ERASMUS UNIVERSITY ROTTERDAM

Master Thesis Financial Economics

"The Effects of managerial ability on merger outcome"

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Date: 26_04_2022

ABSTRACT

I use Data Envelopment Analysis (DEA), as introduced by Demerjian et al. (2011), to calculate a more precise and overarching measure of managerial ability. I use this measure to validate the research of Malmendier and Tate (2008) who find that CEO overconfidence, as measured by their 'Holder67' variable, leads to lower merger outcome. Using the same methodology, I find the same results as the authors. However, I argue that these results can partly be explained by managerial ability instead of overconfidence. I find a low but significant correlation between the 'Holder67' variable and the managerial ability variable, implying that both measures capture traits of each other. Once controlling for managerial ability in the Malmendier and Tate (2008) research, I find managerial ability to be slightly positively and significantly related to merger outcome. Furthermore, I find the 'Holder67' variable to become slightly more insignificant and negatively related to merger outcome. The interpretation of my results is that overconfidence, as measured by the 'Holder67' variable, is correlated with managerial ability but captures distinct aspects of overconfidence.

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1. Introduction to the subject

"I Know that I'm intelligent, because I know that I know nothing"

- Socrates

On January 18th, 2022, Microsoft announced that it had agreed to buy Activision Blizzard in a deal valued at nearly $69 billion, fully financed in cash. This deal, if it succeeds, would supplant Dell's 67$ billion acquisition of EMC in 2016 as the biggest tech deal in history. Some investors argue the deal is brilliant from Microsoft's perspective, who would become the world's third-largest gaming company. Proponents of the deal argue that a significant presence in a market that is expected to grow by +20% in two years is value-creating for Microsoft (Bloomberg, 2022). However, other investors are more skeptical of this investment, arguing that the target struggles with quality concerns and that Microsoft overpaid for the deal (Yahoo Finance investments, 2022). Not a peculiar thought since directing the biggest tech deal in history is something a skillful manager like Satya Nadella (current CEO of Microsoft) might strive for.

This paper investigates what role a manager's ability plays in the market reaction around a merger announcement. Therefore, the research question I answer in this paper is:

'What are the effects of managerial ability on merger outcome?'

It is interesting for academics to give more insights into what factors drive market reaction around an acquisition announcement. Over recent years, researchers have increasingly concluded that CEO characteristics and abilities matter in explaining corporate performance.[1] In this field of research, that investigates the behavioural aspects of corporate finance, researchers try to capture behaviour of managers using various proxies. However, one can understand that some proxies, like managerial ability or overconfidence, are hard to capture by looking at only one proxy. Previous researchers tried to capture these proxies by using different measures. For example, Song and Wang (2019) take a managers' compensation as proxy for managerial ability, where Richardson (2006) and Biddle et al. (2009) calculate a

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[1] For example, see Bertrand and Schoar (2003) and Kaplan et al. (2012)

score based on inefficient investments to capture the same trait. Because different measures are used to capture the same behavioural trait, some conclusions regarding the effect of these traits are ambiguous. Even when conclusions regarding the effects of a trait are homogeneous, it could be that a new, more efficient way of measuring a trait is introduced that agitates earlier outcomes.

In this paper, I use a more overarching way of measuring managerial ability and investigate if and in what way this variable is related to overconfidence, and how this affects merger outcome.

The managerial ability variable mentioned in this paper, is first introduced by Demerjian et al. (2011). This variable is based on a managers' efficiency in turning firm inputs into firm outputs (revenue). To calculate a managerial ability score for each manager, the authors first use Data Envelopment Analysis (DEA) to come to a firm efficiency score. This score is then purged from firm-specific factors, and the residual is the managerial ability score. Demerjian et al. (2011) claim that this variable outperforms existing ability measures. The framework for this measure will be explained in more detail in section 3.3.

Three years before the introduction of this managerial ability measure, Malmendier and Tate (2008) introduced a new way to capture another CEO trait; overconfidence. Their measure, called 'Holder67', is based on the option exercise behaviour of a manager. The rationale behind this measure is that rational CEOs exercise stock options that are sufficiently in-the-money well before expiration to reduce his exposure to company-specific risks. Waiting with executing such options signals overconfidence about the prospects of the firm. The findings of Malmendier and Tate (2008) are that overconfident CEOs are more likely to conduct value-destroying mergers compared to their non-overconfident executives. This paper, including the 'Holder67' variable, received recognition in the field of behavioural finance and is widely adopted in subsequent literature.

However, the conclusions of Malmendier and Tate (2008) could also be interpreted in a different way. This would be the case if the effect is driven by a trait that is correlated with, but different than overconfidence. In this paper, I argue that this trait is the earlier discussed managerial ability for two reasons.

First, diverse papers show a relationship between some form of managerial ability, and some form of overconfidence (see Gudmundsson and Lechner, 2013; Stango et al., 2017; Chapman et al., 2018; Meikle et al., 2016; Tost et al., 2012). Second, various proxies that try to capture a part of a manager's ability are found to be related to firm performance (see Cui et al., 2020; Dong and Doukas 2021; Bonsall et al., 2017). Both relationships will be discussed more extensively in the literature section of this thesis. This research will check if both relationships also exist using a more overarching variable to capture managerial ability and using the 'Holder67' variable to capture overconfidence. If both relationships exist in the context of this thesis, it shows that at least part of the established effect on how overconfidence influences merger outcome can be explained by managerial ability.

Besides looking at the validity of the overconfidence variable in explaining merger outcome, it is also interesting to look at the effects of managerial ability. Where previous literature used single proxies to capture managerial ability, like tenure, education, reputation, or style, I use the earlier discussed measure introduced by Demerjian et al. (2011). I look at the effects of this more overarching measure on short-term market reaction around a merger announcement.

This research contributes to existing literature because it gives more insights to academics, managers and shareholders to what CEO traits drive market reaction. Besides using more overarching data, my research gives an extra validity check to the overconfidence measure found by Malmendier and Tate (2008), which is widely used in various research after. My research finds that the effect of CEO overconfidence on mergers and acquisitions is partly driven by managerial ability. This implies that the relationship between CEO overconfidence and merger outcome, as described by Malmendier and Tate (2008), is spurious. Furthermore, the proposed research is relevant for future researchers because it shows the relationship between managerial ability and merger outcome. Also, my research shows whether the newly developed data envelopment analysis (used to compute the managerial ability variable) is suited to hold in situations within the field of mergers and acquisitions. Lastly, my research expands our knowledge of the specific role of management in merger outcome, leading to a more efficient allocation of company resources.

The remainder of this thesis is structured as follows. In the first section, I give an overview of the relevant literature that formed the basis for my hypotheses. In the second section, I discuss the variables I used in this thesis. Especially the overconfidence measure and the manager ability variable are discussed more extensively. Furthermore, this section gives a brief definition of the data gathering process and what other variables I included. I end this section with an overview of the methodology I used to answer the hypotheses. Subsequently, section 4 discusses the results of this thesis. Finally, the last sections are dedicated to the limitations of this research and a conclusion of the most important findings.

2. Literature review

In this section, I discuss the theoretical foundations and literature that form the basis for this thesis. I start by explaining the traditional perspective on corporate finance, followed by the behavioural perspective. Consequently, I give a comprehensive review of studies concerning the overconfidence bias and its implications regarding mergers and acquisitions. Furthermore, it is important for this thesis to understand what exactly is meant by omitted variable bias, and what possible implications could be of omitting an important variable. Therefore, a subsection is dedicated to this bias. Finally, I end this section by showcasing what previous literature concludes about the influence of managerial ability on merger outcome, and why I believe some of the effects Malmendier and Tate (2008) allocate to overconfidence, are caused by managerial ability.

2.1 The traditional perspective on corporate finance

In the traditional corporate finance literature, corporate decision making is explained by assuming rationality of managers and investors. The consensus is that financial markets are efficient due to the existence of arbitrageurs, and therefore assets are priced correctly. Furthermore, this perspective means that managers and investors maximize their expected utility by updating their beliefs correctly (Scott, 2000).

There are two concepts in traditional corporate finance theory that capture the rational decision making of CEOs. These concepts are agency theory (Jensen & Meckling, 1976; Jensen, 1983) and information asymmetry (Myers & Majluf, 1984). The agency theory points out that the interests of managers (agents) who work for and take decisions on behalf of the shareholders (principals) of a firm do not always align (Jensen, 1983). In this theory, market inefficiencies arise because rational managers maximize their utility and pursue their self-serving objectives. The second concept assigns market inefficiencies to information asymmetry within the market. Since outside investors do not have access to as much information about the firm as its managers, they will demand a premium for this asymmetry, making the issuance of equity relatively costly for the firm. This relationship between information asymmetry and the cost of capital leads to the pecking order theory of Myers & Majluf (1984). This theory implies that a manager follows a hierarchy when considering

sources of financing where a company's retained earnings are preferred, followed by debt, and choosing equity financing as a last resort.

The two concepts of information asymmetry and agency theory assume that the investment decisions and corporate capital structure primarily depend on the choices made by an entirely rational manager who tries to maximize his own utility (agency theory) or to maximize firm value (pecking order theory). In the traditional perspective, investors also act in an entirely rational way. However, more recent literature has challenged the assumption of full rationality and gave rise to a new field of research, namely behavioural corporate finance. My research will be in this field of research. I will give an overview of this theory in the next section.

2.2 The behavioural perspective on corporate finance

Contrary to the traditional perspective on corporate finance, the behavioural perspective on corporate finance challenges the assumption of full rationality. The behavioural framework explains investment distortions by assuming imperfect capital markets. Opposed to the traditional perspective, which assumes rationality in explaining investment distortions, the behavioural corporate finance literature attempts to explain investment distortions by using more realistic behavioural principles (Baker et al., 2012).

One of the most influential publications in this field of research is the survey conducted by Baker et al. (2012), in which the available literature is categorized into two broader fields of research. These fields are the 'market timing and catering proposition' and the concept of 'managerial biases'. The market timing and catering proposition describes rational managers interacting with irrational investors, while the managerial biases approach explains the behaviour between irrational managers and rational investors. The first proposition assumes that it is the irrationality of some investors that causes mispricing in the market. Following this theory, managers are assumed to be entirely rational and can identify this mispricing due to superior information or expertise. Consequently, these managers can exploit mispricing and maximize a firms' short-term value (Baker et al., 2012). The second concept aims to explain market distortions by looking at managerial biases. This theory assumes that investors

are rational and that it is the irrationality of managers that causes mispricing in the market. This concept studies the behaviour of management that deviates from a rational benchmark. Important to notice is that this concept differs from the earlier discussed rational agency model. Where the manager in the agency models is maximizing his own value, in the managerial biases approach the manager wrongly believes he is maximizing firm value. In the managerial biases concept, corporate investment decisions are explained by a manager's personal characteristics, beliefs, and preferences (Baker et al., 2012).

Because the managerial biases approach in explaining market distortions is central in this thesis, I will further elaborate on what drives the decision making of executives. Shefrin (2007) analyzes managerial behaviour and its deviations from a rational benchmark and identifies three psychological phenomena which cause these deviations. The first phenomenon is managerial biases. Examples of managerial biases are the illusion of control or the confirmation bias. The illusion of control bias illustrates that managers overestimate their ability to influence events over which they have limited control, and the confirmation bias is apparent when one tends to process information by looking for information that is consistent with one's existing beliefs. Another managerial bias is overconfidence, which is an important bias in this thesis and therefore will be discussed extensively in the next subsection. The second phenomenon the author identifies is heuristics. Heuristics are mental shortcuts that help to solve problems and make judgements efficiently and fast. These rule-of-thumb strategies allow people to react quickly because they reduce the complexity of tasks to simpler judgmental operations (Tversky & Kahneman, 1974). An example is the anchoring heuristic, which is the tendency to take one value as anchor, or reference point, and adjust this value insufficiently to new information. A relevant example of this is the research by Baker et al. (2012), who find an anchoring bias present in M&A offer prices. In their research, recent price peaks serve as anchor. The last phenomenon Shefrin (2007) mentions are framing effects. These effects are apparent when people decide on options based on whether the option is framed with positive or negative connotations (as a loss or as a gain). For example, people tend to be more risk seeking when an option is presented as a gain, and risk averse when an option is presented as a loss.

2.3 Overconfidence

In this section, I will describe the bias that is central for this research: the overconfidence bias. This bias is a derivative of the hubris hypothesis as introduced by Roll (1986). The author investigates if acquisitions create shareholder value for the acquiring firm and argues that acquisitions occur because executives can have excessive confidence in their ability to create synergies. Some managers wrongly allocate periods of good firm performance to their managerial competencies and consequently feel overconfident in their own ability. This overconfidence, or managerial hubris as the author calls it, is associated with paying higher acquisition premia and therefore destroying value for the shareholder (Hayward & Hambrick, 1997).

Previous literature distinguishes two main variants of overconfidence. The first is called miscalibration and is based on a manager's tendency to overestimate their information's accuracy. Ben-David et al. (2013) find CFOs suffer from this bias because they underestimate the riskiness of their company's market. The second type is based on the better-than-average effect. This effect is present when executives tend to overestimate their own abilities. Malmendier and Tate (2005) argue that this effect is related to optimism about merger outcomes and translates to a manager's own performance. Furthermore, Svenson (1981) finds that people tend to have a perception that they have above mean talent.

While the focus of this thesis lies on the influence of managerial overconfidence on firm outcome, it is essential to note that not only managers suffer from this bias. Psychologists argue that almost every individual suffers from some form of overconfidence (Larwood & Whittaker, 1997). Furthermore, the literature on this bias in other professions is abundant. For example, Christensen-Szalanski & NBushyhead (1981) observe this bias in physicians and nurses and Kidd (1970) finds this bias among engineers. Nevertheless, it could be argued that it is managers that are more prone to be overconfident. One reason for this could be that overconfident individuals are more likely to strive for a position as an executive. On top of that, Baker & Nofsinger (2010) argue that persons who suffer from overconfidence are more likely to win contests because they are more likely to take risks.

When an executive suffers from overconfidence, firm-level fundamentals are not the only driver of corporate decisions. There is empirical evidence that shows that the overconfidence bias can help explain important corporate decisions, mainly in the field of dividends, buybacks, and acquisitions (Campbell et al., 2011). For example, Hackbarth (2008) finds that executives who suffer from overconfidence choose higher debt levels and prefer debt as a way of financing more often than predicted by the pecking order theory. Furthermore, Hackbarth (2008) argues that this could have a positive effect because higher debt levels lead to higher interest payments. These interest payments lead to lower cash available and mitigate investments in value-destroying acquisitions. Ben-David et al. (2013) confirms this finding and adds that overconfident CEOs do more investments. Hirshleifer et al. (2012) argue that having an overconfident manager in some industries is beneficial because an overconfident manager does more investments. The authors argue that because these executives are more risk-seeking, they invest more in innovative projects. Furthermore, the authors conclude that overconfident CEOs indeed produce more highly cited patents and have higher R&D expenses. Lastly, the authors find that for a given level of R&D expenses, the number of copyrights and citations increases in overconfidence. While these findings only hold for innovative industries, they provide a bright side over overconfidence.

2.3.1 Overconfidence and merger outcome

In previous literature, mergers and acquisitions is a topic that has been studied comprehensively. Various papers give different explanations on why a firm should do an acquisition, but the main conclusion is that companies should do an acquisition if it creates value for the shareholders (Andrade et al., 2001). To classify an acquisition as value-creating, one could look at various aspects of a merger. In previous literature, the most widely adopted way to examine if a merger is value-creating is by looking at the average abnormal return in the days surrounding the merger announcement. The general results from research concerning this topic are that mergers and acquisitions are value-creating for the target and value-destroying for the acquirer (Andrade et al., 2001; Franks et al.,1991). An explanation of this could be that acquiring companies fail to realize synergies or other gains due to the high bid premium they pay (Agrawal et al., 1992). These findings initiated more research on what characteristics of CEOs can drive merger outcomes. This field of research is relatively new and still offers a plethora of room to explore in more depth.

One example of research investigating the relationship between CEO characteristics and merger outcome is the paper of Malmendier and Tate (2008). The authors build on the evidence obtained by Roll (1986) and examine the influence of overconfidence on M&A's. The authors' first finding is that overconfident executives are more likely to be involved in mergers and acquisitions than non-overconfident CEOs, because overconfident CEOs are convinced that they can generate superior profits. They classify a CEO as overconfident by using the proportion of in-the-money options and conclude that an overconfident CEO is 65% more likely to engage in mergers and acquisitions than their rational counterpart (Malmendier and Tate, 2008). Other academics have come with similar conclusions regarding overconfidence and merger activity, for example Kolasinski & Li (2013), who use stock buying behaviour as a proxy for overconfidence or Ben-David et al. (2007), who classify an executive (CFO) as overconfident by conducting a survey.

The second finding of Malmendier and Tate (2008) lays the basis of this research. The authors find that the market reacts significantly more negative to an overconfident CEO announcing a merger than when a non-overconfident CEO announces a merger (-90bps vs. -12bps). On this, my first hypothesis is based:

Hypothesis 1: "The average value created in mergers is lower for overconfident than for rational CEOs"

2.4 Omitted Variable Bias

Even if the results for my first hypothesis comply with the results of Malmendier and Tate (2008), and CEO overconfidence indeed destroys value for the acquiring firm, these effects could be driven by a trait that is correlated with, but different from overconfidence. This would imply that the authors did not consider all relevant variables in their regression, leading to omitted variable bias. Before I elaborate on why I believe this bias is present in their research, I will first discuss what exactly is meant by this bias.

2.4.1 Gauss-Markov Theorem

For a regression model to have unbiased estimators, the Gauss-Markov Theorem states that a regression model must comply with the following five assumptions (ad, 2019).[2]

Assumption 1: Linear Parameter and correct model specification

Assumption 2: Full Rank of Matrix X

Assumption 3: Explanatory Variables must be exogenous

Assumption 4: Independent and Identically Distributed Error Terms

Assumption 5: Normal Distributed Error Terms in Population

If a model complies with all five assumptions, all estimators are the *best linear unbiased estimators (BLUE)*. Meaning the estimators are efficient in this respect. This is known as the Gauss-Markov theorem (Heij & De Boer, 2004, pp.92-98).

Omitted variable bias occurs in a model when assumption 1 is violated. This is the case when the specification of the model is not correct because not all relevant variables are included in the model. Leaving out a relevant variable could cause other variables to be biased. This bias can occur for various reasons. It could be that a variable is omitted in a model because its effect is unknown. Another reason could be that the variable is simply not available. In the following subsection, I will discuss the consequences of this bias.

2.4.2 Framework: Consequences of Omitted Variable Bias

This subsection explains the consequences of omitting a relevant variable in a regression model. The problem is illustrated with the Venn diagram illustrated below. The overlapping area of overconfidence and merger outcome (area C) is the actual impact of CEO overconfidence on merger outcome. The overlapping area of managerial ability and merger outcome (area D) is the true impact of the variable managerial ability on merger outcome. Assume you run a regression model with the variable overconfidence included, but the

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2 For a specification of all assumptions, I refer to (Heij & De Boer, 2004, pp. 92–98). However, for this thesis only assumption 1 is discussed in more detail.

variable managerial ability is omitted. By doing this, the impact of overconfidence on merger outcome is estimated by areas C and B, instead of the actual impact (area C).
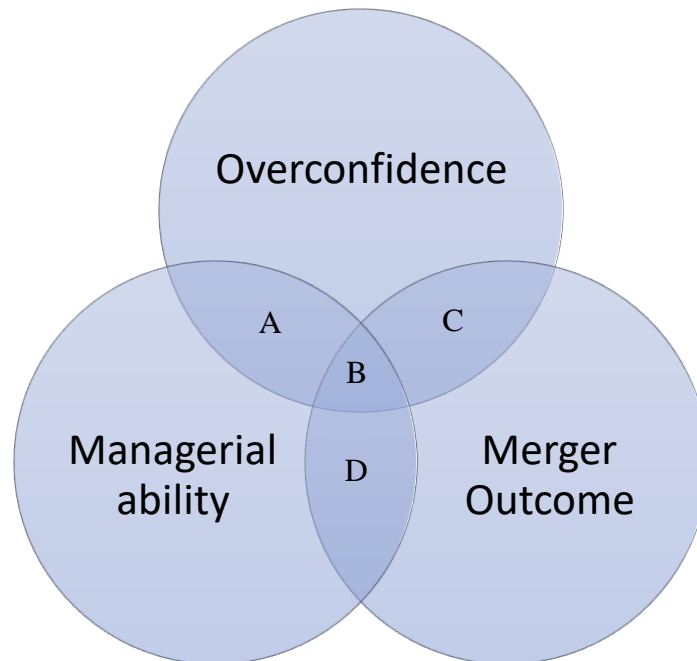
Figure 1: The effects of Omitted Variable Bias

The effects of the omitted variable bias are disentangled empirically following the methodology of Bertrand and Mullainathan (2001). This methodology is further explained in subsection 3.5 of this thesis.

2.5 Managerial ability

Based on previous literature, I have reason to believe that Malmendier and Tate (2008) did not control adequately for managerial ability in their research. If this paper points out managerial ability is indeed an omitted variable in their research, the estimate of the relationship between overconfidence and merger outcome as described by the authors is biased.

For a confounding variable to lead to omitted variable bias, the following conditions must be met:

- The confounding variable (managerial ability) must correlate with an independent variable that is in the regression model (overconfidence);

- The confounding variable (managerial ability) must correlate with the dependent variable (merger outcome)

If a relationship exists between managerial ability and overconfidence, and managerial ability and merger outcome, the effects Malmendier and Tate (2008) allocate to overconfidence are spurious. To support this claim, I will first discuss the literature that claim a relationship between managerial ability and overconfidence exists, followed by literature that claim a relationship between managerial ability and merger outcome exists.

2.5.1 Managerial ability and overconfidence

When talking about managerial ability, it is important to note that this is a trait hard to capture. However, I measure managerial ability by looking at all traits that contribute to converting firm inputs into outputs more efficiently, as discussed in more detail in section 3.3. While this way of measuring makes it a very broad and overarching measure, previous literature try to capture managerial ability by only looking at a specific trait that says something about part of a manager's ability. Conclusions of this literature are twofold; some researchers claim a negative relationship between managerial ability and overconfidence. For example, Gudmundsson and Lechner (2013) find that managers who are less able to build a strong network are found to be more often overconfident. Furthermore, Stango et al. (2017) find that analytical skills are lower for an overconfident manager and Chapman et al. (2018) find that managers who suffer from overconfidence have lower cognitive ability. Lastly, Meikle et al. (2016) and Tost et al. (2012) find that more overconfident managers tend to be worse listeners and feedback seekers. These conclusions are consistent with the classic study by Kruger & Dunning (1999), who find that lower ability individuals tend to be more overconfident. The authors argue that lower ability individuals are less capable of recognizing their own mistakes, causing them to overestimate their own ability.

Other researchers suggest that overconfidence is advantageous and positively related to managerial ability. For example, Galasso and Simcoe (2011) find that overconfident CEOs are more likely to pursue innovation. Hirschleifer et al. (2012) find the same conclusion and add that firms with overconfident managers also obtain more patents and patent citations. Furthermore, Larwood and Whittaker (1977) conclude that the more overconfident a

manager is, the more optimistic he is with organization, planning and commitments. Kennedy et al. (2011) claim that overconfident individuals have more social skills, and Anderson, Brion & Moore (2010) state that overconfidence makes it easier to gain status in a group.

It is hard to conclude if managerial ability and overconfidence are positively or negatively related. The outcome of my research will contribute to this discussion.

2.5.2 Managerial ability and merger outcome

The literature on the effects of managerial ability and merger outcome is abundant. For example, Cui et al. (2020) find that acquiring firms with higher ability management achieve better long-term operating performance and stock returns, and Chen & Lin (2018) find that deals done by management ability pay lower premiums than deals done by lower ability management. Furthermore, Dong & Doukas (2021) conclude that acquirers with strong managerial ability realize higher post-merger firm performance in the long run than their low-ability counterparts. Other research links managerial ability to other effects that could positively influence merger outcome. For example, Bonsall et al. (2017) find that managers with higher ability get higher credit ratings, making it easier and cheaper to finance mergers. Moreover, Demerjian et al. (2011) find that ability is positively related to overall firm performance and Koester et al. (2017) associate managerial ability with lower firm tax payments. Overall, research show that managerial ability is positively related to firm performance. However, it has not yet been investigated what the short-term effect of managerial ability on market reactions is, and that is how my research contributes to this discussion.

Even though the effect of overconfidence on managerial ability is controversial, as discussed in subsection 2.5.1, literature seem to establish a relationship between both traits. Furthermore, there seems to exist a positive relationship between managerial ability and merger outcome. Because of this, I form the following hypotheses to check if managerial ability is an omitted variable in the Malmendier and Tate (2008) paper:

Hypothesis 2a: "Managerial ability is negatively correlated with overconfidence"

Hypothesis 2b: "Managerial ability is positively correlated with merger outcome"

Besides the question if my research points out if managerial ability is an omitted variable in the research of Malmendier and Tate (2008), it could still be of interest to investigate the role of managerial ability on merger outcome. As outlined earlier in this section, at least some part of managerial ability is positively related to long-term firm performance. On this premise, I expect the same for short-term firm performance. Therefore, my third hypothesis states:

Hypothesis 3: "The average value created in mergers is higher for more able managers than for lower-ability managers"

3. Methodology and data

In this section, I discuss the methodology and data I used to answer the hypotheses of this thesis. I firstly elaborate on the data gathering process of my main variables of interest: 'Cumulative Abnormal Returns (CAR)', 'CEO overconfidence' and 'Managerial ability'. After that, I discuss the control variables and the statistical tests. I continue with a description of the databases I used to gather all variables, and I provide a summary of the descriptive statistics. Finally, I end this section by elaborating on some correlations between variables in the data.

3.1 Measuring Cumulative Abnormal Returns (dependent variable)

There are different types of measures one could look at to measure a firms' M&A performance. Megio en Risberg (2011) classify these measures into four types: 'market performance', 'accounting performance', 'operational performance' and 'overall performance'. In this paper, a firms' market performance is analyzed by looking at the Cumulative Abnormal Return (CAR) of a firm around the announcement date of a merger. A firms' CAR can be measured using two approaches: event studies and accounting studies (Bruner, 2005). Because managers can easily manipulate accounting figures, I perform an event study. Brown and Warner (1985) introduce three models to perform an event study and calculate the abnormal return of a company:

- Mean adjusted returns
- Market adjusted returns
- Market and risk-adjusted returns

While some researchers use the market and risk-adjusted returns measure to estimate abnormal returns (e.g., Leverty & Qian (2009); John, Liu & Taffler (2011)), I follow Malmendier and Tate (2008) and calculate the cumulative abnormal return to the acquiring firms' stock using the market adjusted return. I first calculate the abnormal return using the S&P 500 index as a proxy for expected returns, as can be seen in equation 1.

$$ARit = Rit - RMt \qquad \text{(1)}$$

Where:

$ARit$ = Abnormal return of stock i during time t

Rit = Observed return of stock i during time t

RMt = S&P 500 market return during time t

Furthermore, using the S&P 500 index as proxy is appropriate because my data set consists of large US firms that comprise a substantial portion of market returns. Following equation 2, I then analyze the abnormal returns over a three-, five- and eleven-day window around the announcement of the merger bid to come to the cumulative abnormal returns.

$$CARit\ (t1, t2) = \sum_{t=t1}^{t2} ARit \qquad \text{(2)}$$

Where:

$CARit\ (t1, t2)$ = Cumulative abnormal return of stock i around $(t1)$ and $(t2)$

3.2 Measuring CEO overconfidence (independent variable)

Since the relationship between overconfidence, managerial ability and merger outcome is the focus of this paper, a measurable proxy for CEO overconfidence is essential. While overconfidence is a trait that is hard to capture, previous researchers came up with various ways to identify several aspects of it. While Ben-David et al. (2013) measure overconfidence directly in a survey setting, by asking CIOs to forecast their earnings and comparing their forecasts to the firms' realized earnings, other studies have used several indirect measures. Examples of indirect measures that are accepted and used by various researchers are the press coverage measure and the option exercise measure. The press coverage measure is based on the portrayal of the CEO in the news media, as developed by Malmendier and Tate (2005). This measure employs counts of words relating to overconfidence or its opposite in proximity to the company name and the keyword "CEO" to classify a CEO as overconfident. This press-based approach requires an extensive search of media coverage for each individual

executive. By contrast, the option exercise measure uses widely available data of executives' option holdings. Therefore, in my thesis, I will use an option-based measure. Malmendier and Tate (2005) look at CEOs' personal portfolios to identify a difference in their exercise behaviour. These options are part of the compensation scheme of CEOs and give the holder the right to purchase company stock, usually at the stock price on the grant date. When the holder decides to exercise the option, he receives shares of company stock. In most cases, these shares are sold immediately (Ofek & Yermack, 2000). However, some CEOs persistently fail to exercise options that are highly in-the-money. One interpretation of this exercise failure is overconfidence, i.e., a CEO overestimates the firms' future returns. Other interpretations could be signaling, pressure from the board, tax benefits, procrastination or positive inside information. I will elaborate on these other interpretations in the limitation section of this research, section 5. In this thesis, I follow Malmendier and Tate (2008) and relate late option exercise behaviour to overconfidence.

Malmendier & Tate (2008) introduce the "Holder67" variable. Under this variable, a CEO gets classified as overconfident if he fails to exercise options with five years remaining duration that are 67% or more in-the-money. This percentage is justified using the Hall & Murphy (2002) framework and maintains assumptions on constant relative risk aversion and diversification. Subsequently, the option moneyness of an option is calculated using equation 3.

$$\text{Option moneyness} = \frac{Strike\ price}{Stock\ price} - 1 \qquad (3)$$

3.3 Measuring managerial ability (independent variable)

Like CEO overconfidence, managerial ability is a trait hard to capture. Previous researchers tried to capture ability with different proxies like media mentions, past abnormal returns, firm size, or type of education. In 2011, Demerjian, Lev & McVay introduced a new method to estimate the ability of a manager. This measure, based on a managers' efficiency in generating revenues, is available for a large sample of firms and outperforms existing measures that capture ability (Demerjian, Lev & McVay, 2011). The authors state that more able managers are better at generating revenues than their less able peers, given they have the same

resources available. To allocate a managerial ability score to the management of a firm, first a firm efficiency score needs to be calculated using Data Envelopment Analysis (DEA). I will continue with a detailed explanation of this analysis and elaborate on how to convert a firm efficiency score into an ability score.

3.3.1 Data envelopment analysis framework

DEA is a statistical procedure that enables comparing entities, or "decision making units", based on their relative efficiency. This analysis was first introduced by Chames, Cooper & Rhodes in 1978. The analysis forms an efficient frontier by measuring the mix of input used to generate output, in my paper a firms' revenue. This method has been used by other academics to measure efficiency across a wide variety of disciplines. Examples of this are Leverty & Grace (2011), who use DEA analysis to measure the efficiency of insurance companies or Murthi et al. (1996), who use DEA analysis to analyze marketing efficiency.

In a simplified form, the DEA model is described as a ratio of outputs over inputs:

$$0 < \frac{Output}{Inputs} < 1 \tag{4}$$

In contrast to a statistical regression, where a line is computed that minimizes the sum of squares of the vertical deviations from each data point to that line, the DEA method computes a so-called efficiency frontier. This frontier represents the highest efficiency and touches at least one data point, where the other data points are on or below that line. As can be seen in equation 4, each firm gets assigned a score between 0 and 1, whereas a firm that lies on the line (the most efficient firm in the sample) gets assigned a score of 1.

In this research, I follow the methodology of Demerjian et al. (2011) and use seven inputs and one output to come to a firm efficiency score. Equation 4 then becomes:

$$x = \frac{\sum_{i=1}^{S} U_i \, Y_{i\kappa}}{\sum_{j=1}^{m} V_j \, X_{j\kappa}} \tag{5}$$

$$\kappa = 1, \ldots, n$$

In this equation S stands for the output, which is revenue in my research. For inputs, m, the following variables are used: Net Property, Plant & Equipment; Net Operating Leases; Net Research and Development; Purchased Goodwill; Other Intangible assets; Cost of inventory; and Selling, General and Administrative Expenses. All these variables are derived from firms' financial reports and are publicly available. To calculate an efficiency score, each output and input variable gets assigned a weight U and V, respectively. The variables themselves are denoted by y and x. To calculate an efficiency score using DEA, the following steps were undertaken:

1. Sort firms into industry groups to make it possible to compare underlying relations between inputs and output.

2. Max equation (5) for each DMU in the group by varying the weights u and v. This shows the weights u and v that maximize equation (5). This maximization uses all the DMUs in the group, and results are DMU-specific.

3. These optimal weights are then multiplied with inputs and outputs and summed across all inputs and outputs. This gives a DMU-specific ratio.

4. Then, the DMU-specific ratios are scaled so that the efficiency score falls between the interval 0 and 1 (see equation (4)). In this equation, the most efficient firm gets a score of 1.

5. To ensure that each input and output is valuable, input, outputs and weights U and V are constrained to be non-negative.

These five steps were followed to obtain a firm efficiency score for each firm in my sample. This score, however, is affected by both firm-specific factors and management characteristics. Thereby the score either over- or under-estimates the ability of a manager. In this research, I only want to quantify the ability a manager has to turn inputs into revenue. To transform this firm efficiency score into a managerial ability score, the following regression is estimated:

$$\text{Firm Efficiency} \hspace{4cm} (6)$$

$$= \alpha + \beta 1 \ln(Total\ Assets) + \beta 2\ Market\ Share$$
$$+ \beta 3\ Free\ Cash\ Flow\ Indicator + \beta 4 \ln(Age)$$
$$+ \beta 5\ Business\ Segment\ Concentration$$
$$+ \beta 6\ Foreign\ Currency\ Indicator + Year_i + \varepsilon_i$$

Following Demerjian, Lev and McVay (2011), I estimate this regression by year effects. Regression (6) captures effects on which the manager has no influence, but these variables could influence the efficiency of a firm. So, by using this regression it is possible to isolate firm fixed effects from the firm efficiency score. The residual from equation (6) is the managerial ability score for each manager.

3.4 Control variables

In this section, I briefly describe the control variables. I follow Malmendier & Tate (2008) and distinguish between CEO control variables, deal control variables and firm control variables. I will elaborate on them shortly in the subsequent subsections.

3.4.1 CEO control variables

The first control variable I include is *'Age'*, which corresponds to the age of a CEO at the time of the announcement. The findings of the effect of *'Age'* on mergers and acquisitions are ambiguous. Prendergast & Stole (1996) emphasize that younger managers are more risk-taking as they want to establish their careers. This risk-taking makes them more often do value-destroying mergers. Holmstrom (1999) argues the opposite, namely that younger CEOs are more risk-averse because they want to prevent negative implications for their career prospect in case of failure. The literature establishes an empirical relation between the age of a manager and M&A behaviour. Therefore, it is included as a control variable in this research. '*Age'* is measured as the age of the CEO in years at the announcement date of the acquisition.

As in Malmendier & Tate (2008), I include *'Tenure'* as control variable, showing the number of years the CEO is with the firm at the time of the acquisition. The longer a CEO is with a firm, the more likely he is to become overconfident in his skills and overestimate mergers outcome

(Berger et al., 1997). This overestimation could cause him to take on more value destroying mergers. CEO Tenure is measured as the number of years serving as CEO at the time of the announcement.

Stock options are widely used to compensate a CEO. These options are supposed to ensure that the incentive of a CEO gets aligned with the incentives of company shareholders (Berger et al., 1997). Because of this, the variables *'StockOwn'* and *'VestOp'* are included as control variables in this thesis. *'StockOwn'* is measured as the percentage of shares a CEO holds in the company at the time of the acquisition. *'VestOp'* is measured as the number of exercisable options the CEO holds at the time of the acquisition announcement.

3.4.2 Deal control variables[3]

Mergers and acquisitions that have been financed (partly) with cash tend to realize higher returns than if fully financed with debt (Andrade et al., 2001). This is due to the signaling effect: by financing an acquisition with equity, a manager signals to the market he believes the firms shares are relatively overvalued compared to cash (Myers & Majluf, 1984). I introduce the dummy variable *'Cash',* which equals 1 if the deal is partly financed with cash, and 0 if fully financed with equity.

Research in the field of diversifying mergers is abundant. Many papers, like Shelton (1988), Harrison et al. (1991) and Ramaswamy (1997), find that non-diversifying acquisitions create more value than diversifying ones. This is in line with traditional finance theory, which states that mergers create value through synergies and buying a firm in the same sector often creates more synergies than buying a firm in a non-related sector (Morck, Shleifer & Vishny, 1988). Therefore, I create the dummy variable *'Diversifying'* that takes the value of 1 if the acquiring firm is active in a different sector than the target firm, measured by the difference in Fama-French 48 industry groups.

The last deal control variable is *'Dsize'*, corresponding with the size of the deal. Because bigger deals could get more media attention, the size of a deal might influence the market reaction

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[3] Here, I deviate from Malmendier and Tate (2008) and exclude the variable *'Hostile',* since my sample consists of friendly or neutral takeovers only.

to an announcement. Therefore, this variable is included. As in Malmendier & Tate (2008), deal size is measured in millions of dollars.

3.4.3 Firm control variables

Following Malmendier & Tate (2008) *'Fsize'* is included as a control variable. Previous research has found a positive relationship between the size of a firm and the abnormal returns (Moeller et al., 2004). Furthermore, Moeller et al. (2004) find that firm size is positively correlated with CEO overconfidence. *'Fsize'* is measured as the natural logarithm of a firms' assets.

The variable *'TQ'*, representing the Tobin's Q of a firm, shows the over – or undervaluation of a stock and is therefore a valid control variable when looking at investment opportunities. The ratio is an indicator of the asset replacement costs of a firm and is calculated by dividing the market value of a firm by the book value of its assets.

Agency theory suggests a negative relationship between the number of managers on the board and company performance due to increased coordination and communication costs when board size increases (Ahmed, A.S. et al., 2013). However, the resource dependence theory argues a positive relationship between board size and company performance because the quality of the decision making of a board increases when more managers from different backgrounds are on the board (Liu, Y. et al., 2015). Malmendier & Tate (2008) find that a board size is most efficient containing between 4 – 12 executives. Therefore, the variable *'Bsize'* is introduced. Since there are no boards bigger than 11 in my sample, the dummy variable *'Bsize'* is assigned the value of 1 if there are more than 4 members in the board.

Jensen (1983) finds that the more cash a firm has available, the more likely the manager is to make value-destroying mergers. Because of the relationship between free cash available and merger outcome, the variable *'FCF'* is introduced as a control variable, symbolizing a firms' free cash flow. The variable is calculated following Malmendier & Tate (2008) by subtracting interest expense, income taxes and preferred dividends by operating income before depreciation. Subsequently, it is standardized by a firms' assets.

The last firm control variable incorporated in this research is capital expenditures (*'CAPEX'*). Significant investments can reduce a firms' free cash flow, leading to less capital available for acquisitions. Following Malmendier & Tate (2008), investments are included as a control variable and measured by capital expenditures in the fiscal year.

3.5 Statistical tests

In this section, the statistical tests used to answer the research questions are discussed. Before the hypothesis where tested, the dataset was first controlled for outliers and validated on the necessary assumptions for linear regression. The results for normality, linearity and autocorrelation are shown in the plots in appendices A, B and C of this paper. After the model was validated, I continued by testing my hypothesis.

My first hypothesis mimics the research of Malmendier & Tate (2008), who find that overconfident CEO's do more value-destroying mergers than non-overconfident CEOs. As this thesis is based on their research, I expect to find similar results. Therefore, my first hypothesis is:

Hypothesis 1: "The average value created in mergers is lower for overconfident than for rational CEOs"

I test this hypothesis following the methodology of Malmendier & Tate (2008), leading to the following linear regression equation:

$$CARit\ (t1, t2)\ =\ \beta_1 + \beta_2\, OC_{it} + \beta_3\, X'_{it} + \varepsilon_i \qquad (7)$$

Where:

$CARit\ (t1, t2)$ = The cumulative abnormal return of firm i between time $t1$ and $t2$;

OC = Dummy variable that captures CEO overconfidence (Holder67);

X = Set of control variables, as described in chapter 3.4.

The null hypothesis is that β_2 equals zero:

$$H0: \beta_2 = 0 \qquad (8)$$

For my second hypothesis, I argue that managerial ability may be a confounding variable in the Malmendier & Tate (2008) paper. For a confounding variable to lead to omitted variable bias, the following conditions must be met:

- The confounding variable (managerial ability) must correlate with the dependent variable (merger outcome);
- The confounding variable (managerial ability) must correlate with an independent variable in the regression model (overconfidence).

On these conditions, the following hypotheses are based:

Hypothesis 2a: "Managerial ability is correlated with overconfidence"

Hypothesis 2b: "Managerial ability is correlated with merger outcome"

H0 for both hypotheses are that the correlation coefficient equals zero, see equation 9 and 10.

$$H0: cor(managerial\ ability, overconfidence) = 0 \qquad (9)$$

$$H0: cor(managerial\ ability, merger\ outcome) = 0 \qquad (10)$$

These relationships will be tested by calculating the Pearson correlation coefficients between both variables, including their corresponding P-values.

To empirically disentangle the effect of overconfidence on merger outcome that is explained by managerial ability, I follow the methodology of Bertrand and Mullainathan (2001), who use a two-stage procedure to separate the effects. First, I will predict overconfidence using managerial ability to isolate changes in overconfidence that are caused by managerial ability. This is calculated by the following linear regression equation:

$$OC = \beta1 + \beta2\ ManAb + \varepsilon i \qquad (11)$$

Where:

OC = Dummy variable that captures CEO overconfidence (Holder67)

ManAb= Variable that captures managerial ability

In the second stage, I will see how sensitive merger outcome is to the predicted overconfidence variable. This is calculated by the following logistic regression equation:

$$CARit\ (t1,t2) = \beta1 + \beta2\ Ocit\ (predicted) + \beta3\ X'it + \varepsilon i \qquad (12)$$

Where:

$CARit\ (t1,t2)$ = The cumulative abnormal return of a firm i between time $t1$ and $t2$
$Ocit\ (predicted)$ = Dummy variable that captures the part of CEO overconfidence (Holder67) caused by managerial ability

The beta corresponding with this predicted overconfidence variable (β2) then explains how sensitive merger outcome is to the part of the overconfidence variable that is caused by managerial ability.

The third hypothesis tests the relationship between managerial ability and merger outcome. Therefore, it adds a variable that captures managerial ability to equation 7. This leads to the following linear regression equation:

$$CARit\ (t1,t2) = \beta_1 + \beta_2\ OC_{it} + \beta_3\ ManAb + \beta_4 X'_{it} + \varepsilon_i \qquad (13)$$

Where:

$CARit\ (t1,t2)$ = The cumulative abnormal return of a firm i between time $t1$ and $t2$
OC = Dummy variable that captures CEO overconfidence (Holder67)
ManAb = Variable that captures managerial ability
X = Set of control variables, as described in chapter 3.4

The null hypothesis is that β_3 equals zero

$$H0: \beta_3 = 0 \qquad (14)$$

A summary of all variables used, including their abbreviation and adaptation in relevant literature, can be found in table 1.

Table 1: Overview of variables				
Variables	Abbreviation	Measure	Adoption in literature	Database
Independent variables				
CEO overconfidence	Holder67	Holder 67 variable (in the money stock options of CEO)	John, Liu & Taffler (2011) Malmendier & Tate (2008) Hirshleifer et al. (2012)	ExecuComp
Managerial ability	ManAb	Managerial efficiency score based on how inputs are turned into outputs	Demerjian, P. R., Lev, B. I., & McVay, S. E. (2011).	Compustat
Dependent variable				
Market reaction to M&A announcements	CAR	Cumulative Abnormal Returns	Malmendier & Tate (2008) John, Liu & Taffler (2011) Brown and Warner (1985)	CRSP
Control variables				
<u>**CEO Control Variables**</u>				
Age	Age	CEO age at the time of the announcement	Malmendier & Tate (2008); Holmstrom (1997); Prendergast and Stole (1996)	ExecuComp
Tenure	Tenure	CEO tenure at the time of the announcement	Berger et al. (1997); Malmendier & Tate (2008)	ExecuComp
Stock ownership	StockOwn	% Of company stock held by the CEO at the time of the merger	Berger et al. (1997); Malmendier & Tate (2008)	ExecuComp

Vested options	VestOp	Number of vested options a CEO possesses	Berger et al. (1997); Malmendier & Tate (2008)	ExecuComp
Firm control variables				
Board size	BSize	Dummy variable that equals 1 of board size is between 4-12 members	Malmendier & Tate (2008)	Compustat
Tobin's Q	TQ	Performance measure calculated by dividing market value by book value	Malmendier & Tate (2008); Moeller, Schlingemann & Stulz (2004)	Compustat
Firm size	FSize	Natural logarithm of total firm assets	Moeller et al. (2004); Malmendier & Tate (2008)	Compustat
Capital expenditures	CAPEX	Capital expenditures at the beginning of the year	Malmendier & Tate (2008)	Compustat
Free cash flow	Fcf	Normalized earnings minus depreciation	Jensen (1983); Malmendier & Tate (2008)	Compustat
Deal control variables				
Cash payment	Cash	Equals 1 if the deal is (partly) financed with cash, 0 otherwise	Malmendier & Tate (2008); Andrade et al., (2001); Myers & Majluf, (1984)	ThomsonOne
Diversifying acquisition	Diversifying	Dummy variable equals 1 if target is from a different industry than acquirer.	Morck, Shleifer, & Vishny, (1990)	ThomsonOne
Deal size	DSize	Deal size in millions $	Malmendier & Tate (2008)	ThomsonOne

3.6 Data sources and collection

In this subsection, I describe the data gathering process and the data sources I used for my research. First, data about all acquisitions in the United States between 2010 and 2020 was gathered on ThomsonOne. I chose this time horizon because I wanted to exclude the effects of the financial crisis that started in 2007, and for some variables only information till 2020

was available. Following Malmendier and Tate (2008), a deal was only included if the acquiring company obtained at least 51% of the target shares and excluded if the acquirer already held 51% of the target shares before the deal. Furthermore, acquisitions worth less than 5% of acquirer value were omitted. This criterion is important because the CEO is not always actively involved if a relatively large company does a small acquisition. Table 2 provides a summary of the other restrictions is given:

Table 2: Data gathering proces			
Search criteria			
Request	**Operator**	**Description**	**Hits**
Database	Include	All Mergers & Acquisitions	n/a
Acquiror Nation (Code)	Include	United States of America	394670
Date Announced	Between	01/01/2010 to 01/01/2020	115357
Acquiror Public Status (Code)	Include	Public	37016
Percent of Shares Owned after Transaction	Between	51 to HI	23301
Percent of Shares Owned before Transaction	Must not exceed	50 percent	23097
Deal Value ($ Mil)	Between	2 to HI	10723
Target value / acquirer value	must exceed	5%	10369
Deal Status (Code)	Include	Completed	10369
Custom Report		Deal specifics...	10369

The data obtained from ThomsonOne contained information on 10.369 deals. More specifically, it contained data about the deal date, acquirer cusip, deal value, acquirer and target market code, type of payment, deal attitude and the percentage of shares owned and vested by the CEO.

Subsequently, this deal information was complemented with CEO data to construct the overconfidence variable. For all acquiring firms, information about the compensation scheme of the CEO was gathered from WRDS ExecuComp. More specifically, ExecuComp 'Outstanding equity awards' table was used to gather grant-level data on option packages like option exercise price, stock prices and expiration dates, and other executive information like age, sex, and tenure. With this information, the option moneyness was calculated, following equation 3 in section 3.2.

The data was further supplemented with company-specific information. I used WRDS Compustat to gather company accounting information like market value, book value, total

assets, capital expenditures, and board size. These variables were mainly used as control variables in this research. The last step of the data gathering process was to gather information on daily stock returns to calculate cumulative abnormal returns around the announcement dates of the merger. This data was retrieved from the WRDS CRSP Daily Stock database. After dropping firms with insufficient data for the estimation window and merging with the ExecuComp-ThomsonOne dataset, the final dataset consists of 241 unique firms performing 653 acquisitions between 2010 and 2020.

3.7 Descriptive statistics

In this section, I provide the summary statistics of the dependent, independent and control variables used in the regression models of this thesis. The most important statistics are presented in table 3:

Table 3: Descriptive statistics						
Variable	obs	Mean	Min	Median	Max	Std. Dev.
CARs						
CAR [-1,+1]	651	0,011	-0,310	0,009	0,370	0,053
CAR [-2,+2]	651	0,014	-0,270	0,011	0,369	0,059
CAR [-5,+5]	651	0,015	-0,290	0,013	0,400	0,070
Overconfidence						
Holder67 *'Holder67'*	651	0,301	0	0	1	0,459
Managerial Ability						
Managerial ability *'ManAb'*	651	-0,106	-0,316	-0,130	0,387	0,119
CEO control variables						
Age *'Age'*	651	56,582	38	56	88	7,228
Tenure *'Tenure'*	651	9,471	0	9	32	6,617
Stock ownership *'StockOwn'*	651	0,798	0	0,170	18,660	1,957
Vested options *'VestOp'*	651	419,012	0	167,920	20408,210	1012,762
Firm control variables						
Board size *'Bsize'*	651	0,736	0	1	1	0,441
Tobin's Q *'TQ'*	651	2,406	1	2,285	6,782	0,949
Firm size *'Fsize'*	651	8,110	4,337	7,993	13,004	1,551
Capital expenditures *'CAPEX'*	651	253,690	0	61,100	21550	976,986
Free cash flow *'FCF'*	651	1,267	-0,424	0,851	9,8321	1,522
Deal control variables						
Cash payment *'Cash'*	651	0,536	0	1	1	0,499
Diversifying *'Diversifying'*	651	0,372	0	0	1	0,484
Deal size *'Dsize'*	651	578,200	2,4	98	21997,300	1955,844

The dependent variable *'CAR'* exhibits a mean of 0,011 for the three-day event window, 0,014 for the five-day event window and 0,015 for the eleven-day event window. While this finding goes against the theory that suggests that mergers are, on average, value-destroying for the acquirer, is it in line with research by Jensen (1983) and Roll (1986).

Of all CEOs in my sample, 30% are considered overconfident following the Holder67 variable. This percentage lies in the middle of the overconfidence variables of Malmendier and Tate (2008), who find a lower percentage for their *'Longholder'*[4] measure (11%) and a slightly higher measure for their *'Holder67'* variable.

The average managerial ability score is -0,106, with values ranging from -0,316 to 0,387. This is similar to the findings of Demerjian et al. (2011), who find values in a range of -0,415 till 0,557 and a mean of -0,004. When comparing my results to the results of Demerjian et al. (2011), the managers in my sample have lower ability on average.

Looking at the CEO control variables, it becomes clear the average age of a CEO is 57 years, and the average CEO has worked for 9,5 years at the company. Both are in line with the research of Malmendier & Tate (2008). The average stock holdings of a CEO are in my sample 0,789, which implies that the CEOs in my sample hold 0,789% of company stock on average. Regarding the firm control variables, it becomes apparent that 73,6% of board sizes fall between the implied ideal board size of 4-12 members. This is a higher percentage than Malmendier & Tate (2008) have in their sample, and this could be a possible explanation of why the earlier discussed returns are slightly higher in my sample than in their sample. Furthermore, in my sample the average values for Tobin's Q, R&D spending and market value are slightly higher than in the Malmendier & Tate (2008) paper. This could be explained by the research of Connolly & Hirschey (2005), who find a positive correlation between Tobin's Q, market value and R&D spending. Implying that if one variable is higher in my dataset, probably all three variables will be higher.

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[4] The *'longholder'* measure in Malmendier and Tate (2008) identifies a CEO as overconfident who, at least once during their tenure, hold an option until the year of expiration, even though the option is at least 40% in-the-money.

Considering the deal control variables, the average deal value is around $580 million. Furthermore, 53,6% were paid with some type of cash, and 37,2% of total deals were done by an acquirer that was in a different industry than the target (diversifying merger).

3.8 Correlation

In this subsection, I analyze the correlation between the variables used in this thesis. All correlations can be found in table 4. In the following parts of this subsection, I elaborate primarily on the most important and significant correlations, which must be considered in the interpretation of the results.

In table 4, the most remarkable finding is that managerial ability is positively correlated with both merger outcome (CAR [-1,+1]) and overconfidence. The implication of this outcome is that managerial ability is a confounding variable in the Malmendier and Tate (2008) research. However, this finding will be discussed in more detail in the result section of this research, where more sophisticated methods are used to analyze this finding.

When analyzing the other correlations in table 4, It becomes apparent that deals paid with any combination of cash are positively correlated with market reaction (+0,090, significant at the 5% level). This is in line with the findings of Wansley, Lane & Yang (1983, 1987), Asquith, Bruner & Mullins (1987), Travlos (1987), Franks, Harris & Mayer (1988), and Brown & Ryngaert (1991), who report that returns to bidders are small, but positive in cash acquisitions. This finding could be explained by the signaling effect, stating that market participants interpret a cash-financed acquisition as a positive signal of the value of the acquiring firm (Yook, 2003). Furthermore, a diversifying merger is negatively correlated with merger outcome (-0,081, significant at the 5% level). This finding is in line with previous research that states that diversifying mergers create fewer synergies compared to non-diversifying mergers. If a merger is expected to create lower synergies, the merger creates lower value for the shareholders (Shelton (1988), Harrison et al. (1991), Ramaswamy (1997).

When looking at the overconfidence variable, table 4 shows that, while not significant, overconfidence is negatively correlated with Cumulative Abnormal Returns (-0,041). This

finding is in line with the research of Malmendier and Tate (2008), who show that overconfidence leads to lower merger outcome. Furthermore, table 4 shows that overconfidence is negatively correlated with age (-0,111, significant at the 1% confidence level). This finding contradicts previous research that argues that a CEO becomes more overconfident with increasing age, as Holmstrom (1999) argues, and is in line with research that states that CEOs become less overconfident with increasing age, as Prendergast & Stole (1996) argue. This implies that younger managers are more risk-taking, making them do more value-destroying mergers.

Looking at the relationship between managerial ability and overconfidence, the table shows a positive correlation (0,102 at the 1% significance level). This means that my research aligns with previous research that find a positive relationship between overconfidence and some form of ability. Examples are Galasso and Simcoe (2011) and Hirschleifer et al. (2012), who find that overconfidence increases firm value in innovative industries.

Furthermore, the correlation between managerial ability and short-term merger outcome is also positive (0,092, significant at the 5% level). Previous studies find a positive relationship between long-term firm performance and ability (Cui et al., 2020) and overall firm performance (Demerjian et al., 2020). This finding appends to these studies and shows that the short-term market reaction is positively related to managerial ability.

Table 4: Correlation matrix

This table presents the Pearson-correlation matrix between several relevant variables in the final dataset of this thesis. The definition of the variables corresponds with the descriptions given in Table 1. (The p-values correspond with the following significant values: (* Significant at 10%; ** significant at 5%; *** significant at 1%.)

	CAR[-1,+1]	Holder67	ManAb	Age	Tenure	Fsize	CAPEX	FCF	TQ	BSize	Cash	Diversifying	DSize	StockOwn	VestOp
CAR[-1.+1]	1,000														
Holder67	-0,041	1,000													
ManAb	0,092**	0,102***	1,000												
Age	0,015	-0,111***	-0,026	1,000											
Tenure	0,034	-0,058	-0,024	0,497	1,000										
FSize	-0,038	-0,069*	-0,053	0,138 ***	-0,096 *	1,000									
CAPEX	-0,025	-0,039	-0,099**	0,069 *	-0,017	0,384	1,000								
FCF	0,100**	-0,119***	0,144***	-0,002	-0,047	0,039	-0,065*	1,000							
TQ	0,015	-0,294	-0,235 ***	0,069 *	-0,042	-0,101 ***	-0,011	0,155 ***	1,000						
BSize	0,032	-0,003	0,009	-0,118 ***	0,117 **	-0,081*	0,020	-0,148 ***	0,113***	1,000					
Cash	0,090**	-0,034	-0,073*	-0,081**	0,070	0,040	-0,026	0,057	0,010	-0,007	1,000				
Diversifying	-0,081**	-0,110 ***	-0,026	0,042	0,027	0,069 *	-0,015	0,030	0,055	-0,044	-0,043	1,000			
DSize	-0,033	-0,059	-0,058	0,020	-0,049	0,316 ***	0,081**	0,026	-0,016	0,043	0,155	-0,059	1,000		
StockOwn	0,008	0,004	0,229***	-0,007	0,342	-0,277 ***	-0,035	0,153 ***	-0,170	0,078 *	-0,069 *	0,010	-0,079*	1,000	
VestOp	-0,076*	-0,123 ***	-0,106 **	0,036	0,071	0,124 ***	0,059	0,050	0,122 ***	0,010	0,003	-0,043*	0,064	0,067	1,000

4. Results and discussion

In this section, the findings of this research are discussed. I first present the results of the relationship between acquirer CEO overconfidence and merger outcome. Thereafter, I conclude if the variable managerial ability is indeed an omitted variable in the Malmendier & Tate (2008) research. Additionally, the relationship between managerial ability and merger outcome is investigated. In each subsection in this chapter, I relate the findings to previous literature and discuss the deviations and implications.

4.1 Overconfidence and merger outcome

In this subsection, the research done by Malmendier & Tate (2008) is replicated, and the effects of CEO overconfidence on merger outcome are discussed. Furthermore, I test the model's validity by including longer time horizons. I firstly elaborate on the results of the main variable of interest, overconfidence. Secondly, I elaborate on the empirical findings of the control variables and how they contribute to discussions in the existing literature.

Malmendier & Tate (2008) find that overconfident CEOs tend to do more lower-quality deals than their rational counterpart. Moreover, they find that overconfident CEOs tend to overbid more often. My first hypothesis is based on their findings and states:

Hypothesis 1: "The average value created in mergers is lower for overconfident than for rational CEOs"

H0: The average value created in mergers is equal for overconfident and rational CEOs

To check this hypothesis, I follow Malmendier & Tate (2008) and perform the same regression as the authors do. The results of this regression are reported in table 5. To test the validity of the model, longer time horizons are included. These results are displayed in panel B and C of the corresponding table.

Table 5: The effects of CEO overconfidence on market reaction

This table shows the results of the corresponding linear regression $CARit\,(t1,t2) = \beta_1 + \beta_2\,OC_{it} + \beta_3\,X'_{it} + \varepsilon_i$. Here, '$CARit\,(t1,t2)$' is used as dependent variable, which captures the abnormal return t days before and t days after an acquisition announcement. 'OC_{it}' is a binary variable that captures CEO overconfidence measured by the 'Holder67' variable. It shows a value of 1 if a CEO holds on to his exercisable options that are at least 67% in-the-money, and 0 otherwise. X'_{it} represents the following control variables: 'Age' represents the age of the executive at time of the announcement. 'Tenure' represents the number of years the CEO is with the company, at the time of the announcement date. 'FSize' is measured as the natural logarithm of a firms' total assets. 'CAPEX' captures a firms total capital expenditure. 'FCF' is measured as a firms' normalized earnings minus depreciation. 'TQ' is the ratio of market value over book value of a firm. 'BSize' is assigned a value of 1 if the board has between four and twelve members and 0 otherwise. 'Cash' is assigned a value of 1 if the deal was paid with cash involved, and 0 otherwise. 'Diversifying' is assigned a value of 1 if the acquirer was active in another sector than the target, and 0 otherwise. 'Stockown' represents the number of shares owned in own company stock by the CEO. 'VestOp' is the number of vested options a CEO possesses.

Panel A: CAR [-1,+1]

Variable	Estimate	Std, Error	t value	Pr(>|t|)	Significance
(Intercept)	3,959e-02	3,712e-02	1,067	0,2871	
Holder67	**-6,915e-03**	7,528e-03	-0,919	**0,3592**	
Age	-2,215e-04	5,373e-04	-0,412	0,6805	
Tenure	6,786e-05	6,261e-04	0,108	0,9138	
Fsize	-3,417e-03	2,410e-03	-1,417	0,1575	
CAPEX	1,111e-06	2,444e-06	0,454	0,6500	
FCF	1,061e-02	2,526e-03	4,201	3,65e-05	***
TQ	-2,674e-03	3,790e-03	-0,705	0,4812	
BSize	1,581e-02	7,226e-03	2,188	0,0296	*
CASH	9,942e-03	6,519e-03	1,525	0,1285	
Diversifying	-8,725e-03	6,386e-03	-1,366	0,1730	
StockOwn	1,680e-04	1,863e-03	0,090	0,9282	
VestOp	-6,929e-06	4,995e-06	-1,387	0,1665	

Panel B: CAR [-2,+2]

Variable	Estimate	Std. Error	t value	Pr(>|t|)	Significance
(Intercept)	6,139e-02	4,167e-02	1,473	0,2871	
Holder67	**-1,442e-02**	8,451e-03	-1,706	**0,0892**	.
Age	-5,531e-04	6,031e-04	-0,917	0,3600	
Tenure	4,640e-04	7,029e-04	0,660	0,5098	
Fsize	-4,321e-03	2,706e-03	-1,597	0,1116	
CAPEX	6,594e-08	2,744e-06	0,024	0,9808	
FCF	1,206e-02	2,835e-03	4,255	2,93e-05	***
TQ	-1,296e-03	4,255e-03	-0,305	0,7609	
BSize	1,697e-02	8,112e-03	2,092	0,0374	*
CASH	6,072e-03	7,319e-03	0,830	0,4075	
Diversifying	-6,776e-03	7,169e-03	-0,945	0,3455	
StockOwn	4,063e-04	2,092e-03	0,194	0,8462	
VestOp	-6,285e-06	5,607e-06	-1,121	0,2634	

Panel C: CAR [-5,+5]

Variable	Estimate	Std. Error	t value	Pr(>|t|)	Significance
(Intercept)	1,071e-01	5,298e-02	2,023	0,044143	*
Holder67	**-2,137e-02**	1,074e-02	-1,989	**0,047727**	*
Age	-8,849e-04	7,668e-04	-1,154	0,249511	
Tenure	4,333e-04	8,936e-04	0,485	0,628112	

Fsize	-7,365e-03	3,440e-03	-2,141	0,033202	*
CAPEX	2,206e-07	3,488e-06	0,063	0,949622	
FCF	1,417e-02	3,604e-03	3,932	0,000108	***
TQ	1,985e-03	5,409e-03	0,367	0,713991	
BSize	5,703e-03	1,031e-02	0,553	0,580754	
CASH	-1,270e-03	9,304e-03	-0,137	0,891506	
Diversifying	2,027e-03	9,114e-03	0,222	0,824141	
StockOwn	-1,648e-03	2,659e-03	-0,620	0,535883	
VestOp	-8,099e-06	7,128e-06	-1,136	0,256900	

Signif. codes: 0 '***' 0,001 '**' 0,01 '*' 0,05 '.' 0,1 ' ' 1

The results show that, even though not significant in all event windows, the short-term market reaction is negatively influenced by overconfidence for all three event windows [-1,+1], [-2,+2], [-5,+5] (resp. -69 bps, -144 bps and -214 bps). This means that if a CEO is classified as overconfident, the market reacts more negatively to this announcement than when his rational counterpart announces a merger. These results are roughly similar to the result Malmendier & Tate (2008) find in their research, who claim that overconfidence reduces the stock price of the acquiring firm by 90 bps if the announcement is made by an overconfident CEO. What is also similar is that the overconfident measure is sensitive to different time windows. The Holder67 variable in this research becomes more significant when the event window increases. Malmendier & Tate (2008) conclude the same in their paper.

When examining the control variables, the first significant variable in the [-5,+5] window is 'Fsize' (estimate of -7,365e-03, significant at the 5% level). The variable firm size is negatively related to merger outcome, confirming the claim of Moeller, Schlingeman & Stulz (2004) that abnormal returns are lower for firms with larger market capitalization. The second variable that is positive and significant for all three event windows, is 'FCF' (Estimate of 1,417e-02, significant at the 0,1% level). It shows that the larger the free cashflow of a company, the higher the market returns surrounding the announcement date of a merger. Remarkably, this finding is contrary to the free cash flow hypothesis advanced by Jensen (1983), which states that managers endowed with free cash flow will invest it in negative net present value projects. Furthermore, for the shorter event windows [-1,+1] and [-2,+2], the last variable that is positive and significant is 'BSize' (Resp. 1,581e-02 and 1,697e-02, both significant at the 5% level). This finding provides statistically significant evidence for the rationale of Malmendier

& Tate (2008) that an efficient board size (between 4 and 12 members) can help limit value-destroying acquisitions done by an overconfident CEO. Interestingly, while Malmendier & Tate (2008) come with this rationale, they do not find significant evidence to support this claim in their research. My finding emphasizes the importance of choosing an appropriate board size when it comes to engaging in M&A's.

When examining the other control variables, it becomes apparent that the estimate for 'Age' is negative in all three event windows (estimate of -8,849e-04). Even though the estimate is insignificant, this result contributes to the discussion if the age of a CEO is positively correlated to market returns, as argued by Holmstrom (1999), or negatively correlated to market returns, as argued by Prendergast & Stole (1996). In this research, CEO age is negatively correlated to merger outcome. An explanation for this is given by Prendergast and Stole (1996), who state that older managers are not able to adapt their investment behaviour to new information, leading them to be involved more often in value-destroying mergers. Furthermore, 'Tenure' seems to be positively related to merger outcome in all event windows (estimate of 4,333e-04). This finding goes against the claim of Berger et al. (1997), who states that CEOs who are longer with a firm become overconfident in their own skillset, leading them to do more value-destroying mergers. My findings explain the opposite, namely that CEOs with longer tenure create more value when doing a merger. A possible explanation for this finding is that CEOs who are longer with a corporation, become more skilled in what they do. This makes them do more value-creating mergers. When looking at the influence of the number of vested options ('VestOp') on merger outcome, it seems that this variable negatively influences merger outcome (estimate of -8,099e-06). However, since it is insignificant and close to zero, it is impossible to contribute to the discussion if higher proportions of fixed compensation help to reduce overconfidence and thus, increase market reaction, as argued by Amihud and Lev (1981) and Berger et al. (1997).

To conclude, even though I only find a significant relationship between overconfidence and merger outcome in the [-5,+5] event window (-2,137e-02, significant at the 5% level), I find a negative relationship for all three event windows. My findings are similar to the results of Malmendier & Tate (2008), confirming that CEO overconfidence lowers the returns

surrounding an announcement of a merger. Therefore, I confirm my first hypothesis and reject H0.

4.2 Omitted variable bias

This subsection analyzes if managerial ability is a confounding variable in the Malmendier & Tate (2008) research. As discussed in previous sections of this research, managerial ability is a confounding variable if there exists a correlation with both the dependent variable *'CAR'* and the dependent variable *'Holder67'*. Therefore, I formulated hypotheses 2a and 2b as follows:

Hypothesis 2a: "Managerial ability is correlated with overconfidence"

H0: corr(manability,overconfidence) = 0

Hypothesis 2b: "Managerial ability is correlated with merger outcome"

H0: corr(manability,merger outcome) = 0

The correlations, as well as the corresponding P-values, are reported in table 6:

Table 6: Correlation coefficients		
	Managerial ability ('ManAb')	**P-value**
Overconfidence ('Holder67')	0.102**	0,009
Market reaction (CAR [-1,+1][5])	0,092*	0,019

Signif. codes: 0 '***' 0,001 '**' 0,01 '*' 0,05 '.' 0,1 ' ' 1

As can be seen in table 6, both correlations are positive and significant. The correlation coefficient of managerial ability and overconfidence is 0,102 at a 1% significance level, indicating a positive linear relationship between both variables. When analyzing the correlation coefficient between managerial ability and cumulative abnormal return, it shows

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[5] Correlation coefficient is robust when controlling for different event windows (CAR [-2,+2], CAR [-5, +5]

a value of 0,092 at a 5% significance value. This exhibits a positive association between both variables.

Because the correlation between managerial ability and overconfidence is positive, I reject H0 and accept hypothesis 2a. This finding contributes to the discussion what the relationship between managerial ability and overconfidence is. My findings are consistent with the research of Hirschleifer et al. (2012), Galasso and Simcoe (2011), and Larwood and Whittaker (1977), who claim a positive relation between overconfidence and managerial ability.

Because the correlation between managerial ability and merger outcome is positive, I can reject H0 of hypothesis 2b. This is in line with the relationship most literature concludes, namely that managerial ability has a positive effect on merger outcome.

Notwithstanding both coefficients are not very strong, they are positive and significant. This implies that managerial ability is a confounding variable in the Malmendier & Tate (2008) paper, meaning that the relationship between overconfidence and merger outcome Malmendier & Tate (2008) report is somewhat spurious. Important to note is that a correlation coefficient only shows the strength of a linear relationship between both variables and does not imply causation.

To investigate how sensitive merger outcome is to changes in the overconfidence variable caused by managerial ability, the two-stage model explained in section 3.5 of this thesis is applied. The results, shown in table 7, show that merger outcome changes 2,161e-01 when overconfidence caused by managerial ability increases by 1.

Table 7: Sensitivity of overconfidence caused by managerial ability on merger outcome

This table shows the results of the corresponding linear regression $CARit\ (-1,+1) = \beta1 + \beta2\ Ocit\ (predicted) + \beta3\ X'it + \varepsilon i$ Here, $'CARit\ (-1,+1)$ is used as dependent variable, which captures the abnormal return 1 day before and 1 day after an acquisition announcement. $'Oc_{it(predicted)}'$ is a variable that captures predicted CEO overconfidence caused by managerial ability. X'_{it} represents the following control variables: 'Age' represents the age of the executive at time of the announcement. 'Tenure' represents the number of years the CEO is with the company, at the time of the announcement date. 'FSize' is measured as the natural logarithm of a firms' total assets. 'CAPEX' captures a firms total capital expenditure. 'FCF' is measured as a firms' normalized earnings minus depreciation. 'TQ' is the ratio of market value over book value of a firm. 'BSize' is assigned a value of 1 if the board has between four and twelve members and 0 otherwise. 'Cash' is assigned a value of 1 if the deal was paid with cash involved, and 0 otherwise. 'Diversifying' is assigned a value of 1 if the acquirer was active in another sector than the target, and

0 otherwise. 'Stockown' represents the number of shares owned in own company stock by the CEO. 'VestOp' is the number of vested options a CEO possesses.

Variable	Estimate	Std, Error	t value	Pr(>|t|)	Significance
	CAR [-1.+1]				
(Intercept)	-1,854e-02	4,359e-02	-0,425	0,671001	
OC(predicted)	**2,161e-01**	**9,680e-01**	**2,232**	**0,026459**	*
Age	-5,373e-04	5,532e-04	-0,971	0,332259	
Tenure	5,223e-04	6,369e-04	0,820	0,412956	
FSize	-3,356e-03	2,390e-03	-1,404	0,161595	
CAPEX	2,243e-06	2,458e-06	0,912	0,362388	
FCF	9,604e-03	2,551e-03	3,765	0,000206	***
TQ	2,152e-04	3,875e-03	0,056	0,955755	
BSize	1,377e-02	7,202e-03	1,913	0,056897	.
Cash	1,188e-02	6,494e-03	1,829	0,068562	.
Diversifying	-9,604e-03	6,333e-03	-1,517	0,130588	
StockOwn	-6,017e-04	1,867e-03	-0,322	0,747458	
VestOp	-3,744e-06	5,061e-06	-0,740	0,460016	

Signif. codes: 0 '***' 0,001 '**' 0,01 '*' 0,05 '.' 0,1 ' ' 1

I interpret this result as overconfidence that finds its origin in skill or talent, increases the abnormal returns around the announcement date of a merger with 2,161e-01.

4.3 The effect of managerial ability on merger outcome

This subsection shows the effect of managerial ability on merger outcome. In subsection 4.1, I performed the same analysis as Malmendier & Tate (2008) and found a similar relationship as the authors between overconfidence and merger outcome. In this subsection, I add managerial ability to that regression. The aim of this subsection is twofold. First, the relationship between managerial ability and merger outcome is investigated. I expect that the market reacts more positively to a more able manager announcing a merger than when a less able manager announces a merger. Second, this subsection shows to what degree the relationship Malmendier & Tate (2008) find between overconfidence and merger outcome is biased.

My third hypothesis is based on the relationship between managerial ability and overconfidence and states:

Hypothesis 3: "The average value created in mergers is higher for more able managers than for lower-ability managers"

H0: There is no difference between merger outcome when a high ability manager announces a merger or when a low ability manager announces a merger

To check this hypothesis, I added a variable that captures managerial ability to the regression I used to test my first hypothesis. The results are exhibited in Table 8. Panel A, B and C of the corresponding table display different time horizons and are included as robustness checks.

Table 8: Effects of CEO overconfidence and managerial ability on market reaction

This table shows the results of the corresponding linear regression $CARit\ (t1,t2) = \beta_1 + \beta_2\ OC_{it} + \beta_3\ ManAb + \beta_4 X'_{it} + \varepsilon_i$. Here, $'CARit\ (t1,t2)'$ is used as dependent variable, which captures the abnormal return t days before and t days after an acquisition announcement. $'OC_{it}'$ is a binary variable that captures CEO overconfidence measured by the 'Holder67' variable. It shows a value of 1 if a CEO holds on to his exercisable options that are at least 67% in-the-money, and 0 otherwise. 'ManAb' is a variable imposed by Demerjian et al., (2011) that captures managerial ability. X'_{it} represents the following control variables: 'Age' represents the age of the executive at time of the announcement. 'Tenure' represents the number of years the CEO is with the company, at the time of the announcement date. 'FSize' is measured as the natural logarithm of a firms' total assets. 'CAPEX' captures a firms total capital expenditure. 'FCF' is measured as a firms' normalized earnings minus depreciation. 'TQ' is the ratio of market value over book value of a firm. 'BSize' is assigned a value of 1 if the board has between four and twelve members and 0 otherwise. 'Cash' is assigned a value of 1 if the deal was paid with cash involved, and 0 otherwise. 'Diversifying' is assigned a value of 1 if the acquirer was active in another sector than the target, and 0 otherwise. 'Stockown' represents the number of shares owned in own company stock by the CEO. 'VestOp' is the number of vested options a CEO possesses.

Panel A: CAR [-1.+1]					
Variable	**Estimate**	**Std. Error**	**t value**	**Pr(>|t|)**	**Significance**
(Intercept)	6,002e-02	3,798e-02	1,580	0,115269	
<u>**Holder67**</u>	<u>**-6,603e-03**</u>	7,473e-03	-0,884	<u>**0,377747**</u>	
<u>**ManAb**</u>	**8,424e-02**	3,805e-02	2,214	<u>**0,027689**</u>	<u>*</u>
Age	-5,504e-04	5,536e-04	-0,994	0,320990	
Tenure	4,405e-04	6,438e-04	0,684	0,494515	
FSize	-3,268e-03	2,394e-03	-1,365	0,173304	
CAPEX	2,084e-06	2,466e-06	0,845	0,398674	
FCF	9,286e-03	2,577e-03	3,603	0,000376	***
TQ	-2,721e-04	3,915e-03	-0,070	0,944642	
BSize	1,410e-02	7,214e-03	1,954	0,051788	.
Cash	1,151e-02	6,510e-03	1,768	0,078171	.
Diversifying	-1,023e-02	6,375e-03	-1,605	0,109729	
StockOwn	-4,796e-04	1,872e-03	-0,256	0,798030	
VestOp	-4,284e-06	5,099e-06	-0,840	0,401649	
Panel B: CAR [-2,+2]					
Variable	**Estimate**	**Std. Error**	**t value**	**Pr(>|t|)**	**Significance**
(Intercept)	8,527e-02	4,261e-02	2,001	0,046389	*

Variable	Estimate	Std, Error	t value	Pr(>|t|)	Significance
Holder67	-1,405e-02	8,383e-03	-1,676	0,094859	.
ManAb	9,848e-02	4,268e-02	2,308	0,021815	*
Age	-9,377e-04	6,210e-04	-1,510	0,132262	
Tenure	8,996e-04	7,222e-04	1,246	0,214053	
FSize	-4,147e-03	2,685e-03	-1,544	0,123689	
CAPEX	1,204e-06	2,766e-06	0,435	0,663568	
FCF	1,051e-02	2,891e-03	3,637	0,000332	***
TQ	1,512e-03	4,392e-03	0,344	0,731006	
BSize	1,497e-02	8,092e-03	1,850	0,065496	.
Cash	7,908e-03	7,302e-03	1,083	0,279848	
Diversifying	-8,536e-03	7,151e-03	-1,194	0,233686	
StockOwn	-3,508e-04	2,100e-03	-0,167	0,867472	
VestOp	-3,193e-06	5,720e-06	-0,558	0,577249	

Panel C: CAR [-5,+5]

Variable	Estimate	Std, Error	t value	Pr(>|t|)	Significance
(Intercept)	1,318e-01	5,435e-02	2,425	0,015986	*
Holder67	-2,099e-02	1,069e-02	-1,963	0,050696	.
ManAb	1,017e-01	5,444e-02	1,868	0,062859	.
Age	-1,282e-03	7,922e-04	-1,619	0,106770	
Tenure	8,832e-04	9,213e-04	0,959	0,338635	
FSize	-7,186e-03	3,425e-03	-2,098	0,036872	*
CAPEX	1,397e-06	3,528e-06	0,396	0,692571	
FCF	1,257e-02	3,688e-03	3,409	0,000755	***
TQ	4,884e-03	5,603e-03	0,872	0,384140	
BSize	3,632e-03	1,032e-02	0,352	0,725221	
Cash	6,253e-04	9,315e-03	0,067	0,946532	
Diversifying	2,087e-04	9,123e-03	0,023	0,981766	
StockOwn	-2,430e-03	2,679e-03	-0,907	0,365235	
VestOp	-4,905e-06	7,297e-06	-0,672	0,502054	

Signif. codes: 0 '***' 0,001 '**' 0,01 '*' 0,05 '.' 0,1 ' ' 1

The main variable of interest for this hypothesis, managerial ability, is positive and significant for the two shortest time horizons (resp. 8,424e-02 and 9,848e-02, both significant at the 5% level). This implies that the ability of a manager indeed has some explanatory power in explaining market reaction to an acquisition announcement. The higher the ability of a manager to turn inputs into outputs, the more positively the market reacts when this manager does an acquisition announcement. This finding confirms my third hypothesis, meaning that the market reacts more favorable to a high-ability manager announcing a merger than when his lower-ability counterpart announces a merger.

My finding contributes to existing literature, which already established a positive relationship between some form of managerial ability and long-term firm performance and confirms that also the short-term market reaction around a merger announcement seems to be positively related to managerial ability. My finding emphasizes the importance of hiring a CEO who has a high managerial ability score for a firm that does a lot of mergers.

The results also showcase if the relation Malmendier & Tate (2008) find between overconfidence and merger outcome is spurious. For easy comparison, the estimates of the overconfidence variable are summarized in table 9, together with the corresponding P-values. Interestingly, it becomes apparent that when controlling for the managerial ability variable, the overconfidence variable became slightly more insignificant in explaining merger outcome, which means that part of the effect of overconfidence established in section 4.1 can be explained by merger outcome. Furthermore, these results show that the research of Malmendier & Tate (2008) indeed suffered from a small but apparent omitted variable bias. For all three event windows, the estimate of overconfidence became less negative when controlling for managerial ability. This finding further strengthens my second hypothesis and implies that managerial ability is a better proxy in explaining merger outcome than is overconfidence.

Table 9: Comparing overconfidence estimates					
Manab excluded			Manab included		
Time horizons	Estimate	Pr(>|t|)	Time horizons	Estimate	Pr(>|t|)
[-1,+1]	-6,915e-03	0,3592	[-1,+1]	-6,603e-03	0,377747
[-2,+2]	-1,442e-02	0,0892	[-2,+2]	-1,405e-02	0,094859
[-5,+5]	<u>-2,137e-02*</u>	0,047727	[-5,+5]	-2,099e-02	0,050696

Signif. codes: 0 '***' 0,001 '**' 0,01 '*' 0,05 '.' 0,1 ' ' 1

When looking at the control variables, I find similar results as in subsection 4.1. For the variables 'FSize', 'BSize' and 'FCF', the signs are in the same direction (resp. -7,186e-03, 3,632e-03 and 1,257e-02) and I find similar confidence levels. This fact confirms again that abnormal returns are lower for firms with a higher market capitalization, and it provides further evidence that board size matters when looking at merger outcome. The estimate of

the variable 'FCF' is again positive, meaning that firms with more cash available have higher abnormal returns surrounding the announcement of a merger.

Different than in section 4.1, the variable *'Cash'* became statistically more significant (1,151e-02, significant at the 10% level) when the variable managerial ability is included in the regression, indicating that the market reacts positively when a CEO decides to finance an acquisition using any form of cash. This finding contributes to the discussion if the form of exchange medium has significant explanatory power in explaining merger outcome. My finding is in line with previous research, like Wansley, Lane & Yang (1983, 1987), Asquith, Bruner & Mullins (1987), Travlos (1987), Franks, Harris & Mayer (1988), and Brown & Ryngaert (1991) who report that bidders return tend to be negative and significant in stock acquisitions and slightly positive though not significant in cash acquisitions. This finding could be explained by the premise that the board of a firm and the market do not share the same information set, resulting in information asymmetry that affects the choice of exchange medium. In case information asymmetry is present, the choice of finance medium conveys information about the firms' true value to the market. The market interprets an acquisition financed with cash as a positive signal of the value of the acquiring firm (Yook, 2003b).

To conclude, my main finding in this section is that managerial ability has statistical power in explaining merger outcome. I find that the more capable a manager is to convert firm inputs into revenue, the higher the abnormal returns will be around the announcement date of a merger. Furthermore, my results illustrate that the more precise measure of managerial ability I used in this thesis, conducted by Data Envelopment Analysis, is suitable for identifying statistically significant relationships. For previous studies, who used less comprehensive proxies to quantify managerial ability, it means they should revise their conclusions by controlling for this newer proxy of managerial ability. For future studies, this measure of managerial ability, which is available for a large sample of firms and outperforms existing ability measures, will allow researchers to pursue studies that were previously difficult to perform.

4.4 Economic implications

In this subsection, I describe the economic implications of the results of this thesis. Subsection 4.2 shows a low but positive correlation coefficient between managerial ability and the Holder67 variable, meaning that both variables are somehow related. This implies that less talented CEOs appear to be less overconfident. There are several reasons this might be the case.

Firstly, it could be that the 'Holder67' measure, which is usually interpreted to capture a distinct aspect of overconfidence, captures (part of) the ability of a manager instead of the overconfidence trait. Arguments for this reasoning can be deducted logically when analyzing how the 'Holder67' variable is measured. When a manager fails to execute his highly in the money options, it is interpreted as overconfidence. However, one could argue that not overconfident managers, but managers with higher ability choose to hold in-the-money options. Because more able managers have higher ability to make a company more profitable, it is more likely that the value of the option he holds will increase over time. Following this argument, it is logically that the Holder67 variable measures part of the managers ability instead of his overconfidence level.

The second reasoning of why managerial ability and CEO overconfidence are related can be deducted from the managerial ability variable. This variable is computed using variables that are all affected by CEO behaviour. However, this behaviour is influenced by both the ability of a manager and his overconfidence level. Examples of these variables are R&D expenses or operating leases. It could be logically argued that all these variables are not affected by the ability of a manager, but rather by his overconfidence level. For example, Hirschleifer et al. (2012) find that more overconfident CEOs do more R&D, and a higher R&D level leads to a higher managerial ability score. Following this reasoning, it can be argued that the managerial ability variable (partly) captures overconfidence instead of true ability.

In my opinion, the way the 'Holder67' variable is measured, it captures besides overconfidence also a part of the managers ability. However, using the regression in subsection 4.4, I find that the explanatory power of the 'Holder67' variable slightly decreases, but not by much when controlling for managerial ability. I interpret these results as showing

that while the variables Holder67 and managerial ability both capture related traits, the Holder67 variable captures a distinct aspect of overconfidence.

5. Limitations

In this section, I outlay the main limitations of this thesis. The limitations discussed mainly focus on this thesis's main variables of interest, namely the overconfidence variable and the managerial ability variable, since good measures that capture both traits are vital for this research.

Starting with the overconfidence measure, the first limitation regarding this variable is that it does not capture overconfidence directly. As discussed in previous sections, I follow the methodology of Malmendier & Tate (2008), who capture overconfidence using a quantitative approach based on stock options exercise of CEOs. The authors classify a CEO as overconfident if he holds exercisable stock options that are more than 67% in-the-money. However, overconfidence is merely one reason why a CEO might decide to postpone his exercise decision. Other reasons a CEO could defer this decision are to postpone taxes due, upcoming dividends, and CEO-specific motives. Another reason could be that the board of directors pressure a CEO not to execute his option to ensure his incentives are aligned with the incentives of other shareholders. To mitigate this limitation, several control variables are introduced in the regression. For example, the variables age, tenure, and cashflow are introduced to reduce the noisiness of the overconfidence measure to a minimum level. Other, more sophisticated tests Malmendier & Tate (2008) use to further validate the interpretation of the results in their research, are outside the scope of this thesis and impossible to replicate due to time constraints and unavailability of data.

Another limitation of this paper is the decision of control variables included in the model. I mimicked the model of Malmendier & Tate (2008), who use a combination of deal-specific, firm-specific, and CEO-specific control variables. However, Dessaint et al. (2019) give a comprehensive overview of variables that possibly influence announcement returns. For example, toeholds, target defense mechanisms, or number of bidders. The overconfidence literature, including the research of Malmendier & Tate (2008), do not include these variables and therefore, neither did I. This could be seen as a limitation of my research since the literature proves the importance of those variables.

Another limitation of this research is concerning the managerial ability estimate. Even though Demerjian et al. (2011) claim their managerial ability measure is proven to be an improvement over other ability measures, it has limitations. First, the measure estimates ability based on firm inputs. These inputs consist of accounting variables, and while some accounting variables contain measurement errors, others are unavailable. This reduces the number of observations in the model. Second, the managerial ability score is purged from the firm efficiency score by taking the residual from a model. A portion of this residual could reflect factors that are not attributable to the ability of a manager. Third, the firm efficiency score is calculated using Data Envelopment Analysis (DEA). Some of the variables used as input variables in the DEA model, such as net PP&E, could be determined by both past and current manager. If this is the case, the score is not fully attributable to the current management. Possible solution for this problem could be to adapt the DEA inputs to only those that management can influence in the short-term, and by controlling for the longer-term inputs that are more difficult to change. However, despite above-mentioned limitations, the managerial ability measure used in this thesis is less noisy than existing proxies of managerial ability. Furthermore, the necessary data to calculate the score is more widely available and more accurate. Therefore, it is still a valid measure in this thesis.

6. Conclusion

This research validates the influential research of Malmendier & Tate (2008), who claim that their proxy for CEO overconfidence is significantly related to merger outcome. I use newer data than the authors and mimic their methodology. Subsequently, I add a variable to their regression. I investigate if omitting this new variable, which is a more overarching way of measuring managerial ability, leads to spurious results in their research. Furthermore, I investigate the relationship between managerial ability and merger outcome. Based on the above, the main question this paper answers is formulated as follows:

'What are the effects of managerial ability on merger outcome?'

This section will give an answer to the above question by discussing the conclusions of this thesis. I will first give a brief description of my dataset and the main variables, followed by a summary of the main findings.

The dataset used in this thesis consists of 241 large US firms, which are all listed on the S&P 1500. Between 2010 and 2020, these firms conducted a total of 652 mergers. The overconfidence measure used in this thesis, called 'Holder67', is based on stock option exercise behaviour. This measure classifies a manager as overconfident when he fails to execute an exercisable option that is 67% in the money (Malmendier & Tate, 2008). Furthermore, market reaction is measured using cumulative abnormal returns around the announcement day of a merger, using three event windows ([-1,+1], [-2,+2], [-5,+5]).

The first finding of this thesis is that, following the methodology of Malmendier & Tate (2008), CEO overconfidence is indeed negatively related to merger outcome. The authors claim that the acquiring stock price is on average 90 bps lower if an overconfident CEO does the announcement, then if done by his rational counterpart. In my research, I find similar results. Even though the findings are only significant for the longer time horizon [-5,+5], it shows that the short-term market reaction around a merger announcement is negatively influenced by overconfidence for all three event windows [-1,+1], [-2,+2], [-5,+5] (resp. -69 bps, -144 bps

and -214 bps). This means that the earlier mentioned claim of Malmendier & Tate (2008) also holds for newer datasets.

Three years after the research of Malmendier & Tate (2008), another way of measuring managerial ability is introduced by Demerjian et al. (2011). Past researchers (like Malmendier & Tate) tried to capture managerial ability using various proxies for talent. However, all these proxies are affected by intervening factors such as firm and industry attributes. Therefore, I advance a measure of managerial ability that is more precise, and available for a large sample of firms. Following the methodology of Demerjian et al. (2011), I use Data Envelopment Analysis as a platform to estimate the efficiency of a firm. I then purge this efficiency score from its firm-driven effects. What is left is the proxy for managerial talent.

In this research, I find a low but significant correlation between this measure of ability and both merger outcome and overconfidence. Between managerial ability and overconfidence, I find a correlation of 0,102, significant at the 1% level. Furthermore, the variables managerial ability and merger outcome have a correlation of 0,092, significant at the 5% level. This finding shows that, while the effects are small, this measure of managerial ability is indeed a confounding variable in the Malmendier and Tate research. This implies that the effect of overconfidence on merger outcome Malmendier & Tate (2008) find is somewhat spurious.

Following the methodology of Bertrand and Mullainathan (2001), I calculated the effect overconfidence caused by managerial ability has on merger outcome. I find a positive effect of 2,161e-01 and interpret the results as follows: if overconfidence that finds its origin in skill or talent increases by 1, the abnormal returns around the announcement date of a merger increases by 2,161e-01.

Subsequently, this research further examined the bias in the research of Malmendier & Tate (2008). To do this, I reconstructed the linear regression used to find the relationship between overconfidence and merger outcome. However, this time I controlled for managerial ability. The estimate of overconfidence on merger outcome changed from -6,915e-03 to -6,603e-03 for a time horizon of 3 days, from -1,442e-02 to -1,405e-02 for a time horizon of 5 days, and from -2,137e-02 to -2,099e-02 for a time horizon of 11 days around the announcement date

of a merger. Meaning the overconfidence estimate became slightly less negative and more insignificant for all event windows. Even though the omitted variable bias is small, it is apparent. By controlling for managerial ability, overconfidence became slightly more insignificant in explaining merger outcome.

Furthermore, I find a low but positive correlation between the Holder67 variable and managerial ability (correlation of 0,102, significant at the 1% level). This implies that CEOs with higher ability tend to be classified as overconfident more often. Although this relationship has been established in previous finance literature (see Stango et al., 2017; Chapman et al., 2018; Meikle et al., 2016), it has not been established for the Holder67 measure of overconfidence. Furthermore, this finding goes against the relationship found in the psychology literature (Kruger & Dunning, 1999).

Lastly, this research investigated the effect of managerial ability on merger outcome. For the two shorter event windows ([-1,+1], [-2,+2]), it resulted in a positive relationship between managerial ability and merger outcome (8,424e-0,2 and 9,848e-02), both significant at the 5% level. For the longer event window, the estimate was also positive. However, with a lower significance level (1,017e-01). This result implies that the ability of a manager indeed has some explanatory power in explaining short-term market reaction of an acquisition announcement. The higher the ability of a manager to turn inputs into outputs, the more positively the market reacts when this manager announces an acquisition. This finding complements the already existing literature, that found that managerial ability positively influences long-term firm performance (Cui et al., 2020).

Based on the conclusions in this thesis, I suggest two avenues for further research. First, I suggest new research to further investigate the relationship between managerial ability and overconfidence. It is interesting to know to what extent both factors influence each other and in what situations overconfidence / managerial ability retains significant explanatory power in explaining firm performance. Future researchers could start by investigating if other overconfidence measures, like the *'Longholder'* variable introduced by Malmendier & Tate (2008), also become statistically insignificant when controlling for managerial ability. Second, this thesis validates Data Envelopment Analysis, as specified in Demerjian et al. (2011), as an

essential factor in explaining market reaction around the announcement date. Therefore, future researchers could use this managerial ability variable to establish further relationships between managerial ability and firm performance, different than short-term market reaction around a merger announcement date. For example, do better managers select and execute more environmentally conscious acquisitions?

Furthermore, this variable could also be used to validate previous research that did not control for this way of measuring managerial ability, as is done in this research. Also, further research could be dedicated to better understanding what factors determine managerial ability. To conclude, this more accurate and accessible measure of managerial ability can allow researchers to further expand our knowledge of what role managerial characteristics play in explaining firm performance.

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# 8. Appendix

Appendix A: check data for linearity
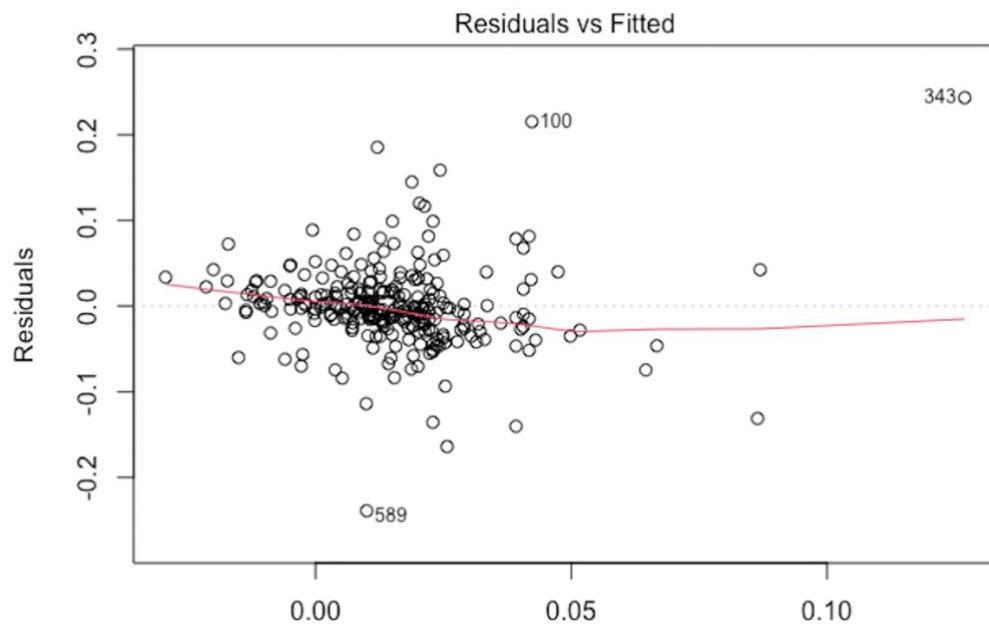
As can be seen in the above figure, the residual plot shows no fitted pattern. The red line is approximately horizontal at zero, meaning there is no pattern in the residual plot. Therefore the model is assumed to have a linear relationship between the predictors and the outcome variables.

Appendix B: check data for normality

Histogram of LRT1.lm$residuals
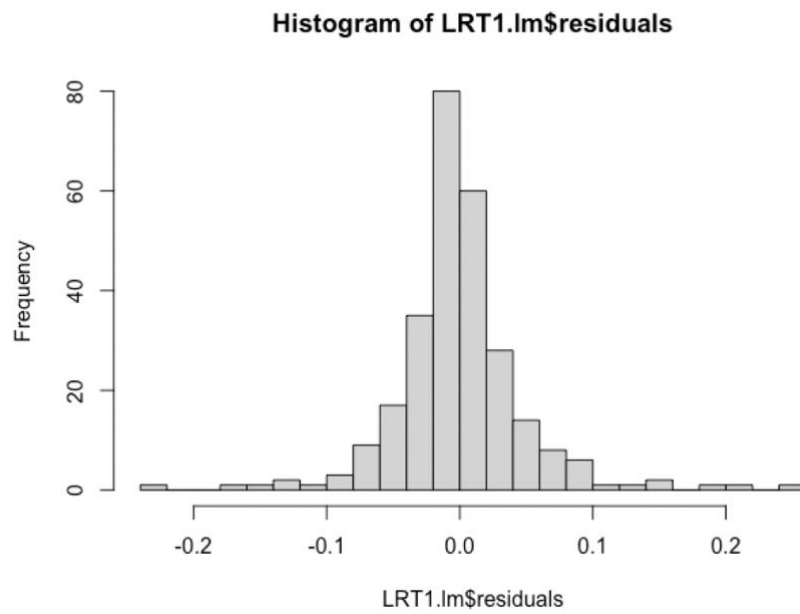
As can be seen in the figure, the residuals of the dataset are normally distributed. Therefore, I assume the model to comply to the assumption of normality.

Appendix C: check data for autocorrelation

Series LRT1.lm$residuals
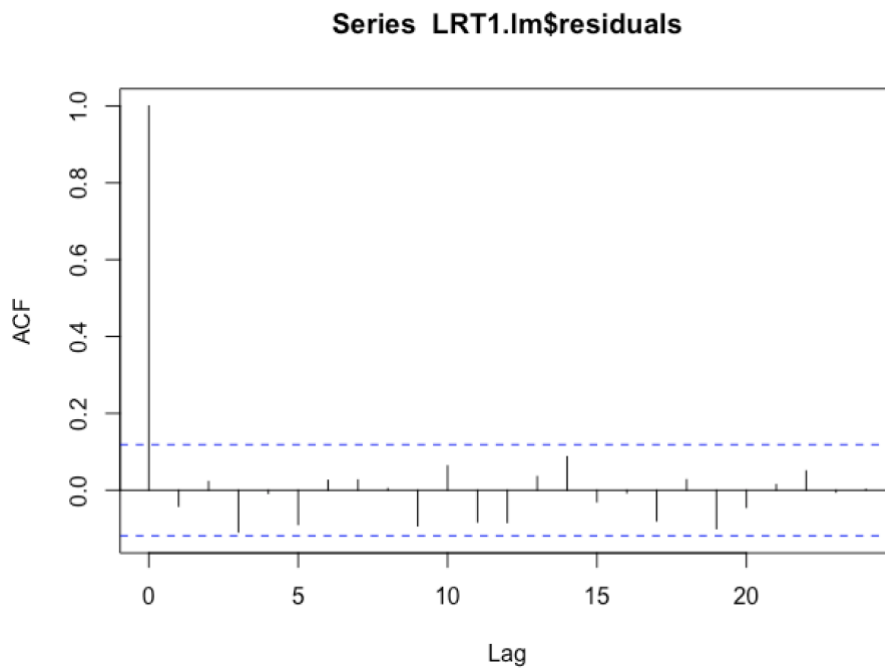
If autocorrelation is absent in the model, the subsequent vertical bars in the figure above would drop to almost zero. The figure shows a clear quick drop in the correlations. So, I conclude that the residuals are not autocorrelated and the model complies to the assumption of no autocorrelation.