the coefficients of CEO and CFO overconfidence still indicate that there is a positive association between managerial overconfidence and M&A activity, deal type and performance. Moreover, column (8) indicates that there is a significant and negative interaction effect between CEO and CFO overconfidence for the M&A activity (Panel A) and M&A performance samples (Panel D). This provides some support for the interaction plot of Figure 4.1, which showed a negative, but insignificant, interaction effect between CEO and CFO overconfidence on M&A activity.

4.4.3 M&A activity & M&A deal type: Sub-samples based on CEO-CFO power

The claim from the baseline results that it is CFO overconfidence , rather than CEO overconfidence, that explains a firm's M&A strategy could only hold when the CFO has a relatively high level of power within an organization. Therefore, the results for the propensity of doing a (diversifying, cross-border or pure cash) deal will be validated by using two sub-samples. These sub-samples, together with the sub-samples in section 4.4.4, are estimated using random effects, as for specific quartiles, there are too few identifiable cases to use the more stringent fixed effects specification.

Firstly, regarding the sub-sample analysis based on quartiles of CEO-CFO tenure overlap, it is expected that for a larger CEO-CFO tenure overlap the impact of CFO overconfidence becomes larger. The rationale behind this claim is that a longer tenure overlap leads to increased and more efficient information exchange between the CEO and the CFO (Buyl, Boone, Hendriks, & Matthyssens, 2011). In the same vein, shared experience results into an increased level of interpersonal trust (Edmondson, Roberto & Watkins, 2003). Hence, in the first years of a CEO-CFO combination, the CEO is less likely to incorporate a CFO's suggestions in his or her decision-making process. The results in Table 6.12, Panel A, underpin this theory. For the first three years of a CEO-CFO combination, it can be observed that, regardless of the deal type, CEO overconfidence seems to have a more significant and economically profound impact on M&A activity than CFO overconfidence. Moreover, in firm-years with a CEO-CFO tenure overlap of at least 9 years, it can be seen that CFO overconfidence becomes more economically and significantly important than CEO overconfidence,[44] thereby confirming the predications from Buyl et al. (2011). Finally, in both medium quartiles, no conclusions can be drawn on which effect, CEO or CFO overconfidence has a more significant impact on M&A activity. In sum, there is some evidence

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[44] This result does not hold for cross-border deals

that CFO overconfidence only significantly affects M&A activity when the CEO-CFO tenure overlap is large. Finally, the effect of the interaction term is twofold. On the one hand, in the first quartile of tenure CEO-CFO tenure overlap, there is some evidence for a significant positive interaction effect, as indicated by column (2) in Panel A1 and A4. On the other hand, column (8) of Panel A1 and A4 reveal significantly negative interaction effects. Hence, in sub-samples in which the CFO has relatively more power, the sign of the interaction effect is identical to the baseline results (Table 4.1).

Secondly, Bebchuk, Cremers and Peyer (2011) stated that a CEO's compensation relative to another executive's compensation is a solid proxy for the CEO's relative power. As a result, it can be expected that CEO overconfidence has a more economically and statistically profound effect on M&A activity when his/her compensation is larger than the CFO's compensation. The results in Table 6.12, Panel B, Column (7) support this prediction. It can be seen that, in higher quartiles of CEO-CFO relative compensation, regardless of the deal type, the coefficient of CEO overconfidence significantly positively affects the propensity of doing a deal, whereas the z-statistics of CFO overconfidence are under conventional levels of significance. Additionally, in lower quartiles (columns (1) to (4)), CFO overconfidence seems a more important determinant of a firm's M&A activity. Thus, there is some evidence that CFO overconfidence only significantly affects merger activity in firms with a relatively small difference between a CEO's and CFO's total compensation. Still, no significant interaction effects are found that are valid across the full range of deal types, thereby confirming the main results.

4.4.4 M&A activity & M&A deal type: Sub-samples based on firm-specific factors

Besides CEO-CFO interpersonal ties, firm-specific and board-related characteristics could confound the results. Firstly, compared to the sample used by Malmendier and Tate (2008), which is predominantly focused on large listed U.S. firms, the sample used in this thesis contains listed firms from all sizes (S&P 1500). Table 6.13, Panel A, reveals the effect of CEO-CFO overconfidence on M&A activity and M&A deal type for different firm sizes. Regarding the statistical and economic importance of either CEO or CFO overconfidence, no clear pattern can be derived from the results. Hence, it is unlikely that the baseline results are driven by firm size. Secondly, capitalizing on section 4.4.3, a CEO can have more power within an organization due to the corporate governance structure. For example, it has been demonstrated that the CEO has more power when he is also the chairman of the board (Agrawal & Knoeber, 1996). Table 6.13, Panel B, contains the results of the joint effect of CEO-CFO overconfidence. Surprisingly, the conclusion that only CFO overconfidence, rather than CEO overconfidence, significantly affects a firm's merger activity seems robust to the sub-sample in which the CEO is the chairman. Again, no significant interaction effects were found.

4.4.5 M&A performance: Alternative event windows and different deal types

In section 4.3, for a three-day event window, it was found that managerial overconfidence is positively associated with announcement returns of acquirers. Moreover, CFO overconfidence, rather than CEO overconfidence, seems to be a more important determinant of how the market responds to an M&A announcement. As a robustness check, these results are validated by using alternative event windows: [0, +1]; [-2, +2]; [-5,+5] and [-10, +10]. This robustness check is performed to check for a potential delay between market responses and merger announcements (MacKinlay, 1997). Table 6.14, Panel A, contains the results. Only when an event window of [0, +1] is used, the results still hold. The results are not robust to five-day [-2, +2]; eleven-day [-5, +5] and twenty-one-day [-10, +10] event windows. Similar to the baseline results in Table 4.5, no significant interaction effects were reported. Nonetheless, when testing the announcement effects of mergers and acquisitions, shorter event windows are preferred over relatively longer event windows, as external factors uncorrelated to the merger might cause an upward or downward bias in the results (MacKinlay, 1997). Thus, it can be concluded that the main conclusions hold when a two-day or three-day event window is used. In Panel B of Table 6.14, Panel B, the results are validated for different deal types. The results indicate that, for cross-border deals and pure cash deals, the conclusion that predominantly CFO overconfidence significantly and positively affects the acquirer's cumulative abnormal returns still holds. For diversifying and listed target deals, no significant effect of CFO overconfidence is found.

5. Discussion & Conclusion

5.1 Discussion

5.1.1 Interpretation of results

In line with previous research (Ferris et al., 2013; Malmendier & Tate, 2005; 2008) CEO overconfidence is positively related to the propensity of doing at least one (diversifying, cross-border or cash-only) merger. However, the economic magnitude, indicated by the odds ratio, is smaller compared to Malmendier and Tate (2008). A potential reason could be the different timeframes used.[45] Due to the Sarbanes-Oxly Act,[46] boards could have hired less overconfident CEOs (Bharati, Doellman & Fu, 2016). More importantly, this reduced group of overconfident CEOs also undertakes relatively less risky decisions after the enactment of the Sarbanes-Oxly Act (Banerjee, Humphery-Jenner & Nanda, 2015b). Hence, positive aspects of CEO overconfidence, such as more innovation (Hirshleifer et al., 2012), are now better reflected (Banerjee et al., 2015b). Therefore, the Sarbanes-Oxly Act could have diminished the impact an overconfident CEO has on a firm's decision to undertake an M&A deal.

Similar to CEO overconfidence, when analyzed in isolation, also CFO overconfidence positively affects the propensity of doing at least one (diversifying, cross-border or cash-only) deal. However, when both CEO and CFO overconfidence are included, only CFO overconfidence retains its statistical and economic magnitude. This inference seems plausible, as Ferris & Sainani (2021) found that the CFO significantly affects a firm's M&A decisions across all levels of a CEO's willingness to delegate M&A-related decisions. Furthermore, sub-sample analyses suggest that this strong effect of CFO overconfidence is even larger when the CFO has relatively more power. Potentially, the role of the CFO has increased. According to The Wall Street Journal (2015), CFOs from S&P 500 firms are outpacing CEOs in terms of annual compensation increases. Moreover, from a sample of high-performance businesses, 75% indicate that the role of the CFO in organizations is growing (Accenture Strategy, 2014).

Concerning the M&A performance sample, the results indicate that, in contrast to previous literature (Billett & Qian, 2005; Doukas & Petmezas, 2007; Malmendier & Tate, 2008), CEO overconfidence is positively associated with the acquirer's CARs. Banerjee et al. (2015b) demonstrated that, after the introduction of the Sarbanes-Oxly Act, CEO overconfidence has a diminished (but negative) impact on an acquirer's deal performance. However, in contrast to the decision to undertake a deal, improved corporate governance within a firm cannot fully explain how the market responds to an M&A

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[45] 2007-2018 in this thesis versus 1980-1994 in Malmendier and Tate (2008).
[46] Introduced in 2002 to improve corporate governance

announcement. According to Kostolany (1999†), a former stock market expert, *"Facts only account for 10% of the reactions on the stock market, everything else is psychology"* (Nasdaq, 2019). Therefore, the combination of a hot U.S. merger market after the financial crisis (Mergermarket, 2014) and the increasing role of social media in M&A (Boni, Sharma & Zhang, 2018) potentially led to opportunistic investor sentiment (Rosen, 2006). In contrast to rational executives, overconfident managers may have been better able to fuel this sentiment by posting very positive tweets (Boni, Sharma & Zhang, 2018) or overly enthusiastic Facebook status updates (Danbolt, Siganos & Vagenas-Nanos, 2015). Furthermore, when using social media, overconfident managers are in charge of what they post, which makes them less dependent on (usually negative) press portrayals of conventional media channels.

Finally, the results in this thesis indicate that there is no interaction effect between CEO and CFO overconfidence on M&A strategy. Surprisingly, in models where there was actually a significant interaction effect, this effect was pointing towards a negative direction.[47] The difference between this potential mitigating effect found in this thesis versus the amplifying interaction effect of CEO-CFO commonalities found in previous literature (Belot & Waxin, 2019; Hsieh et al., 2018; Shi & Chen, 2019) is related to the discussion on diversity versus similarity in corporate decision-making. On the one hand, it can be argued that different backgrounds of executives lead to a more complete assessment of a certain issue.[48] On the other hand, when CEOs and CFO possess similar traits, they are more likely to incorporate each other's suggestions which, in turn, should lead to improved corporate decision-making.[49] Despite the fact both the CEO and the CFO can be classified as overconfident, they can still differ enormously in terms of other personal traits (Kaplan & Sorensen, 2017). Therefore, being both overconfident could be a catalyst for improved interpersonal communication, while at the same time benefiting from each other's different backgrounds and characteristics when making M&A decisions.

5.1.2 Limitations & directions for future research

Despite the robustness checks, the obtained results using the Holder67, Longholder, continuous measure and VtC could be biased and should be interpreted with caution. Besides the previously addressed limitations of the Holder67once measure, such as reverse causality and stock market conditions (section 4.4.1), firms themselves could exacerbate overconfidence levels of managers (Humphery-Jenner, Lisic, Nanda & Silveri, 2016). It was found that, at first glance, overconfident-looking managers are more often offered strongly incentive-based compensation packages, which, in turn, could lead to increased managerial risk-taking. Furthermore, Hill, Kern and White (2014) found

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[47] Examples of these models are when CEO-CFO overconfidence was measured using the continuous and VtC proxies and when there was a high CEO-CFO tenure overlap. See Table 6.11 and 6.12

[48] See e.g. (Bernile, Bhagwat, & Yonker, 2018; Carter, Simkins & Simpson, 2003; Erhardt, Werbel & Shrader, 2003; Milliken & Martins, 1996).

[49] See e.g. (Amason & Sapienza, 1997; Buyl et al., 2011; Edmondson et al., 2003)

that no overconfidence measure, including the measures that circumvent the use of (stock) options,[50] is able to appropriately capture an executive's actual level of overconfidence. On top of that, these measures do not measure the same construct (Hill et al., 2014), which is in line with the discussion on the persistence of overconfidence (section 2.1). Lastly, the measurement of CFO overconfidence could be flawed in particular, as the CFO's level of overconfidence is influenced not only by his own beliefs but could also be influenced by beliefs the CFO has in the CEO (Malmendier et al., 2020). In the same vein, Cheng, Anderson, Tenney, Brion, Moore and Log (2021 found that overconfidence is contagious. In other words, executives are more likely to become overconfident when others are overconfident (Cheng et al., 2021). Thus, the main inference that CFO overconfidence, rather than CEO overconfidence, significantly affects M&A strategy should be interpreted with caution.

The interpretation of the findings together with the described limitations provide the following three opportunities for future research. Firstly, it could be interesting to further assess the role of CFO overconfidence in settings in which the CFO is expected to be more powerful. This can be done by subdividing a U.S. sample based on the CFO Influence Index (Ferris & Sainani, 2021) or by extending the research to the United Kingdom. The U.K. is particularly interesting, as it has one of the largest M&A markets (IMAA, 2021) and CFOs are generally more influential compared to the U.S[51] (Mobbs, 2018). Secondly, the effect of managerial overconfidence on M&A strategy could be extended to other C-Suite managers (COO, CTO, etc.). Especially the role of the COO can be interesting, as these executives are, in general, more similar to the CEO (Banerjee et al., 2015a). Thirdly, another promising avenue for future research can be to assess how social media affects an investor's perception of an overconfident CEO/CFO. This should more strongly support the presumption that overconfident managers could achieve higher CARs due to their ability to fuel investor sentiment.

5.2 Conclusion

For a sample of S&P 1500 firms between 2007 and 2018, this paper investigated how the interplay between CEO and CFO overconfidence affects a firm's M&A activity, type of completed deals and short-term stock market performance surrounding a deal announcement. Based on the altered Holder67once proxy (Hirshleifer et al., 2012), the results indicate that there is not enough statistical evidence for the existence of an interaction effect, indicating that CEO (CFO) overconfidence is neither amplified nor diminished when the CFO (CEO) is overconfident as well. Nonetheless, it was found that, when analyzed independently from each other, both CEO and CFO overconfidence are positively

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[50] See e.g. media-based measures (Hayward & Hambrick, 1997; Malmendier & Tate, 2008) and letters to shareholders (Rovenpor, 1993)
[51] For instance, Ferris and Sainani (2021) reported that CFOs in the UK are more often board members and receive a higher compensation (relative to the CEO) than in the US

related to the propensity of doing a (diversifying, cross-border or cash-only) deal and short-term deal performance. Moreover, for all models with both CEO and CFO overconfidence included, it was reported that only CFO overconfidence remains statistically and economically relevant. This effect of CFO overconfidence was even more pronounced in sub-samples in which the power of the CEO is relatively low. Hence, it seems that it is CFO overconfidence, rather than CEO overconfidence, which is more critical in explaining how many deals a firm undertakes or how the market responds to a merger announcement. The results are robust to using logit and random effects models, using the lag of Holder67once to mitigate reverse causality concerns, adding lagged stock returns and volatility to the controls to control for time-varying omitted variable bias, using different firm sizes. Still, the results should be interpreted with caution, as the main inferences do not hold across all overconfident proxies and event-windows larger than three days.

Finally, the main findings complement existing scientific literature and affirm the relevance of investigating the effects of managerial biases on corporate decision-making processes beyond the person of the CEO. More specifically, this thesis contests the findings of Malmendier and Tate (2005, 2008) by advocating for a smaller effect of CEO overconfidence on undertaking a (diversifying, cross-border or cash-only) deal and by arguing for a positive, rather than negative, effect on an acquirer's CARs. Lastly, this thesis provides a useful implication for all shareholders, employees, (independent) board members and (potential) clients. Instead of mainly monitoring the CEO (Uhde, Klarner & Tuschke, 2017), stakeholders should pay more attention to monitor the actions taken by the CFO. A better monitoring process of the CFO could lead to better-calibrated constraints on the Top Management Team, which in turn will result in better and more deliberate M&A decisions.

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6. Appendix

Table 6.1: Variable descriptions and sources

Variable name	Description	Source
Panel A: CEO-CFO overconfidence measures		
Average moneyness$_t$	Average moneyness is calculated in three steps: 1) average realizable value = (OPT_UNEX_EXER_EST_VAL/OPT_UNEX_EXER_NUM) 2) average strike price = (PRCCF - (OPT_UNEX_EXER_EST_VAL/OPT_UNEX_EXER_NUM)) 3) average moneyness =((PRCCF / (PRCCF - (OPT_UNEX_EXER_EST_VAL/OPT_UNEX_EXER_NUM))) -1)	ExecuComp
CEO/CFOHolder67once$_t$	A binary variable that equals one if the average moneyness of a CEO's/CFO's options exceed the threshold of 67% at least once, and zero otherwise. The CEO remains overconfident from that point in the sample onwards.	ExecuComp
CEO/CFOHolder67twice$_t$	A binary variable that equals one if the average moneyness of a CEO's/CFO's options exceed the threshold of 67% at least twice, and zero otherwise. The CEO remains overconfident from that point in the sample onwards (2007-2019)	ExecuComp
Moneyness long$_t$	Moneyness for detailed option packages are calculated as follows: ((PRCCF / EXPRIC) -1)	ExecuComp
CEO/CFOLongholder$_t$	A binary variable that equals one if a CEO / CFO holds an option package until the last year before expiration, given that these particular options are at least 40% in the money. Following Malmendier et al. (2020), option packages with an exercise price below 0.01 or higher than 1000 are excluded from the sample.	ExecuComp
Net Buyer	A binary variable that equals one if, for more than half of the sample period, the difference between the shares, excluding options, owned at the current fiscal year (ExecuComp: SHROWN_EXCL_OPTS) is larger than the shares owned at the previous fiscal year (Hana,Laib, & Hoc, 2017).	ExecuComp
Continuous measure	OPT_UNEX_EXER_EST_VAL / (OPT_UNEX_EXER_EST_VAL + OPT_UNEX_UNEX_EST_VAL + (SHROWN_EXCL_OPTIONS * PRCCF))	ExecuComp
Value to Compensation	Log (1+ OPT_UNEX_EXER_EST_VAL / TDC1))	ExecuComp
Panel B: Dependent variables		
M&A activity$_t$	A binary variable that equals one if a firm, within a specific firm-year, performed at least one completed "change of control" merger with a deal value of at least USD 1 million, a deal value of at least 1% of the total assets of the previous year, the firm owned less than 50% of the target's shares before the transaction, and owned 100% after the announcement.	ThomsonOne
Diversifying deal$_t$	A binary variable that equals 1 if the target is operating in a different 2-digit SIC industry than the acquirer, and zero otherwise. The conditions for a deal, as in explained in "M&A activity" still apply	ThomsonOne
Cross-border deal$_t$	A binary variable that equals 1 if the target is operating in a different country than the U.S, and zero otherwise. The conditions for a deal, as in explained in "M&A activity" still apply	ThomsonOne
Cash-only deal$_t$	A binary variable that equals 1 if the deal was financed by cash-only and equals zero for all other consideration types offered. The conditions for a deal, as in explained in "M&A activity" still apply	ThomsonOne
CAR [0, +1]; CAR [-1, +1]; CAR [-2, +2]; CAR [-5, +5]; CAR [-10, +10]	Two-day / Three-day / Five-day/ Eleven-day/ Twenty-one-day event window cumulative abnormal return, where t=0 equals the transaction announcement date, calculated using the market model with the S&P 500 index as proxy for expected returns. The estimation window equals 150 days, with a 20-day gap between the estimation window and the event window	WRDS Event Study Tool
Panel C: Firm-specific accounting data		
Firm size$_t$	Logarithm of total assets (Compustat item 6), initially measured in USD millions, winsorized at the 1%-99% level	Compustat
Return on Assets$_t$ (ROA)	The ratio of net income (item 172) income to average total assets (item 6), both net income and total assets (see Firm size) were measured in millions of USD and winsorized at the 1%-99% level. Average total assets are calculated as total [(assets year t + total assets year t-1)/2]	
Tobin's Q$_t$	Ratio of market value of assets over book value of assets, winsorized at the 1%-99% level → (Market value of equity / total assets). Market value of equity is calculated as follows: [total assets (item 6) + market equity – book equity]. Market equity is calculated as [common shares outstanding (item 25) * fiscal year end share price (item 199)]. Book equity is calculated as [total assets (item 6) – total liabilities (item 181) – preferred stock (item 10) + deferred taxes (item 35) + convertible debt (item 79)]	Compustat
Capital$_t$	Property plant and equipment (item 8), measured in USD millions, winsorized at the 1%-99% level	Compustat

Cash flow$_t$	Earnings before extraordinary items (item 18) + depreciation (item 14), measured in USD millions, winsorized at the 1%-99% level	Compustat
Normalized cash flow$_t$	Cash flow / Capital	Compustat
Cash ratio$_t$	Cash (item 162) / total current liabilities (item 5), measured in USD millions, winsorized at the 1%-99% level	Compustat
Leverage$_t$	Total debt including current (not included in legacy item list) / total assets (item 6). Only winsorized at the top 99% level	Compustat
Lagged stock returns$_{t-x}$	{[End year stock price t (item 24) adjusted for stock splits (item 27)] − [End year stock price t-x (item 24) adjusted for stock splits (item 27)]} / [End year stock price t-x (item 24) adjusted for stock splits (item 27)]	Compustat/CRSP
Annualized volatility$_{t-x}$	Annualized stock price volatility (%) is calculated using CRSP's standard deviation of stock returns adjusted for stock splits and dividends multiplied by the square root of trading days	CRSP

Panel D: Board-specific controls

Nationality mix$_t$	Proportion of directors from foreign countries	BoardEx
Gender ratio$_t$	Proportion of male directors	BoardEx
Optimal board size$_t$	A binary variable which equals one when the board size is between 4 and 12 members and zero otherwise	BoardEx

Panel E: CEO-CFO characteristics

CEO/CFO age$_t$	Age of the CEO/CFO as reported in the annual report. In the first few years of CFO data (e.g., 2006-2008) age was often missing. Hence, age was approximated by using the following formula: (2019 - fiscal year observation).	ExecuComp
CEO/CFO gender$_t$	A binary variable which equals one if the CEO's/CFO's gender is male, and zero if the CEO's gender is female	ExecuComp
CEO/CFO total compensation$_t$	CEO's/CFO's total Compensation in thousands USD, winsorized at the 1%-99% level (Salary + Bonus + Other Annual + Restricted Stock Grants + LTIP Payouts + Value of Option Grants)	ExecuComp
CEO/CFO fixed pay ratio$_t$	Proportion of CEO's/CFO's fixed salary relative to total compensation	ExecuComp
CEO/CFO stock ownership$_t$	CEO's/CFO's shares owned as percentage of total common shares outstanding (SHROWN_TOT_PCT)	ExecuComp
CEO/CFO vested options$_t$	CEO's/CFO's proportion of vested options compared to total common shares outstanding OPT_UNEX_EXER_NUM/ common shares outstanding (csho)	ExecuComp
CEO/CFO turnover$_t$	A binary variable that equals one in case there is a new CEO/CFO has been appointed in year t, and zero otherwise	ExecuComp
CEO/CFO chairman$_t$	A binary variable that equals one in case the CEO/CFO is also chairman	ExecuComp
CEO tenure$_t$	A continuous variable that represents the number of years the CEO is the current CEO of the firm	ExecuComp
CEO relative power$_t$	The proportion of CEO total compensation relative to CFO total compensation, winsorized at the 5%-95% level	ExecuComp

Panel F: Deal-specific controls

Deal value$_t$	Deal value in USD millions. In the CAR regressions, deal value represents the natural logarithm of deal value	ThomsonOne
Public target$_t$	A binary variable which equals one if the target's status is "Public"	ThomsonOne

Panel G: Industry-specific controls

F&F 12 industry groups	12 industry groups based on four-digit SIC codes: 1) Consumer nondurables: 0100-0999, 2000-2399, 2700-2749, 2770-2799, 3100-3199, 3940-3989	Fama & French (1997)
	2) Consumer durables: 2500-2519, 2590-2599, 3630-3659, 3710-3711, 3714-3714, 3716-3716, 3750-3751, 3792-3792, 3900-3939, 3990-3999	
	3) Manufacturing: 2520-2589, 2600-2699, 2750-2769, 3000-3099, 3200-3569, 3580-3629, 3700-3709, 3712-3713, 3715-3715, 3717-3749, 3752-3791, 3793-3799, 3830-3839, 3860-3899	
	4) Oil, Gas, and Coal Extraction and Products: 1200-1399, 2900-2999	
	5) Chemicals and Allied Products: 2800-2829, 2840-2899	
	6) Business Equipment: 3570-3579, 3660-3692, 3694-3699, 3810-3829, 7370-7379	
	7) Telephone and Television Transmission: 4800-4899	
	8) Utilities: 4900-4949	
	9) Wholesale, Retail, and Some Services: 5000-5999, 7200-7299, 7600-7699	
	10) Healthcare, Medical Equipment, and Drugs: 2830-2839, 3693-3693, 3840-3859, 8000-8099	
	11) Finance: 6000-6999	
	12) Others: all remaining four-digit SIC codes	

Table 6.2: Frequency of overconfident CEOs and CFOs

This table reveals the yearly split of the number of overconfident CEOs and CFOs based on three different measures: Holder67once, Holder67twice and Longholder. The sample consists of 6,519 firm-year observations between 2007 and 2018, 838 unique firms that were listed at least once on the S&P 1500 during the sample period, 1287 different CEOs, 1376 different CFOs and 1724 unique CEO-CFO pairs. Holder67once and Holder67twice are binary variables that equal one if the average moneyness of a CEO's options exceed the threshold of 67% at least once and twice respectively, and zero otherwise. The executive remains overconfident from that point in the sample onwards. Longholder is a binary variable that equals one if an executive holds an option package until the last year before expiration, given that these particular options are at least 40% in the money.

Year	N	CEO			CFO		
		Holder67once	Holder67twice	Longholder	Holder67once	Holder67twice	Longholder
2007	362	0.52	0.29	0.47	0.45	0.21	0.30
2008	543	0.49	0.26	0.49	0.40	0.19	0.29
2009	554	0.46	0.27	0.51	0.39	0.21	0.31
2010	581	0.53	0.31	0.51	0.45	0.24	0.29
2011	583	0.57	0.36	0.52	0.47	0.30	0.30
2012	583	0.61	0.39	0.52	0.52	0.29	0.30
2013	584	0.70	0.46	0.50	0.62	0.37	0.32
2014	572	0.73	0.53	0.48	0.66	0.48	0.32
2015	556	0.71	0.54	0.45	0.65	0.50	0.29
2016	560	0.69	0.54	0.43	0.59	0.47	0.27
2017	547	0.70	0.54	0.41	0.61	0.45	0.25
2018	494	0.69	0.53	0.38	0.59	0.43	0.22
Total	6519	0.62	0.42	0.47	0.54	0.35	0.29

Table 6.3: Frequency of overconfident CEOs and CFOs by subgroups

This table reveals the frequency of overconfident CEOs and CFOs based on the Holder67twice measure. The subgroups are "CEO overconfident, CFO overconfident", denoted by CEO(1) CFO(1); "CEO overconfident, CFO non-overconfident", denoted by CEO(1) CFO(0) ; "CEO non-overconfident, CFO overconfident", denoted by CEO(0) CFO(1); "CEO non-overconfident, CFO non-overconfident", denoted by CEO(0) CFO(0). The sample consists of 6,519 firm-year observations between 2007 and 2018, 838 unique firms that were listed at least once on the S&P 1500 during the sample period, 1287 different CEOs, 1376 different CFOs and 1724 unique CEO-CFO pairs. Holder67twice are binary variables that equals one if the average moneyness of a CEO's options exceed the threshold of 67% at least twice, and zero otherwise. The executive remains overconfident from that point in the sample onwards.

Year	N	Overconfident subgroups				
		CEO(1) CFO(1)	CEO(1) CFO(0)	CEO(0) CFO(1)	CEO(0) CFO(0)	Total
2007	362	0.15	0.14	0.06	0.65	1.00
2008	543	0.13	0.12	0.06	0.68	1.00
2009	554	0.15	0.12	0.06	0.67	1.00
2010	581	0.17	0.14	0.08	0.62	1.00
2011	583	0.21	0.15	0.08	0.55	1.00
2012	583	0.21	0.19	0.08	0.52	1.00
2013	584	0.26	0.20	0.10	0.43	1.00
2014	572	0.36	0.17	0.13	0.35	1.00
2015	556	0.38	0.16	0.12	0.33	1.00
2016	560	0.35	0.19	0.11	0.35	1.00
2017	547	0.33	0.21	0.12	0.34	1.00
2018	494	0.31	0.22	0.12	0.35	1.00
Total	6519	0.25	0.17	0.09	0.48	1.00

Table 6.4: Descriptive statistics M&A performance dataset

This table reports the number of observations, mean, standard deviation, minimum, median and maximum for the control variables used to test the effect of managerial overconfidence on M&A performance. The sample consists of 1,497 M&A transactions between 2007 and 2018, 480 unique bidders that were listed at least once on the S&P 1500 during the sample period, 603 different CEOs, 626 different CFOs and 695 unique CEO-CFO pairs. For all variable constructions and definitions, see Table 6.1.

Variable Name	Observations	Mean	Std dev.	Minimum	Median	Maximum
Panel A: Deal characteristics						
Deal value	1,497	1,074.75	4,037.12	1.60	200.83	79,406.46
Diversifying deal	1,497	0.42	0.49	0	0	1
Cross-border deal	1,497	0.24	0.43	0	0	1
Cash-only deal	1,497	0.65	0.48	0	1	1
Public target	1,497	0.17	0.37	0	0	1
Panel B: Firm-specific controls						
Gender ratio	1,497	0.86	0.11	0.50	0	1
Firm size	1,497	8.14	1.53	3.04	8.04	13.18
ROA	1,497	0.06	0.08	-0.84	0.06	0.88
Tobin's Q	1,497	2.02	1.04	0.72	1.77	8.26
Normalized cash flow	1,497	1.12	1.61	-7.84	0.75	10.35
Cash ratio	1,497	0.61	0.74	0.01	0.35	5.08
Leverage	1,497	0.25	0.17	0.00	0.24	0.87
Panel C: CEO-CFO controls						
CEO age	1,497	57	6.82	37	57	80
CFO age	1,497	52	6.30	33	52	71
CEO vested options	1,497	0.006	0.007	0.00	0.003	0.076
CFO vested options	1,497	0.001	0.002	0.00	0.001	0.028
CEO stock ownership	1,369	1.82	4.16	0.00	0.75	58.10
CFO stock ownership	1,258	0.20	0.33	0.00	0.09	3.41
CEO chairman	1,284	0.55	0.50	0	1	1
Relative power CEO	1,497	3.06	1.31	1.01	2.84	6.66

Figure 6.5: M&A activity for different types of CEO-CFO overconfidence

M&A activity: propensity of doing at least one year within a specific firm-year. In this figure, the four possibilities of overconfidence and the average value for the propensity of doing at least one deal are shown. For each subgroup, the average value to undertake a deal is calculated relative to the control group, i.e., CEOs and CFOs that met the requirements, but that did not undertake a deal. The frequency of each subgroup is shown in Table 6.3. The measure of overconfidence is based on Holder67twice, as the average value of this measure is between the value for Holder67once and Longholder. Years are denoted as fiscal years.

Legend: Overconfident CEO, Overconfident CFO; Overconfident CEO, Non-overconfident CFO; Non-overconfident CEO, Overconfident CEO; Non-overconfident CEO, Non-overconfident CFO
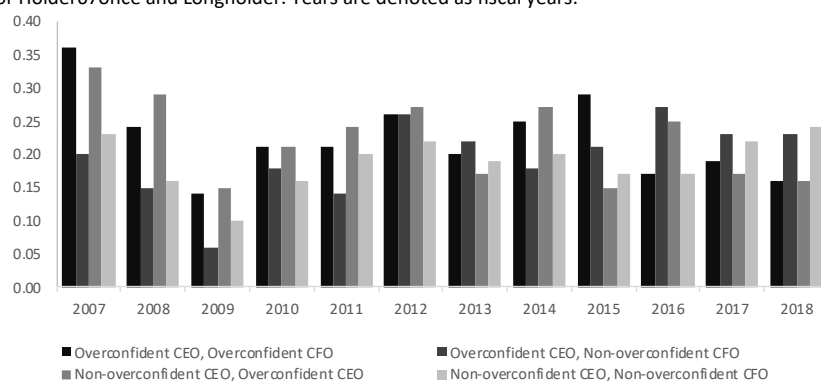
Table 6.6: Frequency of deals

This table reveals the annual frequency of deals, the mean deal value, the median deal value, the proportion of diversifying deals, the proportion of cross-border deals, the proportion of pure cash deals, the proportion of public targets and the CAR estimated over a three-day event window. The sample consists of 1,497 M&A transactions between 2007 and 2018, 480 unique bidders that were listed at least once on the S&P 1500 during the sample period, 603 different CEOs, 626 different CFOs and 695 unique CEO-CFO pairs. Only deals are taken into account when the deal value is at least USD 1 million, at least 1% of the total assets of the previous year and the firm owned less than 50% of the target's shares before the transaction and owned 100% after the announcement. The CARs are estimated using a market model, an estimation period of 150 trading days, with a gap of 20 trading days between the announcement date and the start of the estimation period. In case the announcement day was in the weekend or on a public holiday, the next trading day was chosen as announcement day.

Year	Deals	Mean deal value	Median deal value	Diversifying	Cross-border	Pure cash	Public target	CAR [-1, 1]
2007	95	660.24	102.00	0.47	0.17	0.62	0.23	0.00
2008	108	569.72	100.64	0.35	0.22	0.63	0.15	0.01
2009	72	552.52	123.75	0.51	0.22	0.56	0.19	-0.01
2010	117	1,004.18	161.90	0.47	0.26	0.57	0.22	0.01
2011	138	851.68	158.94	0.42	0.32	0.59	0.12	0.01
2012	159	704.99	176.00	0.45	0.25	0.65	0.14	0.01
2013	130	690.04	159.00	0.45	0.27	0.63	0.17	0.01
2014	153	767.65	205.00	0.33	0.27	0.58	0.13	0.02
2015	135	1,882.34	265.00	0.39	0.19	0.66	0.17	0.02
2016	134	1,114.62	245.02	0.33	0.22	0.76	0.19	0.01
2017	141	1,322.91	287.50	0.43	0.30	0.74	0.15	0.01
2018	115	2,614.04	440.00	0.51	0.17	0.76	0.23	0.01
Total	1,497	1,074.75	200.83	0.42	0.24	0.65	0.17	0.01

Figure 6.7: Overview of annual number of deals and aggregated deal volume

This graph shows the yearly deal volume measured in USD billions (left axis) and the number of M&A transactions (right axis). The sample consists of 1,497 M&A transactions between 2007 and 2018, 480 unique bidders that were listed at least once on the S&P 1500 during the sample period, 603 different CEOs, 626 different CFOs and 695 unique CEO-CFO pairs. Only deals are taken into account when the deal value is at least USD 1 million, at least 1% of the total assets of the previous year and the firm owned less than 50% of the target's shares before the transaction and owned 100% after the announcement.
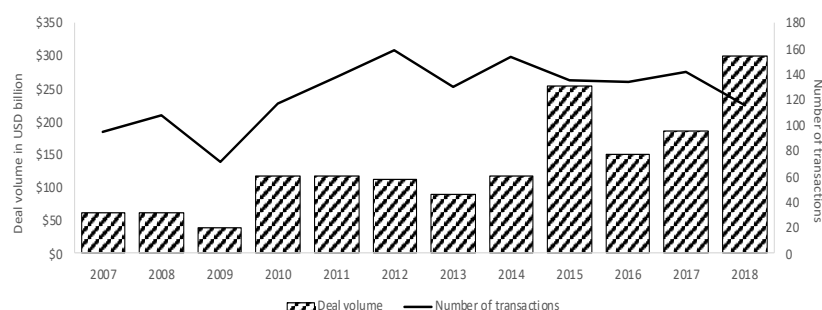
Table 6.8: Test-statistics CARs

This table reports the test-statistics as retrieved from WRDS Event Study Tool for both the abnormal returns (for a [-10, +10] event window) and the cumulative abnormal returns for five different event windows. The sample consists of 1,497 M&A transactions between 2007 and 2018, 480 unique bidders that were listed at least once on the S&P 1500 during the sample period, 603 different CEOs, 626 different CFOs and 695 unique CEO-CFO pairs. Only deals are taken into account when the deal value is at least USD 1 million, at least 1% of the total assets of the previous year and the firm owned less than 50% of the target's shares before the transaction and owned 100% after the announcement. The CARs are estimated using a market model, an estimation period of 150 trading days, with a gap of 20 trading days between the announcement date and the start of the estimation period. In case the announcement day was in the weekend or on a public holiday, the next trading day was chosen as announcement day. Significant at * 10%, ** at 5%, *** 1% level.

Event window	N	CAAR	Standardized cross-section T-statistic
[0, +1]	1,497	1.09%	8.41***
[-1, +1]	1,497	1.07%	7.82***
[-2, +2]	1,497	1.06%	6.92***
[-5, +5]	1,497	1.05%	5.60***
[-10, +10]	1,497	0.97%	4.05***

Figure 6.9 Graphical overview of CAR [-10, +10] event window

This graph reveals the mean cumulative abnormal returns over the [-10, +10] event window. The sample consists of 1,497 M&A transactions between 2007 and 2018, 480 unique bidders that were listed at least once on the S&P 1500 during the sample period, 603 different CEOs, 626 different CFOs and 695 unique CEO-CFO pairs. Only deals are taken into account when the deal value is at least USD 1 million, at least 1% of the total assets of the previous year and the firm owned less than 50% of the target's shares before the transaction and owned 100% after the announcement. The CARs are estimated using a market model, an estimation period of 150 trading days, with a gap of 20 trading days between the announcement date and the start of the estimation period. In case the announcement day was in the weekend or on a public holiday, the next trading day was chosen as announcement day.

Table 6.10: CEO-CFO overconfidence on M&A activity, M&A deal type and M&A performance when using Holder67twice

This table validates the main results using the Holder67twice measure. Holder67twice is a binary variable that equals one if the average moneyness of a CEO's/CFO's options exceed the threshold of 67% at least twice. Concerning Panel A-D, all controls are identical to the controls used in columns (1) to (6) in Table 4.1-4.4. Coefficients are denoted as odds ratios. In parentheses are z-statistics based on standard errors clustered at the firm level. Regarding Panel E, all controls and fixed effects are identical to columns (1) to (6) of Table 4.5. T-statistics based on standard errors clustered by event date are shown in parentheses. For variable construction, see Table 6.1. For all panels; asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Panel A: Fixed Effects: CEO-CFO overconfidence on M&A activity – Holder67twice

	(1)	(2)	(3)	(4)	(5)	(6)
CEO Overconfidence	1.338***		1.156		1.093	1.136
	(2.91)		(1.20)		(0.70)	(1.40)
CFO Overconfidence		1.283**		1.230	1.191	1.272
		(2.26)		(1.54)	(1.23)	(1.19)
CEO*CFO Overconfidence						0.899
						(-0.45)
Controls	NO	NO	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	NO	YES	YES	YES	YES
Observations	4,199	4,199	4,199	4,199	4,199	4,199
Number of firms	482	482	482	482	482	482

Panel B: Fixed Effects: CEO-CFO overconfidence on diversifying deals – Holder67twice

	(1)	(2)	(3)	(4)	(5)	(6)
CEO Overconfidence	1.384**		1.219		1.051	1.086
	(2.28)		(1.17)		(0.28)	(0.38)
CFO Overconfidence		1.559***		1.590**	1.574**	1.666*
		(2.74)		(2.51)	(2.29)	(1.84)
CEO*CFO Overconfidence						0.913
						(-0.27)
Controls	NO	NO	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	NO	YES	YES	YES	YES
Observations	2,565	2,565	2,565	2,565	2,565	2,565
Number of firms	285	285	285	285	285	285

Panel C: Fixed Effects: CEO-CFO overconfidence on cross-border deals – Holder67twice

	(1)	(2)	(3)	(4)	(5)	(6)
CEO Overconfidence	1.534***		1.371*		1.261	1.279
	(2.70)		(1.73)		(1.19)	(0.96)
CFO Overconfidence		1.533**		1.433*	1.311	1.344
		(2.31)		(1.68)	(1.19)	(0.98)
CEO*CFO Overconfidence						0.961
						(-0.11)
Controls	NO	NO	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	NO	YES	YES	YES	YES
Observations	2,211	2,211	2,211	2,211	2,211	2,211
Number of firms	243	243	243	243	243	243

Panel D: Fixed Effects: CEO-CFO overconfidence on cash-only deals – Holder67twice

	(1)	(2)	(3)	(4)	(5)	(6)
CEO Overconfidence	1.387***		0.996		0.923	0.920
	(2.92)		(-0.03)		(-0.57)	(-0.47)
CFO Overconfidence		1.384**		1.247	1.241	1.232
		(2.58)		(1.53)	(1.42)	(0.95)
CEO*CFO Overconfidence						1.011
						(0.04)
Controls	NO	NO	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES
Year fixed effects	NO	NO	YES	YES	YES	YES
Observations	3,456	3,456	3,456	3,456	3,456	3,456
Number of firms	392	392	392	392	392	392

Panel E: OLS: CEO-CFO overconfidence on CAR [-1, +1]– Holder67twice

	(1)	(2)	(3)	(4)	(5)	(6)
CEO Overconfidence	0.006**		0.006**		0.002	0.006
	(2.00)		(1.98)		(0.42)	(1.13)
CFO Overconfidence		0.006**		0.007**	0.007*	0.014**
		(2.16)		(2.23)	(1.69)	(2.13)
CEO*CFO Overconfidence						-0.011
						(-1.26)
Controls	YES	YES	YES	YES	YES	YES
Year*Industry fixed effects	YES	YES	YES	YES	YES	YES
Observations	1,497	1,497	1,497	1,497	1,011	1,011
R-squared	0.18	0.18	0.18	0.18	0.21	0.22

Table 6.11: CEO-CFO overconfidence on M&A activity, M&A deal type and M&A performance when using alternative proxies

This table reveals the effect of CEO-CFO overconfidence on M&A activity, M&A deal type and M&A performance. In this way, the main results of Table 4.1-4.5 are validated by using different proxies for overconfidence. For variable construction or definitions, see section 4.4.2. Concerning Panel A-D, all controls and fixed effects are identical to the controls used in Table 4.1 (column (6)), for variable definitions see Table 6.1. Coefficients are denoted as odds ratios. Z-statistics based on standard errors clustered at the firm level are shown in parentheses. Regarding Panel E, all controls and fixed effects are identical to column (6) of Table 4.5, for variable construction, see Table 6.1. T-statistics based on standard errors clustered by event date are shown in parentheses. For all panels applies that asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level

Panel A: Fixed Effects: CEO-CFO overconfidence on M&A activity – Different proxies for overconfidence

	Longholder		Net Buyer		Continuous		VtC	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEO Overconfidence	1.096	0.998	0.978	0.868	1.004	1.007*	1.090	1.178*
	(0.57)	(-0.01)	(-0.12)	(-0.50)	(1.51)	(1.93)	(1.05)	(1.64)
CFO Overconfidence	0.778	0.655	1.344*	1.208	1.001	1.003	1.140	1.305**
	(-1.38)	(-1.70)*	(1.75)	(0.80)	(0.40)	(1.09)	(1.22)	(2.01)
CEO*CFO Overconfidence		1.323		1.167		0.999		0.889*
		(1.04)		(0.52)		(-1.24)		(-1.64)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	4,199	4,199	4,199	4,199	3,949	3,949	4,197	4,197
Number of firms	482	482	482	482	471	471	482	482

Panel B: Fixed Effects: CEO-CFO overconfidence on diversifying deals - Different proxies for overconfidence

	Longholder		Net Buyer		Continuous		VtC	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEO Overconfidence	1.057	1.092	1.190	1.317	1.005	1.008*	1.119	1.237
	(0.23)	(0.31)	(0.61)	(0.62)	(1.56)	(1.71)	(0.91)	(1.43)
CFO Overconfidence	0.757	0.809	1.302	1.423	1.007**	1.010**	1.326*	1.546**
	(-1.06)	(-0.64)	(1.10)	(1.06)	(2.42)	(2.17)	(1.91)	(2.14)
CEO*CFO Overconfidence		0.903		0.884		0.999		0.869
		(-0.29)		(-0.30)		(-0.75)		(-1.06)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2,565	2,565	2,565	2,565	2,412	2,412	2,565	2,565
Number of firms	285	285	285	285	278	278	285	285

Panel C: Fixed Effects: CEO-CFO overconfidence on cross-border deals - Different proxies for overconfidence

	Longholder		Net Buyer		Continuous		VtC	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEO Overconfidence	1.573	1.308	1.147	1.810	1.007*	1.009	1.010	1.063
	(1.55)	(0.84)	(0.44)	(1.26)	(1.74)	(1.61)	(0.09)	(0.41)
CFO Overconfidence	1.355	0.968	1.484	2.274*	1.005	1.006	1.421**	1.524**
	(0.99)	(-0.08)	(1.47)	(1.73)	(1.23)	(1.12)	(2.15)	(2.16)
CEO*CFO Overconfidence		1.802		0.552		0.999		0.940
		(1.23)		(-1.12)		(-0.37)		(-0.64)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	2,211	2,211	2,211	2,211	2,071	2,071	2,209	2,209
Number of firms	243	243	243	243	238	238	243	243

Panel D: Fixed Effects: CEO-CFO overconfidence on cash-only deals - Different proxies for overconfidence

	Longholder		Net Buyer		Continuous		VtC	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEO Overconfidence	1.212	1.192	1.159	1.354	1.005*	1.008**	1.163*	1.253**
	(1.13)	(0.90)	(0.65)	(0.89)	(1.65)	(2.37)	(1.68)	(2.13)
CFO Overconfidence	0.856	0.827	1.354*	1.560	1.002	1.005*	1.135	1.296*
	(0.13)	(-0.61)	(1.68)	(1.48)	(0.65)	(1.47)	(1.04)	(1.66)
CEO*CFO Overconfidence		1.057		0.816		0.999*		0.890
		(0.17)		(-0.60)		(-1.63)		(-1.38)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Firm fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	3,456	3,456	3,456	3,456	3,219	3,219	3,454	3,454
Number of firms	392	392	392	392	378	378	392	392

Panel E: OLS: CEO-CFO overconfidence on CAR [-1, +1] - Different proxies for overconfidence

	Longholder		Net Buyer		Continuous		VtC	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEO Overconfidence	-0.002	-0.004	-0.001	-0.002	0.000	0.000	0.001	0.006
	(-0.39)	(-0.90)	(-0.11)	(-0.16)	(0.07)	(1.28)	(0.17)	(1.51)
CFO Overconfidence	0.005	-0.000	-0.000	-0.001	0.000	0.000**	0.007	0.016**
	(1.15)	(-0.04)	(-0.06)	(-0.14)	(1.08)	(2.08)	(1.35)	(2.03)
CEO*CFO Overconfidence		0.009		0.001		-0.000**		-0.007*
		(1.02)		(0.13)		(-2.08)		(-1.93)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year*Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,011	1,011	1,011	1,011	983	1,731	1,011	1,011
R-squared	0.21	0.21	0.21	0.21	0.22	0.22	0.21	0.22

Table 6.12: CEO-CFO overconfidence on M&A activity for different levels of CEO-CFO dominance

All controls and fixed effects are identical to the controls used in Table 4.1 (column (6)), for definitions see Table 6.1. Coefficients are denoted as odds ratios. Z-statistics based on standard errors clustered at the firm level are shown in (). Asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Panel A1: Random Effects: CEO-CFO overconfidence on M&A activity - CEO-CFO tenure overlap

	0-3 years		4-5 years		6-8 years		9-12 years	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	1.666***	1.378	1.032	0.927	1.043	1.395	0.734	1.276
	(2.75)	(1.44)	(0.15)	(-0.37)	(0.17)	(1.07)	(-1.07)	(0.70)
CFOHolder67once	1.009	0.721	1.473**	1.175	1.273	1.888*	1.614**	3.061***
	(0.05)	(-1.01)	(2.08)	(0.46)	(0.94)	(1.69)	(1.82)	(2.86)
CEO*CFOHolder67once		1.711		1.369		0.531		0.344**
		(1.40)		(0.77)		(-1.41)		(-2.26)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,661	1,661	1,632	1,632	1,731	1,731	1,495	1,495
Number of firms	535	535	338	338	269	269	158	158

Panel A2: Random Effects: CEO-CFO overconfidence on diversifying deals - CEO-CFO tenure overlap

	0-3 years		4-5 years		6-8 years		9-12 years	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	1.927**	1.370	1.132	0.964	1.168	1.946*	0.417**	0.459
	(2.48)	(0.96)	(0.44)	(-0.11)	(0.45)	(1.83)	(-2.20)	(-1.46)
CFOHolder67once	1.037	0.525	0.996	0.665	1.571	2.905**	2.695**	2.928*
	(0.13)	(-1.25)	(-0.01)	(-0.73)	(1.35)	(2.35)	(2.30)	(1.76)
CEO*CFOHolder67once		2.831*		1.711		0.359*		0.852
		(1.77)		(0.90)		(-1.94)		(-0.22)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,654	1,654	1,615	1,615	1,731	1,731	1,495	1,495
Number of firms	535	535	334	334	269	269	158	158

Panel A3: Random Effects: CEO-CFO overconfidence on cross-border deals - CEO-CFO tenure overlap

	0-3 years		4-5 years		6-8 years		9-12 years	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	1.916**	1.730*	1.663*	2.119**	1.196	1.056	1.240	1.973
	(2.28)	(1.74)	(1.68)	(2.17)	(0.43)	(0.10)	(0.50)	(1.12)
CFOHolder67once	1.361	1.138	1.590	2.483*	1.885	1.655	1.513	2.621
	(1.09)	(0.23)	(1.54)	(1.85)	(1.60)	(0.80)	(0.95)	(1.52)
CEO*CFOHolder67one		1.315		0.533		1.259		0.424
		(0.41)		(-1.09)		(0.30)		(-1.09)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,654	1,654	1,632	1,632	1,692	1,692	1,299	1,299
Number of firms	535	535	338	338	263	263	140	140

Panel A4: Random Effects: CEO-CFO overconfidence on cash-only deals - CEO-CFO tenure overlap

	0-3 years		4-5 years		6-8 years		9-12 years	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	1.579**	1.187	0.833	0.600*	0.738	0.941	0.727	1.191
	(2.06)	(0.62)	(-0.74)	(-1.72)	(-1.15)	(-0.18)	(-1.11)	(0.49)
CFOHolder67once	1.058	0.621	1.430*	0.724	1.654	2.217**	1.732**	2.901***
	(0.27)	(-1.24)	(1.65)	(-0.77)	(1.88)	(2.18)	(2.03)	(2.74)
CEO*CFOHolder67once		2.283*		2.609*		0.611		0.408*
		(1.77)		(1.91)		(-1.04)		(-1.84)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,661	1,661	1,615	1,615	1,731	1,731	1,495	1,495
Number of firms	535	535	334	334	269	269	158	158

Panel B1: Random Effects: CEO-CFO overconfidence on M&A activity – CEO's relative to CFO's renumeration

	1.0-2.1 times CFO		2.1-2.7 times CFO		2.7-3.5 times CFO		3.5-6.7 times CFO	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	1.023	0.891	1.068	1.247	0.904	0.993	1.808**	1.633*
	(0.10)	(-0.37)	(0.33)	(0.84)	(-0.54)	(-0.03)	(2.52)	(1.80)
CFOHolder67once	1.278	1.038	1.491*	1.807*	1.564**	1.795**	1.004	0.760
	(1.06)	(0.10)	(1.96)	(1.86)	(2.41)	(2.02)	(0.02)	(-0.70)
CEO*CFOHolder67once		1.388		0.722		0.803		1.436
		(0.77)		(-0.86)		(-0.61)		(0.81)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,588	1,588	1,630	1,630	1,631	1,631	1,622	1,622
Number of firms	522	522	589	589	557	557	532	532

Panel B2: Random Effects: CEO-CFO overconfidence on diversifying deals - CEO's relative to CFO's renumeration

	1.0-2.1 times CFO		2.1-2.7 times CFO		2.7-3.5 times CFO		3.5-6.7 times CFO	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	0.924	0.475	0.814	1.148	1.052	1.059	2.189**	2.047*
	(-0.27)	(-1.60)	(-0.78)	(0.40)	(0.19)	(0.16)	(2.53)	(1.89)
CFOHolder67once	1.406	0.584	1.761**	2.531**	1.436	1.450	0.864	0.700
	(1.23)	(-1.08)	(2.02)	(2.34)	(1.23)	(0.85)	(-0.58)	(-0.50)
CEO*CFOHolder67once		4.324**		0.521		0.984		1.302
		(2.35)		(-1.39)		(-0.03)		(0.33)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,565	1,565	1,630	1,630	1,625	1,625	1,622	1,622
Number of firms	512	512	589	589	556	556	532	532

Panel B3: Random Effects: CEO-CFO overconfidence on cross-border deals - CEO's relative to CFO's renumeration

	1.0-2.1 times CFO		2.1-2.7 times CFO		2.7-3.5 times CFO		3.5-6.7 times CFO	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	1.389	1.867	1.760*	3.098***	1.131	1.034	2.944**	2.520**
	(0.63)	(0.93)	(1.95)	(2.96)	(0.45)	(0.10)	(2.85)	(2.01)
CFOHolder67once	1.680	2.369	1.869**	3.520***	1.626*	1.435	1.270	0.791
	(1.03)	(1.35)	(2.09)	(2.85)	(1.75)	(0.81)	(0.72)	(-0.33)
CEO*CFOHolder67one		0.551		0.349**		1.223		1.783
		(-0.68)		(-1.97)		(0.38)		(0.74)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,528	1,528	1,619	1,619	1,625	1,625	1,622	1,622
Number of firms	502	532	587	587	556	556	532	532

Panel B4: Random Effects: CEO-CFO overconfidence on cash-only deals - CEO's relative to CFO's renumeration

	1.0-2.1 times CFO		2.1-2.7 times CFO		2.7-3.5 times CFO		3.5-6.7 times CFO	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	0.898	0.872	0.780	0.833	0.985	0.773	1.792**	1.512
	(-0.42)	(-0.41)	(-1.08)	(-0.57)	(-0.07)	(-0.95)	(2.17)	(1.30)
CFOHolder67once	1.594*	1.530	1.868	2.002*	1.363	0.924	0.870	0.518
	(1.84)	(1.10)	(2.60)	(1.87)	(1.55)	(-0.21)	(-0.61)	(-1.12)
CEO*CFOHolder67once		1.069		0.881		1.821		1.924
		(0.14)		(-0.28)		(1.33)		(1.00)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,582	1,582	1,630	1,630	1,631	1,631	1,622	1,622
Number of firms	521	521	589	589	557	557	532	532

Table 6.13 Firm-specific and board-specific factors

All controls and fixed effects are identical to the controls used in Table 4.1 (column (6)), for definitions see Table 6.1. Coefficients are denoted as odds ratios. Z-statistics based on standard errors clustered at the firm level are shown in (). Asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Panel A1: Random Effects: CEO-CFO overconfidence on M&A activity – Firm size

	Quartile (1)		Quartile (2)		Quartile (3)		Quartile (4)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	1.666**	1.749*	0.967	1.713*	1.080	0.972	1.235	1.083
	(2.00)	(1.77)	(-0.15)	(1.94)	(0.39)	(-0.11)	(1.17)	(0.40)
CFOHolder67once	1.123	1.240	1.561**	3.311***	1.208	1.022	1.350	1.072
	(0.46)	(0.50)	(1.97)	(3.45)	(1.00)	(0.07)	(1.63)	(0.21)
CEO*CFOHolder67once		0.873		0.297***		1.284		1.421
		(-0.29)		(-3.00)		(0.66)		(0.96)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,515	1,516	1,625	1,625	1,631	1,631	1,614	1,614
Number of firms	264	264	360	360	323	323	259	259

Panel A2: Random Effects: CEO-CFO overconfidence on diversifying deals- Firm size

	Quartile (1)		Quartile (2)		Quartile (3)		Quartile (4)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	1.005	0.615	1.362	2.305**	0.891	0.767	1.563*	1.616
	(0.01)	(-0.96)	(1.07)	(2.24)	(-0.43)	(-0.75)	(1.73)	(1.61)
CFOHolder67once	1.595	0.644	1.560	3.169**	1.613*	1.307	0.895	0.953
	(1.23)	(-0.68)	(1.57)	(2.52)	(1.83)	(0.68)	(-0.38)	(-0.10)
CEO*CFOHolder67once		3.677*		0.323**		1.392		0.911
		(1.74)		(-2.06)		(0.67)		(-0.17)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,490	1,490	1,610	1,610	1,631	1,631	1,609	1,609
Number of firms	258	258	359	359	323	323	258	258

Panel A3: Random Effects: CEO-CFO overconfidence on cross-border deals – Firm size

	Quartile (1)		Quartile (2)		Quartile (3)		Quartile (4)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	2.696**	3.110**	0.929	1.688	1.516	1.452	1.998***	2.181***
	(2.08)	(2.02)	(-0.23)	(1.15)	(1.38)	(0.85)	(2.60)	(2.75)
CFOHolder67once	1.708	2.332	2.673***	4.601***	1.367	1.278	0.942	1.164
	(1.18)	(0.87)	(2.94)	(3.19)	(0.94)	(0.48)	(-0.22)	(0.28)
CEO*CFOHolder67one		0.669		0.376		1.105		0.753
		(-0.40)		(-1.53)		(0.16)		(-0.48)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,431	1,654	1,561	1,561	1,617	1,617	1,609	1,609
Number of firms	259	535	348	348	321	321	258	258

Panel A4: Random Effects: CEO-CFO overconfidence on cash-only deals – Firm size

	Quartile (1)		Quartile (2)		Quartile (3)		Quartile (4)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	1.234	1.302	0.668	0.156	1.173	0.920	1.318	0.943
	(0.73)	(0.69)	(-1.55)	(0.40)	(0.74)	(-0.31)	(1.33)	(-0.24)
CFOHolder67once	1.999**	2.170*	1.795**	3.436***	1.075	0.709	1.181	0.582
	(2.21)	(1.66)	(2.25)	(3.12)	(0.36)	(-0.91)	(0.82)	(-1.27)
CEO*CFOHolder67once		0.884		0.336**		1.840		2.809**
		(-0.24)		(-2.21)		(-1.04)		(2.19)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,509	1,509	1,604	1,604	1,631	1,631	1,614	1,614
Number of firms	264	264	351	351	323	323	259	259

Panel B1: RE: CEO-CFO overconfidence on M&A activity

	CEO no chairman		CEO chairman	
	(1)	(2)	(3)	(4)
CEOHolder67once	1.231	1.375	1.082	0.004
	(1.21)	(1.47)	(0.47)	(0.69)
CFOHolder67once	1.236	1.411	1.436**	0.006
	(1.28)	(1.35)	(2.28)	(0.78)
CEO*CFOHolder67once		0.795		-0.000
		(-0.74)		(-0.03)
Controls	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES
Observations	2,470	2,470	2,960	2,960
Number of firms	536	536	536	536

Panel B2: RE: CEO-CFO overconfidence on diversifying deals

	CEO no chairman		CEO chairman	
	(1)	(2)	(3)	(4)
CEOHolder67once	1.230	1.165	0.898	0.993
	(0.92)	(0.50)	(-0.45)	(-0.02)
CFOHolder67once	1.235	1.162	1.791***	2.130**
	(0.93)	(0.43)	(2.62)	(1.96)
CEO*CFOHolder67once		1.116		0.778
		(0.26)		(-0.56)
Controls	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES
Observations	2,470	2,470	2,958	2,958
Number of firms	536	536	535	535

Panel B3: RE: CEO-CFO overconfidence on cross-border deals

	CEO no chairman		CEO chairman	
	(1)	(2)	(3)	(4)
CEOHolder67once	1.713**	2.067**	1.272	1.771*
	(2.15)	(2.05)	(0.92)	(1.79)
CFOHolder67once	1.591*	1.948*	1.602*	2.751**
	(1.78)	(1.72)	(1.69)	(2.45)
CEO*CFOHolder67one		0.706		0.460
		(-0.70)		(-1.58)
Controls	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES
Observations	2,457	2,457	2,960	2,960
Number of firms	535	535	536	536

Panel B4: RE: CEO-CFO overconfidence on cash-only deals

	CEO no chairman		CEO chairman	
	(1)	(2)	(3)	(4)
CEOHolder67once	1.173	1.288	0.915	0.781
	(0.86)	(1.04)	(0.46)	(-1.02)
CFOHolder67once	1.161	1.304	1.719***	1.292
	(0.82)	(0.96)	(2.92)	(0.73)
CEO*CFOHolder67once		0.820		1.504
		(-0.85)		(1.01)
Controls	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES
Industry fixed effects	YES	YES	YES	YES
Observations	2,470	2,470	2,958	2,958
Number of firms	536	536	535	535

Table 6.14: Market reaction to CEO-CFO overconfidence for different event windows

This table reports estimates of OLS regressions. In Panel A, the dependent variable represents the acquirer's cumulative abnormal return for different event windows: [0, +1]; [-2, +2]; [-5,+5] and [-10, +10]. The CARs are estimated using a market model, an estimation period of 150 trading days, with a gap of 20 trading days between the announcement date and the start of the estimation period. In case the announcement day was in the weekend or on a public holiday, the next trading day was chosen as announcement day. In Panel B, the dependent variable denotes the acquirer's cumulative abnormal return for a three-day event window: CAR[-1, +1] for different deal types: diversifying, cross-border, cash-only, listed target. Holder67once is a binary variable that equals one if the average moneyness of a CEO's/CFO's options exceed the threshold of 67% at least once. All controls are identical to the controls used in Table 4.5 (column (6)). For definitions and the construction of the controls, see Table 6.1. Industry fixed effects are constructed based on Fama and French's 12-industry group classification. To account for cross-sectional correlation of stock returns, in parentheses are t-statistics based on standard errors clustered at the announcement date. Asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level.

Panel A: OLS: Market reaction for alternative event windows

	CAR [0, +1]		CAR [-2, +2]		CAR [-5, +5]		CAR [-10, +10]	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	0.003	0.002	0.004	0.004	0.006	0.008	0.004	0.006
	(0.66)	(0.45)	(0.82)	(0.69)	(0.93)	(1.04)	(0.53)	(0.63)
CFOHolder67once	0.008**	0.007	0.006	0.006	0.005	0.009	0.004	0.008
	(2.17)	(1.04)	(1.31)	(0.78)	(0.95)	(0.97)	(0.63)	(0.73)
CEO*CFOHolder67once		0.001		-0.000		-0.005		-0.006
		(0.14)		(-0.03)		(-0.48)		(-0.42)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year*Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,011	1,011	1,011	1,011	1,011	1,011	1,011	1,011
R-squared	0.19	0.19	0.22	0.22	0.25	0.25	0.32	0.32

Panel B: OLS: CAR [-1,+1] for different target characteristics

	Diversifying		Cross-border		Cash-only		Listed target	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CEOHolder67once	0.002	-0.005	-0.019*	-0.018	-0.006	-0.003	-0.000	0.002
	(0.27)	(-0.47)	(-1.90)	(-0.91)	(-1.25)	(-0.49)	(-0.02)	(0.12)
CFOHolder67once	0.005	-0.005	0.018***	0.020	0.013***	0.018**	0.007	0.012
	(0.78)	(-0.38)	(2.93)	(1.14)	(2.86)	(2.13)	(0.51)	(0.45)
CEO*CFOHolder67once		0.016		-0.002		-0.007		-0.006
		(1.03)		(-0.10)		(-0.71)		(-0.23)
Controls	YES	YES	YES	YES	YES	YES	YES	YES
Year*Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	421	421	245	245	660	660	178	178
R-squared	0.25	0.25	0.55	0.55	0.26	0.26	0.65	0.65