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The effect of CEO overconfidence on acquisition activity in serial acquisitions

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ABSTRACT

This paper investigates the effects of CEO overconfidence on merger & acquisition (M&A) activity among publicly listed serial acquirers in the United States from 2006 to 2022. Although prior research has shown that overconfident CEOs pay higher premiums, are more likely to conduct diversifying deals, and experience lower cumulative abnormal returns to deal announcements, few studies have specifically focused on the impact of CEO overconfidence in the context of serial acquirers. Using a sample of 49 CEOs and 163 M&A deal observations, this study examines whether the presence of CEO overconfidence in serial acquirers leads to higher acquisition premiums, an increased likelihood to undertake diversifying deals, and lower market reactions to deal announcements. CEO overconfidence is measured by examining the exercise behaviour of CEOs using the average moneyness of their vested stock option holdings as developed by Campbell et al. (2011) and based on Malmendier & Tate (2005, 2008). My findings indicate no statistically significant relationship between CEO overconfidence and acquisition premiums, the likelihood to conduct diversifying deals, or market reactions to deal announcements for serial acquirers. These results suggest that CEO overconfidence may not play a significant role in shaping the M&A decisions and outcomes of serial acquirers, though limitations in the study warrant caution in interpretation. This paper contributes to the literature by focusing specifically on the effects of CEO overconfidence among serial acquirers, providing new insights and a direction for future research.

JEL classification: G14, G30, G32, G34

Keywords: CEO overconfidence, Mergers and acquisitions, Serial acquirers, Acquisition premium, Target selection, Market reaction

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1. INTRODUCTION

Over the years, financial literature mainly assumes individuals have rational expectations and will act rationally according to these expectations (Garcia, 2013). Two key assumptions have framed the traditional literature on financial markets: 1) Individuals collect and use all of the available information in order to obtain maximum utility, well-being, and/or profit; 2) Individuals have an unlimited capacity for processing information, which allows them to continually update their beliefs based on newly acquired information. However, studies in the field of Behavioural Finance suggest that individuals do not always behave rationally (Kahneman & Tversky, 1979; De Bondt & Thaler, 1985; Barberis & Thaler, 2003; Garcia, 2013). Academics and professionals agree that the personalities, abilities, and characteristics of CEOs can significantly impact a company's performance (Bloom & Van Reenen, 2007; Bolton et al., 2008; Kaplan et al., 2012). Among these factors, CEO overconfidence has garnered substantial attention due to its potential to lead to suboptimal corporate decisions (Roll, 1986; Malmendier & Tate, 2005, 2008). Literature often refers to CEO overconfidence as CEO hubris, which Webster's Dictionary defines as "exaggerated pride or self-confidence". The phenomenon of overconfidence among CEOs results in an excessive level of self-assurance in their abilities, judgments, and decisions.

Literature indicates that the presence of CEO overconfidence affects merger & acquisition activity (Malmendier & Tate, 2005, 2008; Ben-David et al., 2007; Ferris et al., 2013). Hayward & Hambrick (1997) argue that acquisitions reflect the individual acquirers' decisions. Therefore, one must use the decision maker, not the firm, as the unit of analysis. Complex decisions such as acquisitions reflect the decision makers' premises, biases, and limitations. Even though decisions on acquisitions require approval from the board of directors, these boards of directors rely heavily on guidance from top management, with the CEO having the most crucial role in large acquisitions. It is highly unlikely that terms of a large acquisition proceed to the board without the personal support of the CEO (Hayward & Hambrick, 1997). For this reason, it is insightful to analyse the effects of CEO overconfidence on acquisition activity. Research shows that, on average, firms with overconfident CEOs are more likely to undertake mergers and acquisitions (Ben-David et al., 2007; Malmendier & Tate, 2008), pay a higher market premium (Roll, 1986; Hayward & Hambrick, 1997; John et al., 2010), and are more likely to pursue deals in industries that differ from their current business (Malmendier & Tate, 2008; Ferris et al., 2013; Hwang et al., 2020), when compared to non-overconfident CEOs.

However, research mainly focuses on the effects of CEO overconfidence in acquisition activity using samples with both single and serial acquirers (Malmendier & Tate, 2005, 2008; Ben-David et al., 2007;

Ferris et al., 2013). Few papers focus on the effects of CEO overconfidence in serial acquirers specifically. Serial acquirers can be identified by their approach to valuing synergies and connections among the companies they acquire over time. Serial acquirers acknowledge that early deals in a sequence can contribute to growth potential and successful execution of the series (Smit, 2001). Rather than executing isolated deals, serial acquirers often execute streams of mutually interrelated acquisitions aimed at specific strategic targets, resulting in possible strategic momentum that can last for several years (Amburgey & Miner, 1992; Laamanen & Keil, 2008). Analysed from a real options perspective, sequential acquisitions create opportunities for growth beyond the initial deal by being able to leverage its core competencies and efficiencies onto follow-on acquisitions (Smit, 2001). The presence of these additional growth options in serial acquisition sequences implies that, in comparison to single acquirers, serial acquirers are likely to pay higher premiums for their deals, as these premiums are expected to reflect the option value embedded within the acquisition chain (Smit & Moraitis, 2010).

Therefore, analysing the effects of CEO overconfidence within serial acquisitions provides an interesting field for research. Current research shows that overconfident CEOs are more likely to undertake mergers and acquisitions (Ben-David et al., 2007; Malmendier & Tate, 2008), implying that firms with overconfident CEOs are more likely to be serial acquirers. Interestingly, both overconfident CEOs and serial acquirers are expected to pay higher premiums for their deals (Roll, 1986; Hayward & Hambrick, 1997; Malmendier & Tate, 2008; Smit, 2001; Smit & Moraitis, 2010). Moreover, research also shows that both firms with overconfident CEOs and serial acquirers experience lower market responses to deal announcements compared to firms with non-overconfident CEOs and single acquirers (Doukas & Petmezas, 2007; Billet & Qian, 2008; Malmendier & Tate, 2008; John et al., 2010). Ultimately, examining the impact of CEO overconfidence in the context of serial acquisitions provides insights that enhance our understanding of how CEO overconfidence influences corporate decision-making related to mergers and acquisitions among serial acquirers. Consequently, this paper focuses on answering the research question: 'Does CEO overconfidence affect merger & acquisition activity for publicly listed serial acquirers in the United States between 2006 and 2022?'.[1]

To answer the research question, I use a sample of 49 CEOs and 163 M&A deal observations conducted by public acquirers in the United States (U.S.), completing at least four deals during a rolling window of 10 years from 2006 to 2022. I measure CEO overconfidence using the average moneyness of a CEO's option portfolio in each year, and I classify a CEO as overconfident if he/she fails to exercise vested

[1] In this paper, I use the terms mergers & acquisitions, mergers, acquisitions, or deals interchangeably.

options that have an average moneyness of 67% or higher at least twice, in line with Campbell et al. (2011) and based on the approach developed by Malmendier & Tate (2005, 2008).

This study analysed whether the presence of CEO overconfidence in serial acquirers leads to higher acquisition premiums, an increased likelihood to conduct diversifying deals, and whether it results in lower market reactions to deal announcements. My findings indicate that there is no significant positive relationship between CEO overconfidence and acquisition premiums in serial acquisitions. Furthermore, I find no evidence to support the notion that serial acquirers with overconfident CEOs are more likely to undertake diversifying deals compared to their non-overconfident counterparts. Finally, my analysis reveals no significant correlation between CEO overconfidence and market reactions to deal announcements for serial acquirers. These results suggest that CEO overconfidence may not play a significant role in shaping the merger & acquisition decisions and outcomes of serial acquirers. Importantly, the results should be interpreted with caution because of limitations present in this study.

This paper contributes to the existing literature by providing insights into the effects of CEO overconfidence on merger & acquisition activity using a sample with only serial acquirers. Existing literature has primarily focused on the effects of CEO overconfidence using samples with both single and serial acquirers. It adds to the growing strand of literature on the effects of CEO overconfidence on corporate policies and performance (Roll, 1986; Hayward & Hambrick, 1997; Malmendier & Tate, 2005, 2008; Ferris et al., 2013; Hwang et al., 2020) Additionally, because research shows that CEO overconfidence is positively related to heightened acquisitiveness (Ben-David et al., 2007; Malmendier & Tate, 2008) – thus also more likely to be a serial acquirer – understanding the effects of CEO overconfidence within serial acquirers provides important insights for stakeholders of serial acquirers such as shareholders and board members. Moreover, this research provides a starting point for future research to further analyse the effects of CEO overconfidence within serial acquisitions.

The remainder of the paper is organized as follows. In the next section, I outline relevant theories using current literature and formulate hypotheses to answer the research question. Then, I provide the research design, which elaborates on the measurement for overconfidence, the dependent variables, and control variables, in addition to the methodology used to test the stated hypotheses. Next, I describe the data sources. Then, I describe the empirical results, followed by a discussion of these results, including limitations and suggestions for future research. The last section summarizes and concludes this paper.

2. THEORY & HYPOTHESES

This section outlines relevant theories using current literature. Key findings and theories related to the research question are highlighted, and gaps in the current literature are identified. Moreover, the hypotheses to test the main research question are formulated.

Overconfidence in acquisitions has been a widely discussed topic among scholars in the field of corporate and behavioural finance. Roll (1986) was one of the first authors to link overconfidence to acquisitions by formulating 'The hubris hypothesis of corporate takeovers'. The paper argues that the absence of aggregate value creation in takeovers can be explained by 'hubris', arguing that acquirers infected with hubris are overconfident about their own abilities, resulting in positive valuation errors leading to value-destroying acquisitions. Interestingly, as mentioned by Malmendier & Tate (2008), psychologists point out that individuals are especially overconfident about outcomes they believe are under their control (Langer, 1975; March & Shapira, 1987) and to which they are highly committed (Weinstein, 1980; Weinstein & Klein, 2002). Both criteria apply during the process of an acquisition, because the CEO is a crucial deciding factor and is highly committed, as it can have a large influence on the professional status and wealth of the CEO (Malmendier & Tate, 2008). For this reason, it is especially interesting to understand the effects of CEO overconfidence in mergers & acquisitions.

This paper analyses the effects of CEO overconfidence on merger & acquisition activity in three areas: 1) Acquisition premium; 2) Target selection; 3) Acquirer market response. Each area is discussed in more detail using relevant literature and a stated hypothesis in the following sections.

2.1. Acquisition premium

Acquisition premiums are a way for acquiring companies to demonstrate the additional value they believe they can extract from the target firm. These premiums highlight the belief of the acquiring company that the current stock price of the target does not fully reflect the value of the firm's assets and potential, and that under their management, more value can be created. However, when CEOs are overconfident and overestimate their ability to create value, they may be willing to pay a higher takeover premium compared to non-overconfident CEOs. Research by Roll (1986) was one of the first papers to assess the effects of overconfidence on takeover premiums. The research argues that 'hubris' or overconfidence can be an explanation for value-destroying acquisitions, because managers overestimate their ability to generate returns. Roll (1986, p. 212) put it simply: 'The hubris hypothesis is very simple: decision makers in acquiring firms pay too much for their targets on average in the samples we observe.'

Research by Hayward & Hambrick (1997) confirms the findings of Roll (1986). Hayward & Hambrick (1997) examine the effects of CEO overconfidence on the size of premiums paid in acquisitions using a sample of 106 large acquisitions in 1989 and 1992. The research suggests that hubris is indicated by four factors: the acquiring firms' recent performance, recent media praise for the CEO, a measure of the CEO's self-importance, and a combination factor of these three variables. The results show that all four previously mentioned variables are significantly and positively correlated with acquisition premiums. Therefore, the paper argues that overconfidence in CEOs will result in paying higher premiums for acquisitions compared to non-overconfident CEOs.

Additionally, research by John et al. (2010) supports the findings by Roll (1986) and Hayward & Hambrick (1997). John et al. (2010) analyse the impact of CEO overconfidence on premiums paid using a large sample of 3160 CEOs of publicly traded U.S. firms, and 1890 M&A deals from 1993 to 2005. They find that acquirer CEO overconfidence is significantly positively related to acquisition premiums at the 5% level. The results show that overconfident CEOs pay, on average, a 2.3% to 3.8% higher acquisition premium compared to non-overconfident CEOs.

All in all, studies on the impact of overconfidence on acquisition premiums emphasize the importance of considering CEO overconfidence when assessing acquisition activity. All three of the aforementioned studies – Roll (1986), Hayward & Hambrick (1997), and John et al. (2010) – show that overconfident CEOs are more likely to overpay for acquisitions. This can lead to poor performance for the acquiring firm and negative returns for shareholders. However, the studies by Roll (1986), Hayward & Hambrick (1997), and John et al. (2010) use a sample of both single and serial acquirers. To investigate whether the tendency for overconfident CEOs to overpay also holds true when analysing serial acquisitions specifically, hypothesis 1 is tested:

Hypothesis 1: Acquisition premiums are higher for serial acquirers with overconfident CEOs compared to non-overconfident CEOs.

2.2. Target selection

Studies on corporate diversification argue that diversification is associated with lower firm valuations, meaning that diversification destroys firm value (lang & Stulz, 1994; Berger & Ofek, 1995; Lamont & Polk, 2002). In addition, diversifying deals are often viewed as more uncertain and have been shown to result in negative market reactions upon announcement (Morck et al., 1990). One explanation for why CEOs do pursue diversifying mergers & acquisitions – even though literature shows that it destroys

value – is overconfidence. CEOs who exhibit overconfidence may be more inclined to pursue acquisition opportunities that deviate from their company's core business, because they see potential synergies to generate returns in new industries. However, overconfident CEOs may overestimate their ability to extract value from such deals, leading them to pursue acquisitions that may not align with their firm's strengths and capabilities. Resulting in overconfident CEOs conducting more lower-quality diversifying acquisitions.

Malmendier & Tate (2008) analysed whether CEO overconfidence can explain the decision to undertake diversifying deals. The paper uses diversification as a proxy for deal quality and analyses if overconfidence in a CEO is related to pursuing more diversifying deals, with a diversified deal defined by the fact that the acquirer and target are not part of the same Fama-French (1997) 48 industry group. The paper uses a sample of 477 large publicly traded U.S. firms from 1980 to 1994. The results show that overconfident CEOs are significantly more likely to do diversifying deals. Suggesting that overconfident CEOs are more likely to do lower-quality diversifying deals. However, these results should be interpreted with caution since the cross-regression difference in coefficients of diversifying and within-industry deals is not significant.

Research by Ferris et al. (2013) supports the results by Malmendier & Tate (2008). Ferris et al. (2013) studied the effects of CEO overconfidence in an international mergers and acquisitions setting during the period 2000 to 2006. The paper adopts the same definition for a diversifying deal as used in Malmendier & Tate (2008) and finds that overconfident CEOs are statistically significantly more likely to conduct diversifying deals. To elaborate, the results are statistically significant for the full sample, a U.S.-only sample, and a non-U.S.-only sample. These results indicate that overconfident CEOs are more likely to conduct diversifying deals both in- and outside the United States.

Moreover, Hwang et al. (2020) researches the effects of overconfident CEOs on mergers and acquisition decisions. The analysis of Hwang et al. (2020) differs from previously mentioned studies because it distinguishes between power-led overconfidence and personality-led overconfidence. The paper argues that both CEO power (resulting in agency problems) and CEO overconfidence (resulting in managerial hubris) can explain lower-quality acquisitions. However, if CEO overconfidence is combined with better governance and compensation structure, it could enhance firm value (Hwang et al., 2020). Therefore, only creating undesirable results when overconfident CEOs have a lot of power. The paper uses a sample with 13,754 U.S. firm-year observations from 1996 to 2014. In contrast to Malmendier & Tate (2008) and Ferris et al. (2013), a deal is identified as diversifying using the first two-digit SIC

codes instead of using the Fama-French (1997) 48 industry groups. The results show that firms with power-led overconfident CEOs are more likely to conduct diversifying mergers and acquisitions compared to non-overconfident CEOs. Interestingly, in contrast to Malmendier & Tate (2008) and Ferris et al. (2013), the results show that personality-led CEOs do not affect the types of deals.

In summary, multiple studies have found evidence that overconfident CEOs are more likely to conduct diversifying mergers and acquisitions, which are often viewed as lower-quality deals. However, the studies by Malmendier & Tate (2008), Ferris et al. (2013), and Hwang et al. (2020) do not differentiate between single and serial acquisitions. Therefore, it is interesting to understand if CEO overconfidence is associated with a greater likelihood of conducting diversifying deals, specifically within serial acquisitions. To answer this question, hypothesis 2 is tested:

Hypothesis 2: Serial acquirers are more likely to conduct diversifying deals when led by overconfident CEOs compared to non-overconfident CEOs.

2.3. Acquirer market response

The acquirer market response is the stock market response to acquisitions. The Efficient Market Hypothesis (EMH) suggests that financial markets are efficient and that asset prices fully reflect all available information at any given time (Fama, 1970). This means that the current market price of a security reflects all the information available to investors, including information about the deal announcement. For this reason, deal announcements will result in quickly adjusting stock prices, incorporating the expected value changes. If markets perceive that a CEO is overconfident – and overestimates their ability to create value – one would expect a negative effect on the stock price to deals announced by overconfident acquiring CEOs.

Research by Malmendier & Tate (2008) assesses the effects of CEO overconfidence on the market reaction to deal announcements. The research analyses the market's reaction to deal announcements using a sample of 394 large U.S. firms from 1980 to 1994. The results show that the average market reaction to acquisitions made by firms with an overconfident CEO is three times as negative compared to non-overconfident CEOs. Interestingly, the decomposed effects, based on the means of financing, show an even larger contrast. The market's reaction to non-overconfident CEOs is significantly positive for cash bids and still significantly negative for stock bids. While the market's reaction to overconfident CEOs is always negative on average, though it is four times as large and only significant for stock bids (Malmendier & Tate, 2008).

Moreover, research by John et al. (2010) is in line with Malmendier & Tate (2008). John et al. (2010) analysed the impact of CEO overconfidence on the acquiring firms' M&A announcement performance, using a large sample of 3160 CEOs of publicly traded U.S. firms, and 1890 M&A deals from 1993 to 2005. The results show that if the CEO of an acquiring firm is overconfident, it can lead to a noteworthy adverse effect on the M&A deal announcement abnormal returns. On average, this effect ranges from -0.8% to -1.2%. Evidently, the market is capable of recognizing M&A transactions carried out by overconfident acquirers and reacts unfavourably.

In addition, Doukas & Petmezas (2007) conducted research that also supports the findings of Malmendier & Tate (2008) and John et al. (2010). Doukas & Petmezas (2007) used a sample of public acquiring firms in the United Kingdom (U.K.) from 1980 to 2004. Interestingly, the study focuses on private targets since most deal activity in the U.K. consists of private acquisitions. Moreover, the study adopts serial acquisitions as a proxy for managerial overconfidence. The paper argues: 'The overconfidence bias suggests that heightened acquisitiveness, a direct measure of managerial overconfidence, should be associated with lower wealth effects than low (single acquirers) acquisitiveness.' (Doukas & Petmezas, 2007, pp. 548-549). The results show that overconfident CEOs perform worse relative to non-overconfident CEOs. Doukas & Petmezas (2007) find that the mean acquirer abnormal return around the deal announcement is 0.79% for serial acquirers and 1.34% for single acquirers, both significantly different from zero. The mean difference in abnormal returns between single and serial acquirers is 0.55% and statistically significant at the 1% level. The results show that while overconfident bidders generate positive announcement returns, these returns are substantially lower than those achieved by single bidders.

It is worth noting that the approach used by Doukas & Petmezas (2007) to measure overconfidence differs from that of Malmendier & Tate (2008) and John et al. (2010). The latter two studies use an option exercise measure and CEO behaviour to gauge overconfidence, while Doukas & Petmezas (2007) argue that heightened acquisitiveness is a direct measure of managerial overconfidence. However, the assumption that all firms with a high level of acquisitiveness have overconfident managers is debatable. Therefore, examining the impact of CEO overconfidence on the market reaction, specifically in the context of serial acquiring firms, is an interesting area for analysis. Research by Malmendier & Tate (2008) and John et al. (2010) on deals by both single and serial acquirers indicates that the market reaction is more negative for deals announced by overconfident CEOs. To answer the question whether deals announced by serial acquirers with overconfident CEOs experience a lower market reaction in comparison to non-overconfident CEOs, hypothesis 3 is tested:

Hypothesis 3: The acquirer market reaction to acquisitions announced by serial acquirers is lower for firms led by overconfident CEOs compared to non-overconfident CEOs.

3. RESEARCH DESIGN

This section provides the research design used to answer the research question and test the stated hypotheses. The independent, dependent, and control variables are described. In addition, the methodologies used to test the proposed hypotheses are discussed.

3.1. Independent variable: A measure for overconfidence

The primary independent variable of this paper is CEO overconfidence. Noticeably, CEO overconfidence is a subjective variable which cannot be directly observed. Current literature mainly adopts two techniques to proxy CEO overconfidence: a qualitative and a quantitative approach.

The qualitative approach involves the use of subjective evaluations from expert opinions using a survey to assess the degree of overconfidence in individual CEOs, as used in, for example, Ben-David et al. (2007) and Kaplan et al. (2022). Additionally, media portrayal of the CEO is also a common proxy to assess the level of overconfidence, used in, for example, Malmendier & Tate (2008) and John et al. (2010). However, the qualitative approach has several limitations. First, the subjective nature of the approach means that it can be prone to individual biases or perceptions of the expert evaluators. This can lead to inconsistent or unreliable measures of CEO overconfidence. Second, the qualitative approach can be time-consuming and expensive, requiring significant resources to gather and analyse data from multiple expert sources. Due to the scope of this paper, I do not construct an overconfident proxy using a qualitative approach.

Alternatively, researchers often rely on quantitative proxies to measure CEO overconfidence. Analysing the decisions on CEO stock option holdings is commonly adopted by researchers to measure CEO overconfidence quantitively (Malmendier & Tate, 2008; John et al., 2010; Campbell et al., 2011; Ferris et al., 2013). A quantitative approach allows for a systematic and objective classification of overconfidence, suitable for hypotheses testing and statistical analysis. Therefore, this study adopts a quantitative approach to proxy CEO overconfidence.

To construct a measure for overconfidence, I use CEO stock compensation data to analyse the personal portfolio decisions of a CEO that cause overexposure to the idiosyncratic risk of their firm, as developed

by Malmendier & Tate (2005, 2008). In the last decades, option-based payments have become an important component of CEO compensation. 'During the 1980s and especially the 1990s, stock options surged to become the largest component of top executive pay. Option compensation comprised only 20% of CEO pay in 1992 but rose to a staggering 49% in 2000.' (Frydman & Jenter, 2010, p. 81). However, CEOs cannot trade these options or hedge risk by short-selling company stock. In addition, the value of their human capital is closely connected to the performance of their firm (Malmendier & Tate, 2005). As a result, CEOs are under-diversified and should exercise their options early, given a sufficiently high stock price, because the marginal cost of keeping the option (increasing risk exposure) will exceed the marginal benefit of selling (Lambert et al., 1991; Hall & Murphy, 2002; Malmendier & Tate, 2005). Consequently, Malmendier & Tate (2005, 2008) link this logic to overconfident behaviour: CEOs that do not exercise deep in-the-money options well before expiration can be classified as overconfident because it signals an overestimated belief of the CEO about the future returns of the company.

Malmendier & Tate (2005, 2008) developed the *Holder67* variable to indicate that a CEO is overconfident. The paper states that a CEO is overconfident if he/she fails at least twice to exercise an option that is 67% in the money during the fifth holding year. The 67% threshold is based on the framework developed by Murphy & Hall (2002) and corresponds to a level at which rational CEOs should have exercised at least some part of the options, also keeping in mind (unobserved) CEO wealth, diversification, and risk aversion. Considering the sample of CEOs that fail to exercise twice, the CEO is classified as overconfident from the first instance he/she fails to exercise such an option and remains so for the rest of the sample period. This approach aligns with the idea that overconfidence is a permanent characteristic.

However, this study does not have access to detailed data on each CEO option grant. The available data shows aggregate information on all combined stock option grants per year. Therefore, I follow an alternative approach developed by Campbell et al. (2011) based on Malmendier & Tate (2005, 2008). The approach calculates the average moneyness of a CEO's option portfolio in each year to determine if a CEO is overconfident. Using average moneyness provides a less accurate proxy for overconfidence compared to the approach developed by Malmendier & Tate (2005, 2008). However, Campbell et al. (2011) show that it generates results similar to those in Malmendier & Tate (2005, 2008). To construct the overconfidence measure, I obtain company financial and CEO compensation data from the Wharton Research Data Services (WRDS) Compustat database.

The average moneyness is computed in three steps. First, the average realizable value per option is calculated by dividing the total realizable value of the options by the number of options held by the CEO, as shown in formula (1).

$$Average\ realizable\ value\ per\ option = \frac{Total\ realizable\ value\ of\ options}{Number\ of\ options\ held\ by\ CEO} \quad (1)$$

Second, the strike price is calculated by subtracting the average realizable value per option from the fiscal year-end stock price, as shown in formula (2).

$$Strike\ price = Fiscal\ year\ end\ stock\ price - Average\ realizable\ value\ per\ option \quad (2)$$

Third, the average moneyness of the options is calculated by dividing the stock price by the estimated strike price minus one, as shown in formula (3).

$$Average\ moneyness = \left(\frac{Stock\ price}{Strike\ price}\right) - 1 \quad (3)$$

Following the threshold developed by Malmendier & Tate (2005, 2008) and based on Hall and Murphy (2002), I classify a CEO as overconfident if he/she fails to exercise vested options that have an average moneyness of 67% or higher at least twice. Since I am only interested in options that can be exercised by the CEO, I only include vested options held by the CEO. Moreover, the overconfidence classification (OC_CEO) is assigned from the first instance, because I assume overconfidence is a permanent characteristic.

3.2. Dependent variables

The main dependent variables of interest are acquisition premium, target selection, and acquirer market response. The next sections describe the dependent variable construction.

3.2.1. Acquisition premium

The acquisition premium is defined as the deal value divided by the target's market value measured four weeks before the first announcement of the acquisition (Acqpremium_4wk). The four-week period is used to control for information leakage (Hayward & Hambrick, 1997; Krishnan et al., 2007). As a robustness check, I also include an acquisition premium defined as the deal value divided by the target's

market value measured one week before the first announcement of the acquisition (Acqpremium_1wk). Acquisition premium data is obtained from the Thomson Securities Data Corporation (Thomson-SDC) database.

3.2.2. Target selection

Target selection explains whether firms conduct a diversifying deal, defined by a binary variable equal to one if the deal is diversifying and equal to zero if not (Diversify_ff). A deal is classified as diversifying if the acquirer and target are not part of the same Fama-French (1997) 48 industry group (Malmendier & Tate, 2008; Ferris et al., 2013). As a robustness check, I also include an additional binary variable classifying a deal diversifying if the acquirer and target do not have the same two-digit SIC code (Diversify_sic). Data about acquirer and target industries is obtained from the Thomson Securities Data Corporation (Thomson-SDC) database.

3.2.3. Acquirer market response

For the acquirer market response, I adopt an event study to calculate the Cumulative Abnormal Return (CAR) for the acquiring firm around the announcement date, as explained in MacKinlay (1997). A short-window event study around a deal announcement provides statistically reliable evidence on whether the market perceives a deal to be value-creating or value-destroying (Andrade et al., 2001). Assuming capital markets are efficient, public information will be incorporated into stock prices. For this reason, deal announcements will result in quickly adjusting stock prices, incorporating the expected value changes. The CAR quantifies the overall impact of a deal announcement on the stock price of a company. It is calculated as the sum of the abnormal returns over a specified period surrounding the event, as shown in formula (4).

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{i,t} \tag{4}$$

In formula (4), $CAR_i(t_1,t_2)$ is the CAR of firm *i* between t_1 and t_2, and $AR_{i,t}$ is the abnormal return of firm *i* at time *t*. Abnormal returns are the difference between the actual returns of a stock and the expected returns estimated by a statistical model, in this case the market model. It is calculated using formula (5).

$$AR_{i,t} = R_{i,t} - E(R_{i,t}) \tag{5}$$

In formula (5), $AR_{i,t}$ is the abnormal return of firm *i* at time *t,* $R_{i,t}$ is the actual return of firm *i* at time *t*, and $E(R_{i,t})$ is the expected return of firm *i* at time *t*. Expected returns are calculated using the CAPM model (Sharpe, 1964; Lintner, 1965) and are constructed using formula (6).

$$E(R_{i,t}) = R_f + \beta_i * (R_m - R_f) + \varepsilon_i \quad (6)$$

In formula (6), $E(R_{i,t})$ is the expected return of firm *i* at time *t*, R_f is the risk-free rate, β_i is the return sensitivity of firm *i* to the market returns, R_m is the market return, and ε_i is the error term. The risk-free rate is proxied by the one-month U.S. treasury bill rate, and the market return is proxied by the S&P500 index. Expected returns are calculated during an estimation window (L_1) of 120 days (MacKinlay, 1997) with a trading day gap of 50 days to account for possible information leakage prior to the announcement.

This paper adopts an event window (L_2) of three days, as commonly used to analyse deal announcements (Andrade et al., 2001; Moeller et al., 2005). The announcement date of the deal corresponds to the event date, with one day before and after the event date, resulting in an event window of [-1, +1]. This event study is illustrated by the timeline in Figure 1.

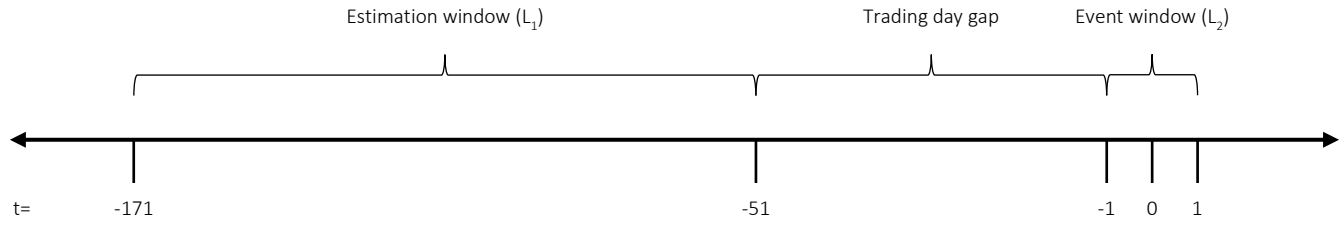

Figure 1: CAR [-1,+1] timeline

As a robustness test, I also include an event window of five days with the announcement date of the deal corresponding to the event date and two days before and after the event day, resulting in an event window of [-2, +2]. This event study is illustrated by the timeline in Figure 2.

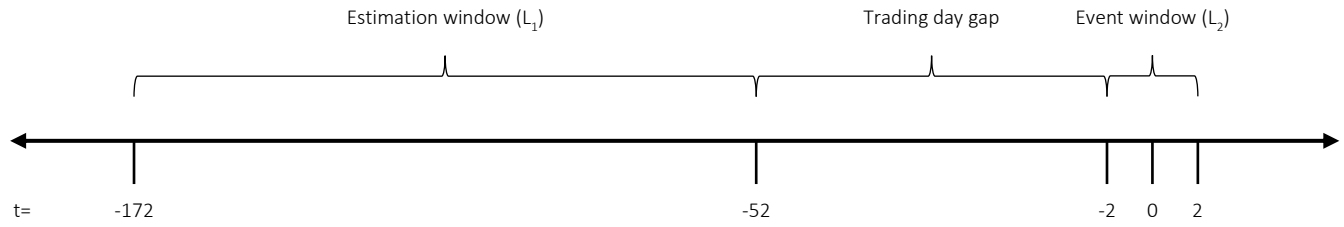

Figure 2: CAR [-2,+2] timeline

3.3. Control variables

In order to ensure that the relationship between the independent and dependent variables is not due to other factors, I control for several variables that could potentially influence the results of this study. These include control variables on a company- and deal level.

3.3.1. Company-level control variables

On the acquirer level, I control for firm size (Size) using the natural logarithm of total assets in millions as a proxy for firm size. Moeller et al. (2004) find that the announcement returns for small acquiring firms are higher compared to large acquiring firms, irrespective of the form of financing and robust to firm and deal characteristics.

In addition, I control for leverage at the acquiring firm (Leverage). A high leverage ratio pressures the availability of cash, due to repayment and interest obligations. This can help mitigate the agency costs that arise when managers lack sufficient incentives to act in the best interests of shareholders. By decreasing free cash flow, a higher leverage ratio motivates management to be as efficient as possible, reducing the risk of suboptimal investment behaviour (Jensen, 1986). Furthermore, research by Maloney et al. (1993) finds a positive relationship between the leverage of the acquiring firm and the abnormal returns of the acquirer at deal announcement. Leverage is defined as the ratio of a firm's total debt to its total assets (Reuer & Ragozzino, 2008; Laamanen & Keil, 2008).

Finally, I also control for Tobin's Q of the acquiring firm (Tobin). Tobin is a commonly used measure of firm performance that is calculated as the ratio of the market value of the firm to the replacement cost of its assets. It expresses the relationship between market valuation and intrinsic value. Research by Lang et al. (1989) and Servaes (1991) shows that for successful acquisitions, shareholders of high Tobin bidders gain significantly more than shareholders of low Tobin bidders. Tobin is constructed by dividing the market value of assets by the book value of assets.[2]

3.3.2. Deal-level control variables

On a deal level, I control for several factors that may impact the variables of interest. First, I create a dummy variable for hostile takeovers (Hostile) to account for the possibility that these types of acquisitions may result in lower returns for the acquiring firm. This finding is supported by previous research (Martynova & Renneboog, 2008) that shows hostile takeovers negatively impact the value of

[2] Tobin's Q is computed as the book value of assets minus the book value of equity plus the market value of equity, all divided by the book value of assets.

the bidding firm. Moreover, hostile bids are also related to higher bid premiums (Eckbo, 2009). In addition, I also created a dummy variable for cross-border deals (Crossborder) to control for the possibility that U.S. acquirers may experience lower announcement returns when acquiring targets outside the U.S. compared to domestic targets. Research by Moeller & Schlingemann (2005) has shown that cross-border deals may face additional cultural, regulatory, and legal challenges that could affect the performance of the acquiring firm.

Moreover, I control for acquirers that own a minority stake in the target company before the announcement (Minority). Prior research finds that toeholds are associated with lower offer premiums (Betton et al., 2009).

Furthermore, I control for tender offers. I create a dummy variable (Tender) for deals with tender offers. Rau & Vermaelen (1998) find that bidders in mergers underperform while bidders in tender offers overperform in the three years after the acquisition. I also control for the presence of multiple bidders since it can lead to overpaying because of the winner's curse (Slusky & Caves, 1991; Flanagan & O'Shaughnessy, 2003). I create a dummy variable (Multiple) equal to 1 of the number of bidders is equal to or larger than two. Additionally, I also created a dummy variable (Allcash) for transactions fully paid using cash to control for the method of payment. Deals with all cash payments are expected to perform better when compared to (partially) stock-paid deals (Travlos, 1987; Brown & Ryngaert, 1992; Masulis et al., 2007).

Finally, because acquisition premiums and CARs are influenced by time-variation and industry characteristics, I control for year and industry fixed effects (Laamanen, 2007; Madura et al., 2012).

3.4. Outliers

When analysing firm behaviour in M&A transactions, it is important to consider the presence of outliers in the key variables of interest. Outliers, which represent extreme values in the data, can significantly skew statistical analysis and produce biased results. To account for possible outliers in the variables of acquisition premium, firm size, and Tobin's Q, I employ a winsorizing technique at the 5% tails.

3.5. Methodology

The following section describes the regression models used to test the hypothesis of this study. The main independent variable of interest is CEO overconfidence (OC_CEO), which is defined as a CEO that failed to exercise vested options that have an average moneyness of 67% or higher at least twice. The

classification is assigned from the first instance, because I assume overconfidence is a permanent characteristic. To reduce the risk of omitted variable bias, I include various control variables, as described in section 3.3. Fixed effects are included to isolate time effects and industry variation.

The first hypothesis states that acquisition premiums paid by overconfident CEOs are higher when compared to deals conducted by non-overconfident CEOs. To test the first hypothesis, I estimate an ordinary least square (OLS) regression. The dependent variable is the acquisition premium (Acqpremium_4wk), defined as the deal value divided by the target's market value measured four weeks before the first announcement of the acquisition. As a robustness check, I also include an alternative variable for acquisition premiums (Acqpremium_1wk), defined as the deal value divided by the target's market value measured one week before the first announcement of the acquisition.

The OLS regression models to test hypothesis 1 are specified in equations (7) and (8).

$$\begin{aligned} Acqpremium\_4wk_i &= \beta_0 + \beta_1 OC\_CEO + \beta_2 Size + \beta_3 Leverage + \beta_4 Tobin + \beta_5 Hostile \\ &+ \beta_6 Crossborder + \beta_7 Minority + \beta_8 Tender + \beta_6 Multiple + \beta_6 Allcash \\ &+ \varepsilon_i \end{aligned} \quad (7)$$

$$\begin{aligned} Acqpremium\_1wk_i &= \beta_0 + \beta_1 OC\_CEO + \beta_2 Size + \beta_3 Leverage + \beta_4 Tobin + \beta_5 Hostile \\ &+ \beta_6 Crossborder + \beta_7 Minority + \beta_8 Tender + \beta_6 Multiple + \beta_6 Allcash \\ &+ \varepsilon_i \end{aligned} \quad (8)$$

In equations (7) & (8), β_i represents the coefficients of the variables, and ε_i represents the error term. I use (7) and (8) to test the null hypothesis $\beta_1 = 0$.

The second hypothesis states that overconfident CEOs are more likely to conduct diversifying deals. To test the second hypothesis, I estimate a logistic regression. The dependent variable is a binary variable for diversifying deals based on the Fama-French (1997) 48 industry groups (Diversify_ff). Diversify_ff is equal to 1 if the deal is diversifying, classified as acquirer and target not being part of the same Fama-French (1997) 48 industry group, and equal to zero if not. As a robustness check, I also use two-digit SIC codes (Diversify_sic) and classify a deal diversifying if the acquirer and target are not part of the same two-digit SIC code.

The logistic regression models to test hypothesis 2 are specified in equations (9) & (10).

$$\begin{aligned}\Pr\{\text{Diversify\_ff} = 1|OC\_CEO_{it}, X_{it}\} \\ = G(\beta_0 + \beta_1 OC\_CEO + \beta_2 Size + \beta_3 Leverage + \beta_4 Tobin + \beta_5 Hostile \\ + \beta_6 Crossborder + \beta_7 Minority + \beta_8 Tender + \beta_6 Multiple \\ + \beta_6 Allcash)\end{aligned} \tag{9}$$

$$\begin{aligned}\Pr\{\text{Diversify\_sic} = 1|OC\_CEO_{it}, X_{it}\} \\ = G(\beta_0 + \beta_1 OC\_CEO + \beta_2 Size + \beta_3 Leverage + \beta_4 Tobin + \beta_5 Hostile \\ + \beta_6 Crossborder + \beta_7 Minority + \beta_8 Tender + \beta_6 Multiple \\ + \beta_6 Allcash)\end{aligned} \tag{10}$$

Equations (9) and (10) model a logistic regression where X captures the control variables, and G represents the logistic distribution. I use (9) & (10) to test the null hypothesis $\beta_1 = 0$.

Finally, the third hypothesis states that deals conducted by overconfident CEOs result in lower stock market reactions when compared to deals conducted by non-overconfident CEOs. To test the third hypothesis, I estimate an OLS regression. Our dependent variable is the Cumulative Abnormal Return (CAR), which measures the change in the stock price of the acquirer firm in the event window surrounding the deal announcement. In line with Malmendier & Tate (2008), I use a three-day event window, defined as the day of the deal announcement and the days preceding and following the announcement. As a robustness check, I also use a five-day event window, defined as two days before the deal announcement and two days preceding the announcement, in line with Doukas & Petmezas (2007).

The OLS regression models to test hypothesis 3 are specified in equations (11) & (12).

$$\begin{aligned}CAR(-1,+1)_i = \beta_0 + \beta_1 OC - CEO + \beta_2 Size + \beta_3 Leverage + \beta_4 Tobin + \beta_5 Hostile \\ + \beta_6 Crossborder + \beta_7 Minority + \beta_8 Tender + \beta_6 Multiple \\ + \beta_6 Allcash + \varepsilon_i\end{aligned} \tag{11}$$

$$\begin{aligned}CAR(-2,+2)_i = \beta_0 + \beta_1 OC - CEO + \beta_2 Size + \beta_3 Leverage + \beta_4 Tobin + \beta_5 Hostile \\ + \beta_6 Crossborder + \beta_7 Minority + \beta_8 Tender + \beta_6 Multiple \\ + \beta_6 Allcash + \varepsilon_i\end{aligned} \tag{12}$$

In equations (11) & (12), β_i represents the coefficients of the variables, and ε_i represents the error term. I use (11) & (12) to test the null hypothesis $\beta_1 = 0$.

To ensure the validity and reliability of our regression results, it is crucial to test for and address heteroskedasticity in the OLS regressions. Heteroskedasticity refers to the presence of unequal variances in the error term of a linear regression model. This condition violates the homoskedasticity assumption of OLS regressions, potentially leading to inefficient and biased estimators (Croux et al., 2004). I perform a Breusch–Pagan/Cook–Weisberg and White's test on all OLS regressions to check for the presence of heteroskedasticity.[3] To account for heteroscedasticity in the data, I employ robust standard errors when heteroskedasticity is present. 'Robust standard errors remain valid when the error terms are not independent and identically distributed (i.d.d.) but suffer from heteroskedasticity or autocorrelation. A robust standard error consistently estimates the true standard error even for non-i.i.d. error terms.' (Croux et al., 2004, p. 2). For the logistic regressions, I cluster standard errors at firm level to account for heteroskedasticity and auto-correlation at the firm level (Malmendier & Tate, 2008).[4]

4. DATA & DESCRIPTIVE STATISTICS

This section presents the data used for this research. I elaborate on the data and sample selection process and present the descriptive statistics of the dataset. Furthermore, I present a correlation matrix for the variables of this study.

4.1. Data and sample selection

To test the formulated hypotheses, this study uses a dataset of publicly disclosed acquisitions of U.S. acquirers between 2006 and 2022. Because the focus of this research is on serial acquirers, I need a definition for serial acquisitions. I adapt the definition used by Laamanen & Keil (2008) and Chao (2018) and only include deals from firms that have completed at least four deals during a 10-year rolling window period.[5] I construct the measure for overconfidence using company financial and CEO data for

[3] I reject the null hypothesis of constant variance/homoskedasticity using a 5% significance level.

[4] Following Malmendier & Tate (2008), I verify the robustness of the results to clustering at the CEO rather than the firm level. Firm-level clustering is more stringent since it allows for the possibility that all of the firm's errors are correlated. CEO-level clustering instead assumes that observations of different CEOs within the same firm are independent. (Malmendier & Tate, 2008)

[5] For robustness purposes I also obtain a dataset for firms which have completed at least two deals during a five-year rolling window period.

acquirers from the Wharton Research Data Services (WRDS) Compustat database. I construct the dependent variables using deal data from the Thomson Securities Data Corporation (Thomson-SDC) database. In addition, I use the WRDS U.S. Daily Event Study tool to calculate relevant CAR data using the Market Model as described in detail in the research design section. I construct the control variables using both deal data from the Thomson-SDC database and company financial data from the WRDS Compustat database. I restrict the sample from 2006 to 2022 because executive compensation data with separate information about vested and unvested options is only available from 2006 to 2022. A detailed description of the collected data is presented in Table A1 in the appendix.

I adopt the following criteria to select relevant deal data from the Thomson-SDC database:

1. The deal is conducted by a serial acquirer. Following Laamanen & Keil (2008) and Chao (2018), I define serial acquirers as firms that have completed at least four acquisitions during a 10-year observation period.[6]
2. The deal is announced between 01/01/2006 and 31/12/2022.
3. The acquirer nation is the United States of America.
4. The acquirer and target company status is public.
5. Acquisition status is completed.
6. Acquisitions categorized in Thomson-SDC as acquisitions of remaining interest, privatizations, recapitalizations, repurchases, self-tenders, and spinoffs are excluded.[7]
7. Acquisitions with firms in the financial industry (SIC 6000 – 6799) and utility industry (SIC 4900 – 4999) are excluded.[8]
8. The acquirer owns less than 50% of the target before the announcement date and owns at least 50% of the target after the transaction is completed.
9. CEO compensation data of the acquiring firm is available in the WRDS Compustat database.

The final sample consists of 163 deal observations made by 49 CEOs from 25 serial acquirers listed in the United States.[9]

[6] A robustness sample is also collected including firms that have completed at least two deals during a five-year rolling window period.
[7] This research focuses on mergers & acquisitions. Therefore, deal types categorized as acquisitions of remaining interest, privatizations, recapitalizations, repurchases, self-tenders, and spinoffs are excluded (Chao, 2018).
[8] Following Ben-David et al. (2007), Doukas & Petmezas (2007), and John et al. (2010), I exclude financial and utility acquirer and target firms. These firms are regulated and therefore managers' investment biases are less likely to be as pronounced as in non-regulated firms (Doukas & Petmezas, 2007).
[9] The robustness sample consists of 330 deal observations made by 147 CEOs from 101 firms listed in the United States that completed at least two deals during a five-year rolling window period.

4.2. Descriptive statistics

This section describes the dataset of this study. Table 1 shows the number of observations (N), mean, standard deviation (SD), minimum (min), and maximum (max) for all variables in the serial acquirer sample with firms completing at least four deals during a rolling window of 10 years.[10]

Observing Table 1 shows us that 14.1% of CEOs are classified as overconfident, translating to 23 deals completed by overconfident CEOs and 140 deals completed by non-overconfident CEOs. This is slightly higher compared to Malmendier & Tate (2008) and Ferris et al. (2013), who have datasets with 9.8% and 10.4% overconfident CEOs, respectively. The distribution of overconfident CEOs is similar to the study by Hwang et al. (2020), who also have a dataset with 14.1% overconfident CEOs using a similar overconfidence measure. Looking at the dependent variables of interest, I observe an average acquisition premium (using data four weeks before the first announcement of the deal) of 53.0% for the full sample, which is in line with Hayward & Hambrick (1997), who find an average acquisition premium of 49%. Interestingly, comparing non-overconfident CEOs to overconfident CEOs, I observe an average acquisition premium of 52.4% and 56.6%, respectively, indicating that overconfident CEOs pay higher acquisition premiums, on average, compared to non-overconfident CEOs. Noticeably, I include negative acquisition premiums based on research by Weitzel & Kling (2018), who provide theoretical and empirical evidence that negative premiums do exist and are a rational phenomenon. Weitzel and Kling (2018) provide both theoretical and empirical evidence to support the idea that negative premiums are explained by "hidden earnouts" and corrections of overvaluation.[11] Additionally, I observe that 33.7% of deals are classified as diversifying using the Fama-French (1997) 48 industries and 30.1% of deals are classified as diversifying using two-digit SIC codes. This proportion is lower compared to Malmendier & Tate (2008), who find that 61.4% of deals are diversifying. However, Bharath et al. (2019) show that for serial acquirers, 36% of deals are classified as diversifying for a large sample of U.S. firms from 1980 to 2013, in line with the proportion of this study. Lastly, I observe that the acquirer CAR is, on average, slightly positive for the three-day time window [-1,+1], while it is on average negative for the five-day time window [-2,+2], with CARs corresponding to 0.01% [-1,+1] and -0.3% [-2,+2]. Inspecting the difference between non-overconfident and overconfident CEOs shows us that the three-day CAR is, on average, positive for non-overconfident CEOs, while it is, on average, negative for overconfident CEOs. The five-day CARs are both negative, on average, with a slightly more

[10] The descriptive statistics for the robustness sample with firms completing at least two deals during a rolling window of five-years are presented in Table A2.

[11] A “hidden earnout” is when target shareholders participate in the bidder's share of joint synergies (Weitzel & Kling, 2018).

negative CAR for overconfident CEOs. These observations are in line with expectations based on Malmendier & Tate (2008) and John et al. (2010).

Analysing the firm control variables shows us that there is no large firm size difference between non-overconfident and overconfident CEOs. The average natural logarithm of total assets in millions equals 9.7 for the full sample. Inspecting the leverage ratio shows us an average ratio of 23.8% for the full sample. Interestingly, overconfident CEOs have a lower average leverage ratio of 22.6% compared to 24% for non-overconfident CEOs. This could be explained by overconfident CEOs overestimating the firms' stand-alone value, creating a financing cost from the perspective of the CEO: Given the estimations of future returns, financiers will demand a higher interest rate, and new shareholders will demand a lower issue price relative to the expectations of the CEO (Malmendier & Tate, 2008). Overconfident CEOs may therefore be more reluctant to issue debt. Observing Tobin's Q shows us a sample average of 2.16 which is higher compared to the dataset of Malmendier & Tate (2008), who find an average Q of 1.42 but in line with data by John et al. (2010) and Ferris et al. (2013), who find an average Q of 2.04 and 1.96 respectively. Moreover, I observed a higher Q on average for overconfident CEOs of 2.63 compared to 2.08 for non-overconfident CEOs, in line with research by Mundi & Kaur (2019) and Kim et al. (2022).

Finally, observing the deal control variables shows us that only 0.6% of deals are hostile, and 12.3% are acquired outside the United States. Additionally, the average minority share for acquirers is 0.32%. Moreover, 39.3% of acquirers launched a tender offer, and 5.5% of deals had two bidders or more. Notably, 77.3% of deals were paid using 100% cash which is high compared to the sample of Doukas & Petmezas (2007), who found that 57% of serial acquirer deals are paid using 100% cash. Malmendier & Tate (2008) use a dataset where 38.8% of deals by overconfident CEOs are paid using 100% cash, and 33.5% of deals by non-overconfident CEOs are paid using 100% cash. However, both studies use a dataset from before 2006. A more recent study by Klitzka et al. (2022) analysed mergers and acquisitions payment methods in large transactions of public U.S. acquirers between 2009 and 2016 and found that 73.59% of deals are financed solely with cash. Additionally, De Bodt et al. (2018) observe that since 2001, the number of solely stock-financed M&A declined significantly from around 62% in 2000 to approximately 10% in 2010. The reduction in full-stock acquisitions is due to the abolishment of pooling and goodwill amortization in the United States (SFAS 141 and 142) in 2001 (De Bodt et al., 2018). The abolishment of pooling and goodwill amortization in the U.S. in 2001 explains the higher proportion of fully cash-paid deals in this dataset compared to the dataset used in Doukas & Petmezas (2007) and Malmendier & Tate (2008).

4.3. Correlation matrix

Table 2 shows a correlation matrix between the variables of this study. I analysed Table 2 to check that no multicollinearity is detected by examining the correlations among the explanatory variables. Multicollinearity has several consequences, such as inflated standard errors for the estimated parameters of collinear variables, significant sampling variability leading to a wide variation in estimated parameters across different samples, and inaccurate interpretation of the effects of explanatory variables due to their interdependence, where changes in one variable are inevitably linked to changes in another (Alin, 2010; Tay, 2017). Therefore, checking that no multicollinearity is present is essential to ensure reliable estimation parameters. Correlation values should not exceed the typical threshold range from 0.6 to 0.8 (Tay, 2017, p. 2006). Additionally, the variance inflation factor (VIF) is often recommended as another selection criterion to detect multicollinearity, with typical threshold values of 5-10 (Tay, 2017, p. 2006).

Analysing Table 2 shows that no multicollinearity problems are detected. Between the control variables, there are no correlations exceeding the lowest threshold of 0.6. Additionally, I perform a VIF check for all OLS regressions and find that no VIF values above five are detected, supporting the observations from the correlation matrix that no multicollinearity is present.[12]

[12] I verify that there are also no multicollinearity problems in the robustness sample of firms completing at least two deals within a five-year rolling window period. No correlations exceeding the lowest threshold of 0.6 and VIF values above five are observed for the robustness sample. The correlation matrix for the robustness sample is found in Table A3.

TABLE 1: Summary Statistics for the Serial Acquirers Dataset

Notes: The sample consists of 163 observations of publicly disclosed acquisitions for U.S. serial acquirers between 2006 and 2022. Serial acquirers are defined as firms that have completed at least four acquisitions during a 10-year rolling window period. Deal data is obtained from the Thomson Securities Data Corporation database. Additional company and CEO data is obtained from the Wharton Research Data Services Compustat database. CARs are calculated using the WRDS U.S. Daily Event Study tool.

	Full sample					Non-overconfident CEOs					Overconfident CEOs				
	N	mean	SD	min	max	N	mean	SD	min	max	N	mean	SD	min	max
Independent variable															
OC_CEO	163	0.141	0.349	0	1										
Dependent variables															
Acqpremium_4wk	163	52.98	37.92	-7.61	133.1	140	52.38	38.25	-7.61	133.1	23	56.61	36.48	16.22	133.1
Acqpremium_1wk	162	45.15	35.79	-4.69	129.63	139	44.23	36.35	-4.69	129.63	23	50.66	32.38	9.68	129.63
Diversify_ff	163	0.337	0.474	0	1	140	0.343	0.476	0	1	23	0.304	0.47	0	1
Diversify_sic	163	0.301	0.46	0	1	140	0.336	0.474	0	1	23	0.087	0.288	0	1
CAR[-1,+1]	154	0.0126	3.123	-10.43	8.713	131	0.0619	3.232	-10.43	8.713	23	-0.268	2.449	-9.153	2.845
CAR[-2,+2]	154	-0.315	3.787	-12.48	13.14	131	-0.281	3.962	-12.48	13.14	23	-0.511	2.632	-9.459	3.257
Firm control variables															
Size	163	9.724	0.935	6.234	10.24	140	9.68	0.991	6.234	10.24	23	9.994	0.384	8.985	10.24
Leverage	163	0.238	0.135	0	0.689	140	0.24	0.141	0	0.689	23	0.226	0.0864	0.0989	0.353
Tobin's Q	163	2.159	0.69	1.038	4.703	140	2.082	0.619	1.038	4.161	23	2.625	0.907	1.516	4.703
Deal control variables															
Hostile (dummy)	163	0.00613	0.0783	0	1	140	0.00714	0.0845	0	1	23	0	0	0	0
Crossborder (dummy)	163	0.123	0.329	0	1	140	0.114	0.319	0	1	23	0.174	0.388	0	1
Minority	163	0.323	2.355	0	19.9	140	0.234	1.919	0	19.9	23	0.865	4.15	0	19.9
Tender (dummy)	163	0.393	0.49	0	1	140	0.357	0.481	0	1	23	0.609	0.499	0	1
Multiple (dummy)	163	0.0552	0.229	0	1	140	0.05	0.219	0	1	23	0.087	0.288	0	1
Allcash (dummy)	163	0.773	0.42	0	1	140	0.779	0.417	0	1	23	0.739	0.449	0	1

TABLE 2: Correlation Matrix for the Serial Acquirers Dataset

Notes: The sample consists of 163 observations of publicly disclosed acquisitions for U.S. serial acquirers between 2006 and 2022. Serial acquirers are defined as firms that have completed at least four acquisitions during a 10-year rolling window period. Deal data is obtained from the Thomson Securities Data Corporation database. Additional company and CEO data is obtained from the Wharton Research Data Services Compustat database. CARs are calculated using the WRDS U.S. Daily Event Study tool.

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1.	OC_CEO	1.00															
2.	Acqpremium_4wk	0.03	1.00														
3.	Acqpremium_1wk	0.05	0.86***	1.00													
4.	Diversify_ff	-0.03	-0.11	-0.06	1.00												
5.	Diversify_sic	-0.19*	-0.10	-0.06	0.87***	1.00											
6.	CAR[-1,+1]	-0.04	-0.00	0.00	-0.00	-0.01	1.00										
7.	CAR[-2,+2]	-0.02	0.04	0.08	-0.04	-0.02	0.85***	1.00									
8.	Size	0.12	0.15	0.13	0.21**	0.19*	-0.07	-0.03	1.00								
9.	Leverage	-0.03	-0.07	-0.10	-0.23**	-0.25**	-0.12	-0.07	-0.28***	1.00							
10.	Tobin	0.26**	0.02	0.06	-0.02	-0.06	-0.08	-0.05	0.18*	-0.11	1.00						
11.	Hostile (dummy)	-0.03	0.04	0.06	-0.06	-0.05	0.05	0.08	-0.21**	0.01	-0.10	1.00					
12.	Crossborder (dummy)	0.05	-0.05	-0.02	0.21**	0.18*	0.03	-0.04	-0.09	-0.08	0.08	0.21**	1.00				
13.	Minority	0.09	0.01	-0.03	0.12	0.03	0.02	0.01	0.01	-0.05	0.01	-0.01	0.28***	1.00			
14.	Tender (dummy)	0.17*	0.31***	0.22**	-0.15	-0.28***	0.13	0.07	0.15	-0.13	0.07	0.10	-0.09	0.05	1.00		
15.	Multiple (dummy)	0.05	0.11	0.04	-0.12	-0.16*	0.05	-0.03	-0.14	0.02	-0.10	-0.02	-0.01	-0.04	0.13	1.00	
16.	Allcash (dummy)	-0.03	0.17*	0.14	0.03	0.04	0.21**	0.15	0.15	-0.10	0.15	0.04	0.07	0.08	0.08	0.00	1.00

* Significant at 5%; ** significant at 1%; *** significant at 0.1%

5. RESULTS

This section provides the empirical findings of this research. To answer my research question: 'Does CEO overconfidence affect merger & acquisition activity for publicly listed serial acquirers in the United States between 2006 and 2022?', I test three hypotheses. First, I analyse whether the acquisition premiums of serial acquirers are higher for firms with overconfident CEOs compared to non-overconfident CEOs using OLS regressions. Second, I analyse whether serial acquirers are more likely to conduct diversifying deals when the firm is led by an overconfident CEO compared to a non-overconfident CEO using logistic regressions. Third, I analyse whether the cumulative abnormal returns around a deal announcement of a serial acquirer are lower for firms led by overconfident CEOs compared to non-overconfident CEOs using OLS regressions. The main variable of interest is CEO overconfidence (OC_CEO). I classify a CEO as overconfident if he/she fails to exercise vested options that have an average moneyness of 67% or higher at least twice. The aim of this section is to establish a connection between the obtained results and the existing literature. Through this analysis, I aim to determine whether the formulated hypotheses are supported or rejected by the results. I adopt an alpha level of 5% to determine statistical significance, as commonly used in research (Maier & Lakens, 2022). Additionally, all sections include robustness checks on the findings to ensure the reliability and validity of the results.

5.1. Hypothesis 1: Acquisition premium

This subsection analyses acquisition premiums paid by serial acquirers to test hypothesis 1. I test if acquisition premiums are higher for serial acquirers with overconfident CEOs compared to non-overconfident CEOs using OLS regressions. Table 3 presents the results that test hypothesis 1. The dependent variable is the acquisition premium, defined as the deal value divided by the target's market value measured four weeks before the first announcement of the acquisition in Columns (1), (2) and (3). For robustness purposes, the target's market value is measured one week before the first announcement of the acquisition in Columns (4), (5) and (6). Columns (1) and (4) present the basic regression between acquisition premium and OC_CEO. Columns (2) and (5) add control variables, year fixed effects and industry fixed effects using Fama-French (1997) 48 industry group classification. Columns (3) and (6) add control variables, year fixed effects and industry fixed effects using two-digit SIC codes as a robustness check.

Analysing Table 3 shows that for all models, the coefficient for CEO overconfidence is not statistically significant at the predetermined 5% level. The findings of this study differ from previous research by

Hayward & Hambrick (1997) and John et al. (2010), who find that overconfidence is significantly and positively correlated with acquisition premiums.

Observing the control variables shows that Allcash is statistically significant at a 5% level for Columns (2), (5) and (6), while Column (3) is not significant at the 5% level. The results from Columns (2), (5) and (6) indicate that deals fully paid with cash have, on average, between 14.4% to 16.0% higher acquisition premiums compared to not fully cash-paid deals, in line with research by Wansley et al. (1983) and De La Bruslerie (2013).

For robustness purposes, I also test hypothesis 1 using a sample with firms that completed at least two deals during a five-year rolling window. The OLS regression results are presented in Table A4 in the appendix. Consistent with the finding of Table 3, I observe that none of the CEO overconfidence coefficients are statistically significant in the robustness sample. Analysing the control variables in Table A4 shows that Allcash is significant at 5% in Column (3) and significant at 1% in Columns (5) and (6), implying that deals fully paid with cash have, on average, higher acquisition premiums compared to not fully cash paid deals. However, the coefficients are lower compared to Table 3, ranging from 10.1% in Column (3) to 13.6% in Column (6). Moreover, Table A4 shows that Multiple is significant at 5% for Columns (2), (3), (5) and (6), meaning that deals with multiple bidders have, on average, higher acquisition premiums ranging from 18.1% in Column (6) to 30.0% in Column (2), in line with previous research (Slusky & Caves, 1991; Flanagan & O'Shaughnessy, 2003). Moreover, Columns (3), (5), and (6) show that Minority is statistically significant at 5%, indicating that acquirers with toehold positions pay on average lower acquisition premiums ranging from -1.3% in Column (3) to -2.1% in Column (6), consistent with results by Betton et al. (2009). Lastly, Columns (2) and (5) show that Hostile is statistically significant at 5% and 1%, respectively, indicating that hostile deals pay, on average, higher acquisition premiums, in line with results by Eckbo (2009). However, the results become insignificant in Columns (3) and (6) when two-digit SIC codes are used to control for industry fixed effects instead of the Fama-French (1997) 48 industries.

Overall, the results of this study show that I am unable to reject the null hypothesis that serial acquiring firms with overconfident CEOs pay higher acquisition premiums compared to non-overconfident CEOs. This implies that I find no sufficient evidence for a positive relationship between CEO overconfidence and acquisition premiums in serial acquisitions, therefore not accepting hypothesis 1.

TABLE 3: The Impact of CEO Overconfidence on the Acquisition Premiums Paid by Serial Acquirers

Notes: This table reports the results of OLS regressions with acquisition premium paid by the acquiring firm as the dependent variable. Acquisition premium is defined as the deal value divided by the target's market value measured four weeks before the first announcement of the acquisition in Columns (1), (2) and (3). Acquisition premium is defined as the deal value divided by the target's market value measured one week before the first announcement of the acquisition in Columns (4), (5) and (6). The sample consists of 163 observations of publicly disclosed acquisitions for U.S. public serial acquirers between 2006 and 2022. Serial acquirers are defined as firms that have completed at least four acquisitions during a 10-year rolling window period. Deal data is obtained from the Thomson Securities Data Corporation database. Additional company and CEO data is obtained from the Wharton Research Data Services Compustat database. Overconfident CEO (OC_CEO) equals one if the acquiring CEO does not exercise an at least 67% in-the-money exercisable option twice. The overconfident classification starts from the first instance the CEO fails to exercise an at least 67% in-the-money exercisable option. Size is defined as the natural logarithm of total assets in millions for the acquiring firm. Leverage is defined as the ratio of the acquirer's total debt to its total assets. Tobin is defined by dividing the market value of assets by the book value of assets for the acquiring firm. Hostile is a dummy equal to one if the deal is classified as hostile. Crossborder is a dummy equal to one if the target firm was outside the nation of the acquiring firm. Minority is defined by the percentage of shares in the target company held by the acquiring company six months prior to the deal. Tender is a dummy equal to one if the acquirer launched a tender offer for the target. Multiple is a dummy equal to one if there were two or more bidding firms for the target. Allcash is a dummy equal to one if the acquirer paid for the deal using 100% cash. Columns (1) and (4) presents the basic regression between Acquisition premium and OC_CEO. Columns (2) and (5) add the identified control variables explained in section 3.3 in addition to year fixed effects and industry fixed effects using the Fama-French (1997) 48 industry group classification, while Columns (3) and (6) adopt industry fixed effects using two-digit SIC codes.

	(1)	(2)	(3)	(4)	(5)	(6)
OC_CEO	4.224	9.574	7.852	6.429	17.465	18.436
	(0.49)	(0.79)	(0.63)	(0.80)	(1.55)	(1.65)
Size		-4.658	-4.462		-5.158	-5.468
		(-1.41)	(-1.33)		(-1.24)	(-1.28)
Leverage		-24.763	-21.942		-51.110*	-51.093*
		(-0.93)	(-0.83)		(-1.97)	(-1.96)
Tobin		-2.988	-2.488		-3.034	-3.732
		(-0.62)	(-0.44)		(-0.60)	(-0.68)
Hostile		11.898	12.251		38.337	38.074
		(0.63)	(0.65)		(1.00)	(0.99)
Crossborder		1.814	2.297		3.027	2.928
		(0.18)	(0.23)		(0.32)	(0.31)
Minority		-0.470	-0.463		-1.692	-1.696
		(-0.34)	(-0.33)		(-1.25)	(-1.26)
Tender		9.196	9.135		-0.663	-0.893
		(1.48)	(1.46)		(-0.10)	(-0.14)
Multiple		23.970	23.665		12.913	13.037
		(1.21)	(1.19)		(1.05)	(1.06)
Allcash		14.390**	14.437*		15.970**	15.876**
		(1.99)	(1.97)		(2.36)	(2.34)
Constant	52.383***	77.413*	72.360*	44.232***	64.363	78.451*
	(16.31)	(1.87)	(1.71)	(14.55)	(1.40)	(1.67)
Industry Fixed Effects	No	Yes	Yes	No	Yes	Yes
Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Observations	163	163	163	162	162	162
Adjusted R^2	-0.005	0.205	0.201	-0.002	0.200	0.200

* Significant at 10%; ** significant at 5%; *** significant at 1%. t-Statistics in parentheses.

5.2. Hypothesis 2: Target selection

This subsection analyses the target selection of serial acquirers to test hypothesis 2. I test whether serial acquirers are more likely to conduct diversifying deals when led by overconfident CEOs compared to non-overconfident CEOs using a logistic regression model. Table 4 presents the results that test hypothesis 2. Columns (1)-(4) present the results for the serial acquirer sample defined by firms that have completed at least four acquisitions during a 10-year rolling window period. For robustness purposes, I include the results for the sample with firms that have completed at least two acquisitions during a five-year rolling window period in Columns (5)-(8). The dependent variable is a binary variable equal to one if the deal is diversifying and equal to zero if not. A deal is classified as diversifying if the acquirer and target are not part of the same Fama-French (1997) 48 industry group in Columns (1), (2), (5) and (6). As a robustness check, I also classify deals diversifying if the acquirer and target are not part of the same two-digit SIC code in Columns (3), (4), (7) and (8). Columns (1), (3), (5) and (7) present the basic logistic regression between the diversification dummy and OC_CEO. Columns (2) and (6) add control variables, year fixed effects and industry fixed effects using the Fama-French (1997) 48 industry group classification, while Columns (4) and (8) adopt industry fixed effects using two-digit SIC codes.

Inspecting Table 4 shows that for all models, the CEO overconfidence coefficient is not statistically significant. The results of Table 4 are consistent with Hwang et al. (2020), who adopt two-digit SIC codes to identify diversifying deals and find that firms with personality-led overconfident CEOs (resulting from managerial hubris) do not affect the types of deals. However, the results of Table 4 differ from research by Malmendier & Tate (2008) and Ferris et al. (2013). Both Malmendier & Tate (2008) and Ferris et al. (2013) adopt the Fama-French (1997) 48 industry groups to identify diversifying deals and find a significant and positive relation between CEO overconfidence and the probability to conduct diversifying deals.

Examining the control variables shows that Size is statistically significant at 1% in Column (2), with a coefficient of 0.77 and statistically significant at 5% in Columns (6) and (8), with respective coefficients of 0.45 and 0.44. The coefficients correspond to an odds-ratio of 2.17 for Column (2), 1.57 for Column (6), and 1.55 for Column (8), meaning that a one-unit increase in Size increases the odds of conducting a diversifying merger by a factor 1.55 to 2.17. These findings are in line with research on the positive relationship between firm size and diversification by Grossmann (2007) and Benito-Osorio et al. (2015). Additionally, Minority is statistically significant at 1% in Column (2), with a coefficient of 0.15 and an odds-ratio of 1.17. Minority is also statistically significant at 5% in Column (6), with a coefficient of 0.10 and an odds ratio of 1.10. Indicating that a one-unit increase in minority holdings increases the odds of

conducting a diversifying merger by a factor 1.10 to 1.17. However, the coefficient for Minority is not significant in Columns (4) and (8), when two-digit SIC codes are used to control for industry fixed effects instead of the Fama-French (1997) 48 industries.

In summary, I am unable to reject the null hypothesis that there is no difference between the likelihood of conducting a diversifying deal for serial acquirers led by overconfident CEOs compared to non-overconfident CEOs. Therefore, this study shows no evidence for a positive relationship between the likelihood of conducting a diversifying deal and CEO overconfidence among serial acquirers. Thus, hypothesis 2 cannot be accepted.

TABLE 4: Probability of Conducting a Diversifying Deal for Serial Acquirers and Firms Completing Two Deals in Five Years

Notes: This table reports the results of logistic regressions with a diversification deal dummy as the dependent variable. The binary diversification variable is equal to one if the deal is diversifying and equal to zero if not. A deal is classified as diversifying if the acquirer and target are not part of the same Fama-French (1997) 48 industry group in Columns (1), (2), (5) and (6). A deal is classified as diversifying if the acquirer and target are not part of the same two-digit SIC code in Columns (3), (4), (7) and (8). The sample consists of publicly listed firms in the U.S. between 2006 and 2022. Firms that have completed at least four acquisitions during a 10-year rolling window period are presented in Columns (1)-(4). Firms that have completed at least two acquisitions during a five-year rolling window are presented in Columns (5)-(8). Deal data is obtained from the Thomson Securities Data Corporation database. Additional company and CEO data is obtained from the Wharton Research Data Services Compustat database. Overconfident CEO (OC_CEO) equals one if the acquiring CEO does not exercise an at least 67% in-the-money exercisable option twice. The overconfident classification starts from the first instance the CEO fails to exercise an at least 67% in-the-money exercisable option. Size is defined as the natural logarithm of total assets in millions for the acquiring firm. Leverage is defined as the ratio of the acquirer's total debt to its total assets. Tobin is defined by dividing the market value of assets by the book value of assets for the acquiring firm. Hostile is a dummy equal to one if the deal is classified as hostile. Crossborder is a dummy equal to one if the target firm was outside the nation of the acquiring firm. Minority is defined by the percentage of shares in the target company held by the acquiring company six months prior to the deal. Tender is a dummy equal to one if the acquirer launched a tender offer for the target. Multiple is a dummy equal to one if there were two or more bidding firms for the target. Allcash is a dummy equal to one if the acquirer paid for the deal using 100% cash. Columns (1), (3), (5) and (7) presents the basic logistic regression between the diversification dummy and OC_CEO. Columns (2) and (6) add the identified control variables explained in section 3.3 in addition to year fixed effects and industry fixed effects using the Fama-French (1997) 48 industry group classification, while Columns (4) and (8) adopt industry fixed effects using two-digit SIC codes.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OC_CEO	-0.176	-1.312*	-1.669	-1.669	-0.290	-0.586	-0.568	-1.216*
	(-0.26)	(-1.83)	(-1.48)	(-1.11)	(-0.69)	(-0.97)	(-1.19)	(-1.85)
Size		0.773***		0.621*		0.451**		0.437**
		(2.79)		(1.79)		(2.39)		(2.37)
Leverage		-0.811		-5.017*		-3.664***		-2.643**
		(-0.38)		(-1.65)		(-2.73)		(-2.32)
Tobin		0.062		0.234		-0.251		-0.392
		(0.19)		(0.41)		(-0.84)		(-1.30)
Hostile		0.000		0.000		0.000		0.000
		(.)		(.)		(.)		(.)
Crossborder		0.988		0.073		0.767*		1.065**
		(1.25)		(0.08)		(1.95)		(2.53)
Minority		0.154***		0.006		0.096**		0.063
		(3.11)		(0.06)		(2.42)		(1.13)
Tender		-0.615		-1.887**		-0.330		-0.702
		(-0.93)		(-2.46)		(-0.71)		(-1.64)
Multiple		-1.680		0.000		-0.761		-1.795*
		(-1.40)		(.)		(-1.42)		(-1.87)
Allcash		-0.808		-0.149		-0.142		0.166
		(-1.12)		(-0.17)		(-0.30)		(0.32)
Constant	-0.651**	-7.217**	-0.682*	-4.365	-0.715***	-2.997	-0.732***	-1.179
	(-1.98)	(-2.20)	(-1.82)	(-1.21)	(-3.45)	(-1.45)	(-3.25)	(-0.49)
Industry Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Year Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	163	152	163	143	330	283	330	278

* Significant at 10%; ** significant at 5%; *** significant at 1%. t-Statistics in parentheses.

5.3. Hypothesis 3: Acquirer market response

This subsection analyses acquisition premiums paid by serial acquirers to test hypothesis 3. I test if the acquirer market reaction to acquisitions announced by serial acquirers is lower for firms led by overconfident CEOs compared to non-overconfident CEOs using OLS regressions. Table 5 presents the results that test hypothesis 3. The dependent variable is the cumulative abnormal return of the acquiring company with an event window from the day before through the day after the announcement of the deal [-1,+1] in Columns (1), (2) and (3). For robustness purposes, I also include an event window two days before through two days after the announcement of the deal [-2,+2] in Columns (4), (5) and (6). Columns (1) and (4) present the basic regression between the cumulative abnormal return and OC_CEO. Columns (2) and (5) add control variables, year fixed effects and industry fixed effects using Fama-French (1997) 48 industry group classification. Columns (3) and (6) add control variables, year fixed effects and industry fixed effects using two-digit SIC codes as a robustness check.

Observing Table 5 shows us that for all models, the coefficient for CEO overconfidence is not statistically significant. The results of this study are not in line with previous research by Malmendier & Tate (2008) and John et al. (2010). Both studies report a negative announcement effect for deals announced by overconfident CEOs.

Examining the control variables shows that Allcash is statistically significant at a 1% level in Columns (2) and (3) and statistically significant at a 5% level in Columns (5) and (6). The coefficients range from 2.1 to 2.0, respectively. Meaning that serial acquirers that pay deals with 100% cash experience on average 2.0% to 2.1% higher cumulative abnormal returns. In line with the previous literature, which states that deals with all cash payments perform better when compared to (partially) stock-paid deals (Travlos, 1987; Brown & Ryngaert, 1991; Masulis et al., 2007).

For robustness purposes, I also test hypothesis 3 using a sample with firms that completed at least two deals during a five-year rolling window. The OLS regression results are presented in Table A5 in the appendix. In line with the finding of Table 5, I observe that none of the CEO overconfidence coefficients are statistically significant in the robustness sample.

All in all, the results of this study show that I am unable to reject the null hypothesis that overconfident CEOs of serial acquirers experience lower acquirer market responses to deal announcements compared to non-overconfident CEOs. I do not find sufficient evidence for a negative relationship between CEO overconfidence and acquirer market response in serial acquirers. Thus, I cannot accept hypothesis 3.

TABLE 5: The Impact of CEO Overconfidence on the Cumulative Abnormal Returns Around Deal Announcements by Serial Acquirers

Notes: This table reports the results of OLS regressions with CAR for the acquirer as the dependent variable. Columns (1), (2) and (3) adopt a three-day CAR [-1,+1], Columns (4), (5), and (6) adopt a five-day CAR [-2,+2]. The sample consists of 154 observations of publicly disclosed acquisitions for U.S. public serial acquirers between 2006 and 2022. Serial acquirers are defined as firms that have completed at least four acquisitions during a 10-year rolling window period. Deal data is obtained from the Thomson Securities Data Corporation database. Additional company and CEO data is obtained from the Wharton Research Data Services Compustat database. CARs are calculated by taking the daily return of the acquirer's common equity and subtracting expected returns. Expected returns are calculated using the daily returns of the S&P 500 index. Overconfident CEO (OC_CEO) equals one if the acquiring CEO does not exercise an at least 67% in-the-money exercisable option twice. The overconfident classification starts from the first instance the CEO fails to exercise an at least 67% in-the-money exercisable option. Size is defined as the natural logarithm of total assets in millions for the acquiring firm. Leverage is defined as the ratio of the acquirer's total debt to its total assets. Tobin is defined by dividing the market value of assets by the book value of assets for the acquiring firm. Hostile is a dummy equal to one if the deal is classified as hostile. Crossborder is a dummy equal to one if the target firm was outside the nation of the acquiring firm. Minority is defined by the percentage of shares in the target company held by the acquiring company six months prior to the deal. Tender is a dummy equal to one if the acquirer launched a tender offer for the target. Multiple is a dummy equal to one if there were two or more bidding firms for the target. Allcash is a dummy equal to one if the acquirer paid for the deal using 100% cash. Columns (1) and (4) present the basic regression between the CAR and OC_CEO. Columns (2) and (5) add the identified control variables explained in section 3.3 in addition to year fixed effects and industry fixed effects using the Fama-French (1997) 48 industry group classification, while Columns (3) and (6) adopt industry fixed effects using two-digit SIC codes.

	(1)	(2)	(3)	(4)	(5)	(6)
OC_CEO	-0.330	-0.308	-0.133	-0.229	-1.070	-0.601
	(-0.47)	(-0.28)	(-0.12)	(-0.27)	(-0.77)	(-0.46)
Size		0.620	0.593		0.729	0.656
		(1.11)	(1.08)		(1.23)	(1.07)
Leverage		-3.443	-3.678		-3.601	-4.234
		(-1.22)	(-1.34)		(-1.04)	(-1.23)
Tobin		-0.255	-0.322		-0.110	-0.291
		(-0.40)	(-0.51)		(-0.15)	(-0.40)
Hostile		-0.503	-0.542		2.402	2.298
		(-0.24)	(-0.26)		(0.94)	(0.91)
Crossborder		0.443	0.401		-0.419	-0.534
		(0.53)	(0.50)		(-0.39)	(-0.52)
Minority		-0.032	-0.033		-0.006	-0.008
		(-0.31)	(-0.32)		(-0.06)	(-0.08)
Tender		0.858	0.853		0.205	0.192
		(1.22)	(1.20)		(0.21)	(0.20)
Multiple		-0.587	-0.559		-1.437	-1.363
		(-0.41)	(-0.39)		(-1.00)	(-0.94)
Allcash		2.086***	2.083***		1.992**	1.984**
		(2.82)	(2.82)		(2.38)	(2.36)
Constant	0.062	-7.217	-6.781	-0.281	-8.513	-6.090
	(0.23)	(-1.29)	(-1.12)	(-0.85)	(-1.39)	(-0.88)
Industry Fixed Effects	No	Yes	Yes	No	Yes	Yes
Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Observations	154	154	154	154	154	154
Adjusted R^2	-0.005	0.017	0.020	-0.006	-0.035	-0.050

* Significant at 10%; ** significant at 5%; *** significant at 1%. t-Statistics in parentheses.

6. DISCUSSION

This section discusses the results obtained in this study. I study the effects of CEO overconfidence in public serial acquirers in the U.S. by testing three hypotheses. First, I tested the hypothesis that serial acquiring firms led by overconfident CEOs pay higher acquisition premiums compared to non-overconfident CEOs using an OLS regression. Second, I tested the hypothesis that there is a difference between the likelihood of conducting a diversifying deal for serial acquirers led by overconfident CEOs compared to non-overconfident CEOs using a logistic regression. Third, I tested the hypothesis that overconfident CEOs of serial acquirers experience lower acquirer market responses to deal announcements compared to non-overconfident CEOs using an OLS regression. Taking several robustness checks into account, I found no evidence for a significant relationship between CEO overconfidence and its effect on acquisition premiums, target selection or acquirer market response in serial acquisitions. The following sections will discuss the findings and implications of each hypothesis by relating it to previous research. In addition, I will discuss the limitations of this study and provide suggestions for future research.

6.1. Hypothesis 1: Acquisition premium

The results of this study show that I am unable to reject the null hypothesis that serial acquiring firms led by overconfident CEOs pay higher acquisition premiums compared to non-overconfident CEOs. The findings of this study differ from previous research on the effect of CEO overconfidence on the acquisition premium (Hayward & Hambrick, 1997; John et al., 2010).

Differences between the results of this study and previous research can be explained by two possible factors: sample selection and differences in the methodology. The studies by Hayward & Hambrick (1997) and John et al. (2010) differ from this research because they analyse the effects of CEO overconfidence in acquisitions conducted by firms in general and do not use a sample selection for serial acquisitions. Additionally, both studies analyse a different timeframe, Hayward & Hambrick (1997) study acquisitions in 1989 and 1992, while John et al. (2010) study acquisitions between 1993 and 2005. Moreover, Hayward & Hambrick (1997) adopts a different measure for overconfidence compared to this study; the study uses four factors to indicate overconfidence: the acquiring firms' recent performance, recent media praise for the CEO, a measure of the CEO's self-importance, and a combination factor of these three variables. In contrast, John et al. (2010) adopted a similar methodology as used in this study.

The empirical results suggest that overconfidence may not be a crucial factor in determining the acquisition premiums paid by serial acquirers. This observation could be explained by the fact that serial acquirers, in general, pay high acquisition premiums. Smit & Moraitis (2010) argued that serial acquirers acknowledge the presence of additional growth options and are, therefore, more likely to pay higher premiums for their deals, as these premiums are expected to reflect the option value embedded within the acquisition chain. However, the statistically insignificant results could also be explained by several limitations present in this study, further discussed in section 6.4. For this reason, the results should be interpreted with caution.

6.2. Hypothesis 2: Target selection

The results of this study show that I am unable to reject the null hypothesis that there is no difference between the likelihood of conducting a diversifying deal for serial acquirers led by overconfident CEOs compared to non-overconfident CEOs. The results of this study align with similar research by Hwang et al. (2020), who adopt two-digit SIC codes to identify diversifying deals. However, the results differ from the findings by Malmendier & Tate (2008) and Ferris et al. (2013), who adopt the Fama-French (1997) 48 industry groups to identify diversifying deals.

Noticeably, Malmendier & Tate (2008) and Ferris et al. (2013) both adopt a different methodology to measure CEO overconfidence. Malmendier & Tate (2008) construct a measure for CEO overconfidence using detailed data on CEO option holdings and portrayal in the press. Ferris et al. (2013) construct a measure for CEO overconfidence using a press-based measure similar to Malmendier & Tate (2008). The detailed option holding proxy is more accurate compared to using average moneyness as adopted by this study. Using average moneyness to construct CEO overconfidence is less accurate because the measure considers the overall value of all options combined instead of observing different option grants separately, therefore possibly classifying fewer CEOs with overconfidence. Moreover, stock option exercise behaviour might be influenced by external factors other than CEO overconfidence, further explained in section 6.4. The press portrayal proxy for overconfidence also seems more accurate when controlling for the total number of article mentions. Overall, the use of average moneyness in this study and the study by Hwang et al. (2020) might result in not accurately classifying a CEO with overconfidence, leading to a type II error where the results incorrectly fail to reject the null hypothesis. For this reason, the results on the effects of CEO overconfidence on target selection for serial acquirers should be interpreted with caution.

6.3. Hypothesis 3: Acquirer market response

The results of this study show that I am unable to reject the null hypothesis that overconfident CEOs of serial acquirers experience lower acquirer market responses to deal announcements compared to non-overconfident CEOs. The findings of this study are not consistent with Malmendier & Tate (2008) and John et al. (2010); both studies show a negative announcement effect for deals announced by overconfident CEOs. However, the different results of this study might be explained by the sample selection process. Malmendier & Tate (2008) and John et al. (2010) both analyse CEO overconfidence in acquisitions conducted by firms in general and do not use a sample selection for serial acquisitions. Interestingly, research by Doukas & Petmezas (2007) shows that, on average, cumulative abnormal returns for serial acquirers are 0.55% lower compared to single acquirers, statistically significant at the 1% level. Combining the results of this study and the insight from Doukas & Petmezas (2007) suggests that CEO overconfidence, measured using the average moneyness of option holdings of a CEO, does not negatively influence acquirer market response for serial acquirers. The insignificant relationship found in this study can possibly be explained by the fact that serial acquirers, in general, already experience lower cumulative abnormal returns compared to single acquirers. If the market believes that serial acquisitions are performed mainly by overconfident CEOs, no relationship between CEO overconfidence and acquirer market response will be identified when analysing a sample of serial acquirers.

6.4. Limitations

This section addresses several limitations of the methodology and data of this research. The most important limitation of this study is the measurement for overconfidence. Additionally, concerns about endogeneity, the use of cumulative abnormal returns, and the sample size are discussed.

The primary limitation of this study is the measurement proxy for overconfidence. Unfortunately, one cannot directly observe overconfidence. To overcome this, I adopt a quantitative proxy developed by Campbell et al. (2011) and based on Malmendier & Tate (2005, 2008). The proxy uses average moneyness of a CEO's option portfolio in each year. I classify a CEO as overconfident if he/she fails to exercise vested options that have an average moneyness of 67% or higher at least twice. The relevance of this approach is shown by Campbell et al. (2011) and is adopted by several other studies (John et al., 2010; Hirshleifer et al., 2012; Hwang et al., 2020). However, there are still several drawbacks to this approach. First of all, the approach considers the overall value of all options combined instead of observing different option grants separately, as in Malmendier & Tate (2008), therefore resulting in a less accurate measurement. Additionally, the proxy is based on the assumption that rational CEOs will

exercise their options early to decrease their exposure to idiosyncratic risk. However, as stated by Campbell et al. (2011), the decision to exercise vested stock options could be influenced by expectations from the board of directors and/or pressure from investors to hold in-the-money options. When these external factors influence the option-holding behaviour of CEOs, the true level of CEO overconfidence may not be identified correctly, resulting in classifying rational CEOs as overconfident. Moreover, as stated by Campbell et al. (2011), it is also possible that option holding behaviour of CEOs is explained by inside information in contrast to overconfidence. Brooks et al. (2012) find strong evidence that CEOs use private information when they exercise stock options. Thus, when overconfident CEOs are in possession of negative private information, and use this information to exercise vested options early, the CEO will be classified as non-overconfident when they are actually overconfident. All in all, it shows that the measure of CEO overconfidence adopted in this study is not perfect. For this reason, the results should be interpreted with caution.

Furthermore, possible concerns about endogeneity need to be addressed. Specifically, the relationship between CEO overconfidence and its effect on serial acquisitions may be bi-directional. For instance, a history of successful acquisitions could lead to increased overconfidence in CEOs. As argued by Doukas & Petmezas (2007), heightened acquisitiveness is a direct measure of managerial overconfidence. This reverse causality would make it difficult to determine the true causal effect of CEO overconfidence on acquisition activity for serial acquirers. Because CEOs may become overconfident after successfully completing several acquisitions, leading to a spurious correlation between CEO overconfidence and its effects on serial acquisition. Moreover, there may be unobserved factors that influence acquisition activity in serial acquisitions. For example, unobserved competitive pressures could drive acquisition activity, leading to biased estimations. The problem of omitted variable bias was minimized by adding control variables and including industry and year fixed effects in the analysis. Nevertheless, the problem of omitted variable bias cannot be fully alleviated and should be considered when interpreting the results. Lastly, possible sample selection biases should be addressed.

Another limitation of this study is the use of cumulative abnormal returns to analyse the market reaction to deal announcements. This paper recognizes that acquisition decisions could be influenced by behavioural biases, which contrasts the assumption of stock market efficiency that is inherent in analysis using CARs. The assumption underlying the calculations of CARs is the stock market is efficient, resulting in rational and quickly responding investors when new information becomes available. However, as argued by this paper and stated by several academics, individuals do not always behave

rationally (Kahneman & Tversky, 1979; De Bondt & Thaler, 1985; Barberis & Thaler, 2003; Garcia, 2013). Therefore, using CARs to measure the rational market response might lead to inaccurate estimations.

Moreover, the sample size consists of a relatively small number of observations due to the sample selection process and data availability. CEO compensation data used to construct the measure of overconfidence for acquirers is only available for U.S. firms in the S&P1500 between 2006 and 2022, limiting the scope of this research to U.S. acquirers in the S&P1500. Moreover, because the variables for acquisition premium and cumulative abnormal returns are based on public stock market data, private firms are automatically excluded from the analysis. Additionally, I only analyse serial acquirers defined by firms that complete at least four deals during a 10-year rolling window. All these factors contribute to a small sample size of N=163, considerably smaller compared to previous research by, e.g., Malmendier & Tate (2008), John et al. (2010), Ferris et al. (2013) or Hwang et al. (2020).[13] Small sample sizes can have a detrimental effect on the quality and precision of research (Kotrlik & Higgins, 2001). When sample sizes are small, the standard error of the mean is larger, which makes it more difficult to detect a significant difference between groups. As a result, the statistical power decreases, which increases the likelihood of a type II error (false negative) - failing to reject a false null hypothesis.

Lastly, because the sample of this study is restricted to public serial acquirers listed on the S&P1500 in the U.S. from 2006 to 2022, implications in a different time frame, for firms not listed in the S&P1500, for private firms, and/or for firms in other countries may differ.

6.5. Future research

This research provides insight into the effects of CEO overconfidence on merger & acquisition activity for serial acquirers in the United States. However, several important limitations in this study have been addressed. To validate the findings of this research, future research that addresses these limitations is needed. First of all, a more accurate measurement to proxy CEO overconfidence should be tested. Future research could adopt a qualitative measure to proxy CEO overconfidence, which was not used in this study. For example, one can adopt the use of evaluations from expert opinions using a survey to assess the degree of overconfidence in individual CEOs, as used in for example Ben-David et al. (2007). This approach will not suffer from the problems related to misclassifying CEOs as overconfident due to the fact that stock option behaviour might be influenced by external factors. Alternatively, one can

[13] A robustness sample with firms completing at least two deals within a rolling window of 5 years with N=330 is also analysed but is still considerably smaller compared to previous research by e.g., Malmendier & Tate (2008), John et al. (2010), Ferris et al. (2013) or Hwang et al. (2020).

adopt a quantitative approach based on a new direct method to measuring managerial overconfidence using synergies forecast error, measured as the deviation between acquisition forecasted operating synergies and actual realized operating synergies, as proposed by Ismail & Mavis (2022). Using this measure directly links overconfidence to corporate decisions. Therefore, alleviating concerns about outside factors influencing the proxy such as in the option holding or press portrayal proxy.

Moreover, additional research on the effects of CEO overconfidence on merger & acquisition activity in serial acquirers with a broader scope is needed, both in terms of geographical scope and company type scope. Future research could examine the effects of CEO overconfidence in serial acquirers outside the United States and include private firms in the analysis. Additionally, further integration with existing conceptual management theories, such as learning theory and managerial power theory, can enhance the current analysis. For example, as argued by Aktas et al. (2009, 2013), economically motivated risk-averse rational CEOs could learn from acquisitions and investor reactions to past deal announcements, resulting in similar behaviour and market responses observed in overconfident CEOs. Moreover, as argued by Hwang et al. (2020), if CEO overconfidence is combined with better governance and a better compensation structure, it could enhance firm value instead of destroying it. Therefore, only creating undesirable results when overconfident CEOs have a lot of power. Thus, integrating learning theory and CEO power when analysing the effects of CEO overconfidence on merger & acquisition activity for serial acquirers provides an interesting direction for further research.

7. CONCLUSION

This study empirically analyses the impact of CEO overconfidence in serial acquirers on the acquisition premium, target selection, and acquirer market response, using a sample of 49 CEOs and 163 M&A deal observations performed by U.S. public acquirers completing at least four deals during a rolling window of 10 years from 2006 to 2022. I verify the results using a robustness sample of 147 CEOs and 330 M&A deal observations performed by U.S. public acquirers completing at least two deals during a rolling window of 5 years from 2006 to 2022. CEO overconfidence is measured using the average moneyness of a CEO's option portfolio in each year; I classify a CEO as overconfident if he/she fails to exercise vested options that have an average moneyness of 67% or higher at least twice, in line with Campbell et al. (2011) and based on the approach developed by Malmendier & Tate (2005, 2008).

Firstly, the results do not provide sufficient evidence for a positive relationship between CEO overconfidence and premiums paid by serial acquirers. Specifically, I find no significant relationship

between CEO overconfidence and acquisition premiums paid in the main sample and the robustness sample using two measurements to calculate the acquisition premium. Suggesting that overconfidence may not be a crucial factor for determining the acquisition premiums paid by serial acquirers, in contrast to previous research using samples with both single and serial acquirers (Hayward & Hambrick, 1997; John et al., 2010).

Secondly, I do not find any statistically significant relationship between CEO overconfidence and the likelihood to conduct a diversifying deal for serial acquirers. This finding is in line with similar research by Hwang et al. (2020) but differs from the findings by Malmendier & Tate (2008) and Ferris et al. (2013). Importantly, Malmendier & Tate (2008) and Ferris et al. (2013) adopt a different and arguably more accurate methodology to measure CEO overconfidence. In contrast, Hwang et al. (2020) adopt the same methodology as this study. Due to the limitations present in the overconfidence measure of this study and the study by Hwang et al. (2020), and the inconsistent results with previous research, there is reason to believe that the results are subject to a type ii error.

Thirdly, I do not observe any statistically significant correlation between CEO overconfidence and acquirer market response to deal announcements by serial acquirers. Therefore, I find no evidence for a negative relationship between CEO overconfidence and acquirer market response for serial acquirers, in contrast to previous research using samples with both single and serial acquirers (Malmendier & Tate, 2008; John et al., 2010)

In conclusion, this study does not provide sufficient evidence for any statistically significant relationship between CEO overconfidence in serial acquirers and the acquisition premium, target selection, or acquirer market response. Importantly, the results of this research should be interpreted with caution because of several limitations present in this study. Most importantly, the measurement for overconfidence may not provide the most accurate classification for CEO overconfidence because it could inaccurately classify a CEO as overconfident because of expectations from the board of directors and/or pressure from investors, as well as the role of inside information. Moreover, the relationship between CEO overconfidence and its effect on serial acquisitions may be bi-directional, leading to a spurious correlation between CEO overconfidence and its effects on serial acquisitions. Lastly, the sample size of this study is relatively small, decreasing the statistical power, and increasing the likelihood of a type II error - failing to reject a false null hypothesis. For this reason, future research that alleviates the limitations of this study is needed to increase our understanding of the effects of CEO overconfidence within serial acquisitions.

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9. APPENDIX

TABLE A1: Variable Description

Variable	Description	Database
OC_CEO	Binary value equal to 1 if a CEO fails to exercise vested options that have an average moneyness of 67% or higher at least twice, otherwise equal to 0.	WRDS Compustat
Acqpremium_4wk	Acquisition premium defined as the deal value divided by the target's market value measured four weeks before the first announcement of the acquisition.	Thomson-SDC
Acqpremium_1wk	Acquisition premium defined as the deal value divided by the target's market value measured one week before the first announcement of the acquisition.	Thomson-SDC
Diversify_ff	Binary variable equal to 1 if the acquirer and target are not part of the same Fama-French (1997) 48 industry group, otherwise equal to 0.	Thomson-SDC
Diversify_sic	Binary variable equal to 1 if the acquirer and target are not part of the same two-digit SIC code, otherwise equal to 0.	Thomson-SDC
CAR[-1,+1]	Cumulative abnormal returns with a three-day time window, calculated by taking the daily return of the acquirer's common equity and subtracting expected returns. Expected returns are calculated using the daily returns of the S&P 500 index.	Thomson-SDC, WRDS U.S. Daily Event Study tool
CAR[-2,+2]	Cumulative abnormal returns with a five-day time window, calculated by taking the daily return of the acquirer's common equity and subtracting expected returns. Expected returns are calculated using the daily returns of the S&P 500 index.	Thomson-SDC, WRDS U.S. Daily Event Study tool
Size	Natural logarithm of total assets in millions.	WRDS Compustat
Leverage	Ratio of a firm's total debt to its total assets.	WRDS Compustat
Tobin	Book value of assets minus the book value of equity plus the market value of equity, all divided by the book value of assets.	WRDS Compustat
Hostile	Binary variable equal to 1 if the deal is hostile, otherwise equal to 0.	Thomson-SDC
Crossborder	Binary variable equal to 1 if the target firm is outside the United States, otherwise equal to 0.	Thomson-SDC

Minority	Minority stake in the target company before the announcement.	Thomson-SDC
Tender	Binary variable equal to 1 if a tender offer is launched, otherwise equal to 0.	Thomson-SDC
Multiple	Binary variable equal to 1 if the number of bidders is equal to or larger than two, otherwise qual to 0.	Thomson-SDC
Allcash	Binary variable equal to 1 if the deal is paid with 100%, otherwise equal to 0.	Thomson-SDC

TABLE A2: Summary Statistics for the Dataset with Firms Completing Two Deals in Five Years

Notes: The sample consists of 330 observations of publicly disclosed acquisitions for U.S. public acquirers between 2006 and 2022 that completed at least two deals during a five-year rolling window. Deal data is obtained from the Thomson Securities Data Corporation database. Additional company and CEO data is obtained from the Wharton Research Data Services Compustat database. CARs are calculated using the WRDS U.S. Daily Event Study tool.

	Full sample					Non-overconfident CEOs					Overconfident CEOs				
	N	mean	SD	min	max	N	mean	SD	min	max	N	mean	SD	min	max
Independent variable															
OC_CEO	330	0.17	0.376	0	1										
Dependent variables															
Acqpremium_4wk	330	49.26	36.78	-7.61	133.1	274	48.95	37.14	-7.61	133.1	56	50.78	35.25	-4.52	133.1
Acqpremium_1wk	328	43.41	34.19	-4.69	129.63	273	43.02	34.58	-4.69	129.63	55	45.35	32.41	-4.69	129.63
Diversify_ff	330	0.318	0.466	0	1	274	0.328	0.471	0	1	56	0.268	0.447	0	1
Diversify_sic	330	0.306	0.462	0	1	274	0.325	0.469	0	1	56	0.214	0.414	0	1
CAR[-1,+1]	309	-0.347	5.013	-23.38	27.43	256	-0.318	4.997	-23.38	27.43	53	-0.49	5.136	-12.75	13.56
CAR[-2,+2]	309	-0.465	5.418	-24.73	24.9	256	-0.516	5.578	-24.73	24.9	53	-0.22	4.606	-13.14	12.39
Firm control variables															
Size	330	9.203	1.281	4.954	10.24	274	9.183	1.305	4.954	10.24	56	9.305	1.164	5.813	10.24
Leverage	330	0.247	0.166	0	1.025	274	0.243	0.166	0	1.025	56	0.266	0.167	0	0.842
Tobin's Q	330	2.03	0.836	0.796	6.677	274	2.007	0.799	0.796	6.677	56	2.145	0.997	0.874	4.703
Deal control variables															
Hostile (dummy)	330	0.00303	0.055	0	1	274	0.00365	0.0604	0	1	56	0	0	0	0
Crossborder (dummy)	330	0.17	0.376	0	1	274	0.161	0.368	0	1	56	0.214	0.414	0	1
Minority	330	0.557	3.411	0	32.58	274	0.363	2.298	0	19.9	56	1.504	6.504	0	32.58
Tender (dummy)	330	0.321	0.468	0	1	274	0.299	0.459	0	1	56	0.429	0.499	0	1
Multiple (dummy)	330	0.0576	0.233	0	1	274	0.0584	0.235	0	1	56	0.0536	0.227	0	1
Allcash (dummy)	330	0.685	0.465	0	1	274	0.704	0.457	0	1	56	0.589	0.496	0	1

TABLE A3: Correlation Matrix for the Dataset with Firms Completing Two Deals in Five Years

Notes: The sample consists of 330 observations of publicly disclosed acquisitions for U.S. public acquirers between 2006 and 2022 that completed at least two deals during a five-year rolling window. Deal data is obtained from the Thomson Securities Data Corporation database. Additional company and CEO data is obtained from the Wharton Research Data Services Compustat database. CARs are calculated using the WRDS U.S. Daily Event Study tool.

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1.	OC_CEO	1.00															
2.	Acqpremium_4wk	0.02	1.00														
3.	Acqpremium_1wk	0.02	0.88***	1.00													
4.	Diversify_ff	-0.05	-0.07	-0.03	1.00												
5.	Diversify_sic	-0.09	-0.07	-0.03	0.84***	1.00											
6.	CAR[-1,+1]	-0.01	0.00	-0.01	-0.03	-0.01	1.00										
7.	CAR[-2,+2]	0.02	-0.01	-0.01	-0.07	-0.04	0.88***	1.00									
8.	Size	0.07	0.14*	0.11	0.16**	0.17**	0.01	0.01	1.00								
9.	Leverage	0.08	-0.06	-0.07	-0.11	-0.09	0.02	0.03	0.02	1.00							
10.	Tobin	0.07	0.12*	0.11	-0.00	-0.07	0.05	0.01	0.10	-0.04	1.00						
11.	Hostile (dummy)	-0.03	0.04	0.05	-0.04	-0.04	0.02	0.04	-0.09	-0.00	-0.05	1.00					
12.	Crossborder (dummy)	0.04	-0.05	0.01	0.11	0.14*	0.01	-0.04	-0.09	-0.06	0.02	0.12*	1.00				
13.	Minority	0.07	-0.09	-0.09	-0.02	-0.06	-0.01	0.02	-0.01	0.05	0.03	-0.01	0.24***	1.00			
14.	Tender (dummy)	0.08	0.24***	0.19**	-0.09	-0.14*	0.02	0.00	0.14*	-0.11	0.13*	0.08	-0.06	0.05	1.00		
15.	Multiple (dummy)	-0.01	0.15**	0.09	-0.06	-0.08	0.06	0.05	0.00	-0.02	-0.03	-0.01	0.02	-0.04	0.10	1.00	
16.	Allcash (dummy)	-0.10	0.14*	0.15**	0.14*	0.08	0.13*	0.06	0.13*	-0.15**	0.18**	0.04	0.03	0.08	0.20***	0.02	1.00

* Significant at 5%; ** significant at 1%; *** significant at 0.1%

TABLE A4: The Impact of CEO Overconfidence on the Acquisition Premiums Paid by Firms Completing Two Deals in Five Years

Notes: This table reports the results of OLS regressions with acquisition premium paid by the acquiring firm as the dependent variable. Acquisition premium is defined as the deal value divided by the target's market value measured four weeks before the first announcement of the acquisition in Columns (1), (2) and (3). Acquisition premium is defined as the deal value divided by the target's market value measured one week before the first announcement of the acquisition in Columns (4), (5) and (6). The sample consists of 330 observations of publicly disclosed acquisitions for U.S. firms that completed at least two acquisitions during a five-year rolling window period between 2006 and 2022. Deal data is obtained from the Thomson Securities Data Corporation database. Additional company and CEO data is obtained from the Wharton Research Data Services Compustat database. Overconfident CEO (OC_CEO) equals one if the acquiring CEO does not exercise an at least 67% in-the-money exercisable option twice. The overconfident classification starts from the first instance the CEO fails to exercise an at least 67% in-the-money exercisable option. Size is defined as the natural logarithm of total assets in millions for the acquiring firm. Leverage is defined as the ratio of the acquirer's total debt to its total assets. Tobin is defined by dividing the market value of assets by the book value of assets for the acquiring firm. Hostile is a dummy equal to one if the deal is classified as hostile. Crossborder is a dummy equal to one if the target firm is outside the nation of the acquiring firm. Minority is defined by the percentage of shares in the target company held by the acquiring company 6 months prior to the deal. Tender is a dummy equal to one if the acquirer launched a tender offer for the target. Multiple is a dummy equal to one if there were two or more bidding firms for the target. Allcash is a dummy equal to one if the acquirer paid for the deal using 100% cash. Columns (1) and (4) presents the basic regression between Acquisition premium and OC_CEO. Columns (2) and (5) add the identified control variables explained in section 3.3 in addition to year fixed effects and industry fixed effects using the Fama-French (1997) 48 industry group classification, while Columns (3) and (6) adopt industry fixed effects using two-digit SIC codes.

	(1)	(2)	(3)	(4)	(5)	(6)
OC_CEO	1.835	3.467	2.188	2.328	6.164	5.804
	(0.34)	(0.67)	(0.38)	(0.46)	(1.23)	(1.03)
Size		1.190	1.286		0.868	0.614
		(0.65)	(0.73)		(0.55)	(0.37)
Leverage		-7.485	-13.354		-11.466	-16.206
		(-0.54)	(-0.94)		(-0.85)	(-1.19)
Tobin		3.555	4.894		4.112	5.025**
		(1.23)	(1.64)		(1.49)	(1.99)
Hostile		25.987**	17.637		40.943***	31.118
		(2.28)	(1.22)		(3.37)	(0.92)
Crossborder		-2.355	-0.864		0.186	2.803
		(-0.48)	(-0.16)		(0.04)	(0.49)
Minority		-1.036	-1.340**		-1.757***	-2.132***
		(-1.60)	(-2.01)		(-3.80)	(-3.19)
Tender		12.187**	12.106**		5.673	5.636
		(2.58)	(2.48)		(1.32)	(1.29)
Multiple		30.016***	28.970**		18.178**	18.082**
		(3.06)	(2.58)		(1.98)	(2.15)
Allcash		9.292*	10.075**		12.500***	13.649***
		(1.93)	(2.06)		(2.70)	(2.96)
Constant	48.949***	-3.903	14.328	43.019***	-2.659	24.772
	(22.00)	(-0.18)	(0.74)	(20.77)	(-0.14)	(1.28)
Industry Fixed Effects	No	Yes	Yes	No	Yes	Yes
Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Observations	330	330	330	328	328	328
Adjusted R^2	-0.003	0.239	0.205	-0.002	0.198	0.152

* Significant at 10%; ** significant at 5%; *** significant at 1%. t-Statistics in parentheses.

TABLE A5: The Impact of CEO Overconfidence on the Cumulative Abnormal Returns Around Deal Announcements by Firms Completing Two Deals in Five Years

Notes: This table reports the results of OLS regressions with CAR for the acquirer as the dependent variable. Columns (1), (2) and (3) adopt a three-day CAR [-1,+1], Columns (4), (5) and (6) adopt a five-day CAR [-2,+2]. The sample consists of 309 observations of publicly disclosed acquisitions for U.S. firms that completed at least two acquisitions during a five-year rolling window period between 2006 and 2022. Deal data is obtained from the Thomson Securities Data Corporation database. Additional company and CEO data is obtained from the Wharton Research Data Services Compustat database. CARs are calculated by taking the daily return of the acquirer's common equity and subtracting expected returns. Expected returns are calculated using the daily returns of the S&P 500 index. Overconfident CEO (OC_CEO) equals one if the acquiring CEO does not exercise an at least 67% in-the-money exercisable option twice. The overconfident classification starts from the first instance the CEO fails to exercise an at least 67% in-the-money exercisable option. Size is defined as the natural logarithm of total assets in millions for the acquiring firm. Leverage is defined as the ratio of the acquirer's total debt to its total assets. Tobin is defined by dividing the market value of assets by the book value of assets for the acquiring firm. Hostile is a dummy equal to one if the deal is classified as hostile. Crossborder is a dummy equal to one if the target firm is outside the nation of the acquiring firm. Minority is defined by the percentage of shares in the target company held by the acquiring company six months prior to the deal. Tender is a dummy equal to one if the acquirer launched a tender offer for the target. Multiple is a dummy equal to one if there were two or more bidding firms for the target. Allcash is a dummy equal to one if the acquirer paid for the deal using 100% cash. Columns (1) and (4) present the basic regression between the CAR and OC_CEO. Columns (2) and (5) add the identified control variables explained in section 3.3 in addition to year fixed effects and industry fixed effects using the Fama-French (1997) 48 industry group classification, while Columns (3) and (6) adopt industry fixed effects using two-digit SIC codes.

	(1)	(2)	(3)	(4)	(5)	(6)
OC_CEO	-0.172	-0.038	-0.356	0.296	0.084	-0.163
	(-0.23)	(-0.04)	(-0.40)	(0.36)	(0.10)	(-0.18)
Size		0.136	0.128		0.184	0.136
		(0.43)	(0.43)		(0.53)	(0.42)
Leverage		-2.191	-2.767		-2.726	-3.631
		(-0.92)	(-1.17)		(-1.10)	(-1.48)
Tobin		0.129	0.382		-0.014	0.183
		(0.31)	(0.91)		(-0.03)	(0.41)
Hostile		-0.174	1.470		2.937	4.901
		(-0.07)	(0.53)		(1.08)	(1.58)
Crossborder		0.856	0.027		-0.112	-1.084
		(1.18)	(0.03)		(-0.12)	(-1.05)
Minority		-0.019	0.026		0.019	0.077
		(-0.30)	(0.38)		(0.27)	(0.94)
Tender		0.030	-0.178		-0.488	-0.671
		(0.05)	(-0.27)		(-0.67)	(-0.84)
Multiple		0.793	1.691		0.908	1.877
		(0.64)	(1.29)		(0.67)	(1.30)
Allcash		0.994	1.276		0.358	0.649
		(1.36)	(1.65)		(0.44)	(0.75)
Constant	-0.318	-3.830	-8.430***	-0.516	-4.489	-6.840**
	(-1.01)	(-1.04)	(-2.89)	(-1.52)	(-0.94)	(-2.01)
Industry Fixed Effects	No	Yes	Yes	No	Yes	Yes
Year Fixed Effects	No	Yes	Yes	No	Yes	Yes
Observations	309	309	309	309	309	309
Adjusted R^2	-0.003	0.156	0.103	-0.003	0.103	0.035

* Significant at 10%; ** significant at 5%; *** significant at 1%. t-Statistics in parentheses.