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Corporate Takeover and Operational Efficiency

Do investors believe in value creation through the transfer of operational efficiency between merging firms?

Joachim Arnesen & Mathias Berg Sletten

Supervisor: Karin Thorburn

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Joachim Arnesen

Mathias Berg Sletten

Abstract

In this thesis, we examine the value creation in all-cash public takeovers, the relationship between value creation and the opportunity to transfer operational efficiency, and whether this relationship is different for horizontal and diversifying takeovers. We define value creation as the total increase in shareholder value for the target and the acquirer that can be attributed to the takeover, and opportunity to transfer operational efficiency as the absolute value of the difference in operational efficiency between the target and the acquirer. Operational efficiency is approximated by return on invested capital.

The analysis reveals that the average value creation for all-cash public corporate takeovers is positive, which suggests that investors generally believe that corporate takeovers do create value. However, we observe that a substantial number of transactions are, in fact, value-destroying. This finding could suggest that the acquiring management overestimate their ability to create value through corporate takeovers, or that misalignment of incentives cause management to pursue corporate takeovers that do not benefit shareholders. Moreover, the analysis suggests that investors value the opportunity to transfer operational efficiency differently for diversifying takeovers compared with horizontal takeovers, with the association being negative for diversifying takeovers compared with horizontal takeovers. One possible explanation for this is that investors believe that the transfer of a non-industry specific advantage is less probable than an industry-specific one, which can signal that the acquiring management overestimate the potential for transfer of operational efficiency in diversifying takeovers.

Keywords – Corporate Takeover, M&A, Value Creation, Synergy, Operational Efficiency, Prediction of Takeover Success

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1 Introduction

A corporate takeover[1] occurs when one company, the acquirer, acquires the controlling rights of another company, the target. On a fundamental level, any such act is a proposition that the two entities represent greater value together than they do separately. Over 80% of communicated value creation in relation to corporate takeovers is attributed to cost savings (Bernile & Bauguess, 2011). A frequently proposed way of achieving cost savings in corporate takeovers is to improve the operational efficiency for either the acquirer or target to the level of the one that is outperforming the other–we define this as the transfer of operational efficiency. In this thesis, we investigate whether investors believe that corporate takeovers create value on average and whether they value the opportunity to transfer operational efficiency between the merging companies in a takeover. For this purpose, we conduct univariate t-tests, Welch's t-tests, and ordinary least square (OLS) regressions. We define value as shareholder value and estimate the implied value creation at announcement for 240 all-cash public takeover bids in the United States (US) between 2002 and 2017.

1.1 Value creation: Definition and estimation

To investigate value creation in relation to corporate takeovers, we must have a clear idea of what it means to create value. As we define value as shareholder value, the value of a company is the market value of its equity. Value creation through corporate takeover is the combined equity value of the target and the acquirer after the completion of a takeover minus what the companies' combined equity value would have been in the counterfactual scenario.[2] Conventionally, this is estimated as the combined announcement return by calculating the combined cumulative abnormal return (CAR) around the announcement (McWilliams & Siegel, 1997).[3] However, because a takeover is not certain to go through at the time of the announcement, it is natural to assume that the market incorporates

[1] Another term for corporate takeover is mergers and acquisitions (MA). In an acquisition, one company buys a part of another company or the entire company. A merger refers to a transaction in which two companies become one company (Alao, 2010). This distinction is more of a technicality and less relevant in terms of economic impact (Bruner, 2002). In the following, we do not differentiate between different ways of acquiring control rights and refer to any such activity as a corporate takeover.

[2] We refer to a counterfactual scenario as a scenario where the announcement of the takeover didn't happen.

[3] For this thesis, we use log return when computing CAR.

the value creation only to the extent of the perceived likelihood of bid success. Therefore, we use the probability scaling model (PSM), which is based on combined announcement return but also takes the likelihood of bid success into account (Bhagat, Dong, Hirshleifer, & Noah, 2005).

The PSM requires reliable assessments of the likelihood of bid success to yield useful estimates of value creation. To estimate the likelihood of bid success, we build on the model proposed by Samuelson and Rosenthal (1986), who suggest that the stock price movement of the target around an all-cash tender offer contains information about the bid's likelihood of success. We expand on this by including not only tender offers but also regular merger bids that are all cash.

We use the PSM, with our chosen method for calculating the likelihood of bid success, because conceptually it is a logical representation of the value creation that is attributable to a corporate takeover. The model allows us to estimate value creation for all-cash takeover bids that are exclusively public.[4]

1.2 Analysis

Whether corporate takeovers can create value, and whether they usually do so, is of fundamental importance. If corporate takeovers cannot create value, or if they usually do not, a case can be made against the extensive corporate-takeover activity occurring worldwide. This topic has been researched in the literature, and the accepted view is that corporate takeovers can and do, on average, create value. Nonetheless, both agency theory (Jensen & Meckling, 1976) and the hubris hypothesis (Roll, 1986) suggest that takeovers also can be value-destroying. We address this topic with the following hypothesis:

Hypothesis 1: Corporate takeovers are value-creating on average.

For the market to consider that a corporate takeover creates value, the consolidated business must represent an unexpected advantage over the stand-alone companies. Improved overall operational efficiency is a frequently stated motive for corporate takeovers (Piesse, Lee, Lin, & Kuo, 2013). One way in which this can be achieved is if one of the parties involved has a relative operational advantage and the ability to exploit this on behalf of the other

[4]For our application, we choose an event window that stretches from 7 days prior to 1 day after bid announcement.

party is unexpected. In this thesis, we investigate this idea of whether a consolidated company can take advantage of one of the merging companies' operational superiority; which is what we define as the transfer of operational efficiency. Specifically, we raise the question of whether investors value the opportunity to transfer operational efficiency between the merging companies. To address this question, we propose the following hypothesis:

Hypothesis 2: The value creation in corporate takeovers increases with the opportunity to transfer operational efficiency between the merging companies.

The idea that an operational advantage is transferable from one company to another is plausible in different ways. One can imagine that two companies that share operational similarities can benefit from each other's specific knowledge to improve the combined operation. This type of transfer of operational efficiency is conceivable for takeovers where the merging companies are in the same industry (horizontal takeovers). Simultaneously, it can be argued that some managements possess a superior overall ability that can be transferred between companies regardless of industry (diversifying takeovers). These two distinct ways of transferring operational efficiency between merging companies are both presented as possible rationales for pursuing corporate takeovers in the efficiency theory of Copeland, Weston, Shastri, et al. (1988) (described as the differential efficiency theory and the inefficient management theory, respectively). As an extension of our investigation into whether investors value the opportunity to transfer operational efficiency between merging companies, we question whether investors value this opportunity differently for horizontal takeovers compared with diversifying takeovers. Accordingly, we propose the following hypothesis:

Hypothesis 3: The association between value creation and the opportunity to transfer operational efficiency between the merging companies is different for horizontal takeovers compared with diversifying takeovers.

Existing literature on this topic focuses on whether investors value the opportunity to transfer operational efficiency solely from the acquirer to the target in a takeover. We expand on the literature by investigating whether investors value the opportunity to transfer operational efficiency between the merging companies regardless of the direction of the transfer. As such, we define the opportunity to transfer operational efficiency as

the absolute value of the difference in operational efficiency between the acquirer and the target. Furthermore, we define operational efficiency as a company's return on invested capital (ROIC) (Damodaran, 2007).

The results indicate that corporate takeovers are value-creating on average (Hypothesis 1). However, no evidence suggests that increased opportunity to transfer operating efficiency is associated with increased value creation (Hypothesis 2). Nonetheless, the results indicate that the association between value creation and opportunity to transfer operational efficiency is significantly different for diversifying takeover compared with horizontal takeovers (Hypothesis 3), with the association being positive for horizontal takeovers compared with diversifying takeovers.

The finding that corporate takeovers are value-creating on average is in line with the research on the topic. However, we also observe value-destroying takeovers, which is coherent with agency theory and the hubris hypothesis.

We argue that our result, that the opportunity to transfer operational efficiency is associated with more value creation for horizontal takeovers compared with diversifying takeovers, might be explained by investors valuing the differential efficiency motive (the transfer of an industry-specific advantage) more than the inefficient management motive (the transfer of a non-industry specific advantage).

1.3 Outline

The remainder of this thesis is organized as follows: Chapter 2 reviews the literature related to the analysis, and then Chapter 3 proposes and explains the hypotheses. Chapter 3 also includes the design of the empirical testing related to each hypothesis. Chapter 4 outlines the sampling procedure, and Chapter 5 describes the estimation of value creation and discusses the relevant literature. Subsequently, Chapter 6 presents the variables that are used in the analysis and the literature that supports their relevance. Chapter 7 presents the empirical analysis and results, before Chapter 8 provides further discussion, suggestions for further research, and remarks about limitations. Finally, Chapter 9 summarizes the study with synthesized concluding remarks.

2 Literature review

In this chapter, we review the literature related to our hypotheses. This includes studies on what motivates corporate takeovers, how operational efficiency can be measured, and whether operational efficiency is associated with value creation for corporate takeovers. The literature that we present in this chapter is used to build our hypotheses, guide our tests, and discuss our results.

Studies concerning the definition and estimation of value creation and factors associated with value creation are also relevant to this thesis, and they are discussed in Chapter 5 and 6, respectively.

2.1 Do corporate takeovers create value?

Extensive literature examines whether corporate-takeover activity is value-creating.[5] Most research uses CAR around the announcement of a takeover bid as a proxy for value creation. According to Andrade, Mitchell, and Stafford (2001), the combined CAR [-1, 1] is 1.9% on average during 1973–1998, and the average combined CAR differs between cash deals and stock deals. During 1973–1998, the average combined CAR is 3.6% for cash deals and 0.6% for stock deals. This research indicates that corporate takeovers tend to be value-creating, and this is consistent with more recent research (Betton, Eckbo, & Thorburn, 2008; Dessaint, Eckbo, & Golubov, 2019).

2.2 Motivations behind corporate takeovers

What motivates corporate-takeover activity has been discussed extensively in the literature, but no single hypothesis covers all motives for corporate-takeover deals. The most common ways to explain takeover motives are the efficiency theory, agency theory, free cash flow hypothesis, market power hypothesis, diversification hypothesis, information hypothesis, bankruptcy avoidance hypothesis, and accounting and tax effects (Piesse et al., 2013). We elaborate here on the efficiency theory and agency theory, because they are the

[5]The literature also addresses the question of value creation from the target's shareholders and acquirer's shareholders perspective - whether these parties usually are better off following a merger. However, as per the definition of value creation presented in the introduction we are concerned with the total increase in shareholder wealth.

most relevant for this thesis. In addition, we present the hubris hypothesis of corporate takeovers, which provides an alternative angle on the motivation of management to pursue corporate takeover and value creation.

The efficiency theory consists of the differential efficiency theory and the inefficient management theory (Copeland et al., 1988). The differential efficiency theory states that when the acquirer and the target are operating within the same industry, the acquirer can increase the efficiency of the target to the same level as the acquirer through a corporate takeover. This suggests that efficiency gains, through the transfer of operational efficiency, are possible when the acquirer has superior operational efficiency compared with the target. The inefficient management theory differs in that it applies to the transfer of differences in overall management ability, which is not dependent on specific industry characteristics. As such, the differential efficiency theory provides a theoretical basis for horizontal takeovers, whereas the inefficient management theory holds for diversifying takeovers as well.

Agency theory focuses on the potential conflict of interest between company owners and managers (Jensen & Meckling, 1976). These conflicts occur in companies where the manager does not hold company shares or is not given other incentives to work in the interests of the owners. In these cases, managers may be more interested in achieving increased control, increased compensation, and better working conditions rather than improving shareholder value. Managers might therefore be inclined to acquire another company even if this destroys shareholder value.

The hubris hypothesis explains the pursuit of corporate takeovers from a different angle (Roll, 1986). It suggests that, although managers intend to act in the interest of their shareholders and believe that their motives for corporate takeovers are valid, they make acquisitions that fail to create value. This is because the managers are overly optimistic and therefore overestimate the value gains from the deal.

Our thesis relates to this literature as we are interested in whether investors believe in value creation through the transfer of operational efficiency. The concept of the transfer of operational efficiency is one of the elements that drive both the differential efficiency theory and inefficient management theory. Moreover, it relates to agency theory and the hubris hypothesis because they imply that investors may not believe that the transfer of

operational efficiency creates value.

2.3 Operational efficiency: Return on invested capital

For this thesis, we use ROIC as a measure of operational efficiency. ROIC measures financial performance by dividing net income by the book value of the invested capital (Churet & Eccles, 2014). The invested capital is a measure of the book value of the capital committed to the company.[6] The ROIC ratio is often used to represent operational efficiency, as it reflects both profitability and the level of efficiency of management in deploying capital. Furthermore, it accounts for the capital structure and can provide a fair comparison across industries and companies. Damodaran (2007) promotes an operational variation of ROIC that is concerned with the company's effectiveness in turning its assets into operational income. The operational ROIC is calculated by dividing the net operational profit after tax (NOPAT) by the invested capital. For this thesis, we use a slight variation of Damodaran's definition of ROIC for our analysis (Equation 2.1).[7]

$$Return\ On\ Invested\ Capital\ (ROIC) = \frac{Operating\ Income_t\ before\ tax}{Book\ Value\ of\ Invested\ Capital_{t-1}} \tag{2.1}$$

ROIC has previously been used in the literature to investigate whether the acquirer's operational efficiency is associated with abnormal announcement return. For corporate takeovers during 1980–2013 for US public companies, Qian and Zhu (2017) find that the acquirer's ROIC does not explain the differences in the merged company's announcement returns. The acquirer's pre-announcement ROIC, however, is correlated to the post-acquisition performance measured by return on assets (ROA) and stock price. Their findings suggest that the market tends to undervalue the effect of the acquirer's operational efficiency in a corporate takeover at the time of the announcement.

[6] Invested capital is defined as: Book value of equity + Net debt

[7] We deviate from Damodaran's definition as we use the operating income before taxes as the numerator, as opposed to NOPAT. The choice of excluding taxes have no effect on the analysis as the NOPAT in Damodaran's definition is calculated by applying the same hypothetical tax rate for every company.

2.4 Do differences in operational efficiency drive value creation?

In this thesis, we focus on how the difference in operational efficiency between the merging companies impacts value creation in a takeover. To our knowledge, no other study has used ROIC as a proxy for operational efficiency for this purpose. However, Leverty and Qian (2010) investigate the relationship between the difference in operational efficiency between the acquirer and the target and the abnormal announcement return using a different proxy for operational efficiency—what they describe as "frontier efficiency analysis," which is generally considered a good measurement of managerial ability (Demerjian, Lev, Lewis, & McVay, 2012). This technique compares a company's output level with that of a hypothetical best-performing company with the same inputs and characteristics.

For US public companies during 1994–2005, Leverty and Qian (2010) find that the difference in operational efficiency between the acquirer and the target is positively associated with the combined CAR of the acquisition. This research, however, considers the opportunity to transfer operational efficiency solely from the acquirer to the target of a takeover. Their research suggests that the value creation is higher when more efficient companies acquire less efficient companies.

3 Hypotheses

In this chapter, we revisit the hypotheses stated in the Introduction, and then present our empirical testing strategies.

3.1 Hypothesis 1: Corporate takeovers are value-creating on average

H0: Corporate takeovers are not value-creating on average

With this hypothesis, we raise two fundamental questions: whether value creation is possible at all and whether it, on average, does occur. Although already tested in the literature, we test the hypothesis in the light of our novel method. The fundamental implication of rejecting H0 is that investors believe that value-creation through corporate takeover is possible, and that they believe that the majority of pursued takeovers are indeed value-creating.

3.1.1 Empirical testing of Hypothesis 1

To test the hypothesis, we conduct a one-sided univariate t-test to determine if the mean value creation for all transactions in our sample is significantly greater than zero.[8]

Moreover, we qualitatively assess the value creation with a histogram.

3.2 Hypothesis 2: The value creation in corporate takeovers increases with the opportunity to transfer operational efficiency between the merging companies

H0: The value creation in corporate takeovers does not increase with the opportunity to transfer operational efficiency between the merging companies

With this hypothesis, we investigate whether investors value the opportunity to transfer operational efficiency from one company to another through corporate takeover.

The premise of the investigation is that operational efficiency manifests itself in ROIC,

[8]See appendix A3.3 for description of univariate t-test.

and that the difference in ROIC represents the difference in operational efficiency between the target and the acquirer. We define this difference as the opportunity to transfer operational efficiency. If we can provide evidence that value creation increases with the difference in operating efficiency between the merging companies, with all else equal, then this would indicate that the investors value the opportunity to transfer operational efficiency between the merging companies.

To our knowledge, existing literature on the topic addresses the transfer of operational efficiency only from the acquirer to the target (Leverty & Qian, 2010). In principle, however, a transfer of operational efficiency can also occur from the target to the acquirer. For this thesis, we investigate whether investors value the opportunity to transfer operational efficiency irrespective of the direction of transfer; this, we are only interested in the absolute value of the difference in operational efficiency between the acquirer and the target. We define the absolute value of the difference in operational efficiency as the opportunity to transfer operational efficiency between the merging firms.

3.2.1 Empirical testing of Hypothesis 2

Initially, we split the sample in two based on whether the takeover represents an opportunity to transfer operational efficiency, which we define as when the difference in ROIC is more than 10%. Univariate t-tests are conducted to test if the value creation for the subsamples is significantly greater than zero. Welch's t-tests are conducted to test whether a significant difference exists in value creation between the two subsamples.

Finally, to test the hypothesis, we conduct an ordinary least squares (OLS) regression to investigate the association between value creation and the opportunity to transfer operational efficiency, when known factors that influence value creation are controlled for (Model 1, Equation 3.1).[9]

We define the opportunity to transfer operational efficiency differently for the t-tests and the OLS regressions. In the t-tests, we define it as when the absolute value of the difference in operational efficiency between the merging companies is at least 10%. In the OLS regressions, we treat it as a continuous variable independent of whether the difference exceeds 10%. This difference in the definitions also holds for Hypothesis 3. The

[9]See appendix A3: Description of statistical tests for more on univariate t-test, Welch t-test and OLS regression.

OLS model is specified as follows:

$$\begin{aligned}\text{Value Creation}_j = \alpha &+ \beta_1 \text{Opportunity To Transfer Operational Efficiency}_j \\ &+ \beta_2 \text{Horizontal Takeover}_j \\ &+ \beta_3 \text{Serial Acquirer}_j \\ &+ \beta_4 \text{Relative Size}_j \\ &+ \beta_5 \text{Tender Offer}_j \\ &+ \beta_6 \text{Leverage (Acquirer)}_j \\ &+ \beta_7 \text{R\&D Expense (Acquirer)}_j \\ &+ \beta_8 \text{Cash Holdings (Acquirer)}_j + \epsilon_j\end{aligned} \tag{3.1}$$

The control variables are described in Chapter 6.[10]

3.3 Hypothesis 3: The association between value creation and the opportunity to transfer operational efficiency between the merging companies is different for horizontal takeovers compared with diversifying takeovers

H0: The association between value creation and the opportunity to transfer operational efficiency between the merging companies is equal for horizontal and diversifying takeovers

On the one hand, the differential efficiency hypothesis states that transfer of operational efficiency is sought in horizontal takeovers. On the other hand, the inefficient management theory states that the transfer of operational efficiency is sought for diversifying takeovers as well (Copeland et al., 1988). This hypothesis investigates whether investors value the opportunity to transfer operational efficiency differently for horizontal takeovers as opposed to diversifying mergers.

3.3.1 Empirical testing of Hypothesis 3

At this point, we distinguish between horizontal and diversifying takeovers. Therefore, we set the context for the hypothesis testing by presenting statistics of value creation for

[10] See also appendix A1: Variable definition.

horizontal and diversifying takeovers separately, both for the full sample and subsamples of takeovers with the opportunity to transfer operational efficiency. Initially, we use univariate t-tests to test whether the value creation for these samples is positive on average. Subsequently, we conduct Welch's t-tests to compare the average value creation of subsamples of transactions with the opportunity for transfer of operational efficiency between horizontal and diversifying takeovers.

Finally, we test the hypothesis by conducting an OLS regression for the entire sample, with an interaction term between "Opportunity To Transfer Operational Efficiency" and the dummy variable "Horizontal Takeover" (Model 2, Equation 3.2). The interaction term reveals whether the association between the difference in operational efficiency and value creation is different for horizontal takeovers compared with diversifying takeovers. The OLS model controls for factors that are known to influence value creation.[11]

As for Hypothesis 2, we define the opportunity to transfer operational efficiency differently for the t-tests and OLS regressions. For the t-tests, we define it as a binary variable, indicating whether the difference in operational efficiency is more or less than 10%. For the OLS regression, we define it as a continuous variable. The OLS model is specified as follows:

$$\begin{aligned}\text{Value Creation}_j = \alpha &+ \beta_1 \text{Opportunity To Transfer Operational Efficiency}_j \\ &+ \beta_2 \text{Horizontal Takeover}_j \\ &+ \beta_3 \text{Opportunity To Transfer Operational Efficiency}_j * \\ &\quad \text{Horizontal Takeover}_j \\ &+ \beta_4 \text{Serial Acquirer}_j \\ &+ \beta_5 \text{Relative Size}_j \\ &+ \beta_6 \text{Tender Offer}_j \\ &+ \beta_7 \text{Leverage (Acquirer)}_j \\ &+ \beta_8 \text{R\&D Expense (Acquirer)}_j \\ &+ \beta_9 \text{Cash Holdings (Acquirer)}_j + \epsilon_j\end{aligned} \tag{3.2}$$

[11] See Chapter 6 for description of variables.

In this model, the coefficient for "Opportunity To Transfer Operational Efficiency" represents the overall association between value creation and opportunity to transfer operational efficiency for diversifying takeovers. As we are also interested in the overall significance for horizontal takeovers, we replicate the abovementioned regression, where we substitute the dummy for horizontal takeover with a dummy for diversifying takeover in the interaction term (Model 3).

4 Data

We sample transactions and deal characteristics from Securities Data Company Platinum (SDC Platinum). Furthermore, we retrieve additional information about our sampled transactions from two sources: (1) the Compustat North America Database (Compustat) for company characteristics, and (2) the Center for Research in Security Prices (CRSP) for stock prices for the involved companies. This chapter describes the sampling process and the filters we apply. The final data set consists of 240 US public transactions that are all-cash.

4.1 Transaction data from SDC Platinum

We sample transactions from SDC Platinum, where the target and bidder are both public and the consideration is all cash. The sample period is set to 2003–2017, with 2008 excluded because of the financial crisis. We eliminate deals with competing bids and restrict the sample to offers where the acquirer seeks to purchase 100% of the target stocks and information about the offer price exists. Furthermore, we exclude transactions where news of the bid is publicly known before the official date of announcement, and those where SDC Platinum indicates that there is a competing bidder.

4.2 Supplemental information from Compustat and the CRSP

The transaction data from SDC Platinum are supplemented with stock prices from the CRSP for the target and the acquirer, as well as financial data from Compustat for the most recent fiscal year before the announcement bid from. The latter is used to compute operational efficiency and control variables.

Linking between these three sources is complicated as they do not share a universal identification key. We use the CUSIPs, and if that fails the tickers, from SDC Platinum to link up transactions with the CRSP's permanent company identifier (PERMCO).[12] [13] The Wharton Research Data Service's linking table for PERMCO and Compustat's permanent company identifier (GVKEY) is used to link transactions between the CRSP

[12]CUSIP is a unique identification code for all stocks in the US and Canada.

[13]We transform the 6-digit CUSIP from SDC Platinum to possible 8-digit CUSIPs, which CRSP requires. All matches are manually verified.

and Compustat. We use this method because, compared with other available methods such as available linking tables, it yields the most verified matches.[14] [15]

When the data from SDC Platinum is linked with that from the CRSP, we apply another filter for a minimum 10% premium and a filter to ensure that the target's equity value is a minimum of 1% of that of the acquirer. These are applied out of consideration of our value creation estimates. When the supplemental data from Compustat is linked to the data set, we remove transactions where the acquirer is a financial company because the ROIC for such companies is not suited to comparisons with other industries. Finally, we remove transactions that lack the data required for our estimations.

4.3 Other

For the estimation of value creation, we use the market model to extrapolate values between different points in time (McWilliams & Siegel, 1997). The Standard & Poor's 500 composite index, which we retrieve from the CRSP, is used as benchmark for the market. The risk-free rate that we use is the US 3-month Treasury bill retrieved from Datastream.

Throughout this study, we use a company's equity value for different purposes. For the calculation of equity value, we use the company's number of fully diluted shares. This number is retrieved from the company's last quarterly financial report before the announcement of the takeover bid, retrieved from Compustat.

All estimates and variables used for this study are either taken directly from the aforementioned sources or calculated on the basis of them. This is described in more detail in Chapters 5 and 6 for estimates of value creation and other variables, respectively.

[14] The method is described more precisely in appendix A8: Linking process.

[15] See appendix A7: Data sampling process for a table displaying each step of the filtering and sampling process.

5 Estimating value creation

The definition and estimation of value creation are key to this thesis. In this chapter, we discuss our definition and lay out how we calculate value creation. However, before doing so, we clarify the use of some basic concepts that are central to the subsequent presentation.

5.1 Basic concepts

5.1.1 Log return

For the estimation of value creation, we compute daily stock returns using log returns as opposed to simple returns, as we intend to accumulate returns across time, and log returns have additive properties that allow for this. We calculate the log return on a daily basis, and the calculation is performed as per Equation 5.1:

$$Log\ return = ln(\frac{P_1}{P_0}) \tag{5.1}$$

where: P_1 = share price in current period

P_0 = share price in previous period

5.1.2 Announcement return

When we refer to the announcement return, we refer to the abnormal return for a company in the event window stretching from 7 days before to 1 day after announcement of a takeover bid. The combined announcement return refers to the combined abnormal return for the target and the acquirer in this event window. The methods for calculating abnormal return and combined returns are described in subsequent chapters.

5.1.3 Equity value

The equity value of a company is calculated as the share price multiplied by the number of fully diluted shares.[16]

5.1.4 Stand-alone equity value

We frequently refer to the stand-alone equity value of a company. This term represents what a company's equity value would have been on the day after announcement if the takeover bid had not been announced. This is an unobservable value. However, we estimate this value by extrapolating the company's equity value 7 days before announcement (the start of event window) to 1 day after announcement (the end of event window) using the market model (McWilliams & Siegel, 1997).[17]

5.2 Definition of value creation

We define value creation as the combined increase in shareholder value for the target and the acquirer that is attributable to the corporate takeover. Sirower (1997) provides a definition along similar lines, describing "synergy as increases in competitiveness and resulting cash flow beyond what the two companies are expected to accomplish independently."[18] However, strictly speaking, our definition is based on stock performance, whereas the cited definition is based on accounting performance (in other words, it is not a market value).

In an efficient market, accounting improvements due to a takeover should be reflected in the stock performance of the companies once the bid is announced. That is, improved cash flows translate into improved stock performance. However, this is true only to the extent that both the takeover bid and any improvements that the takeover will lead to are unanticipated. As such, our definition of value creation captures improvements that are above what is expected for the companies, but not necessarily all improvements that can be achieved through corporate takeovers.

[16]The number of fully diluted shares is retrieved from the most recent quarterly report available in Compustat prior to announcement of the takeover bid.

[17]See appendix A2: Stand-alone equity value for exact formula for calculation.

[18]Synergy is another term for value creation.

5.3 Estimating value creation

Directly calculating the value creation according to our definition is not possible because the counterfactual scenario does not exist. However, if a takeover bid is unanticipated, the stock price of the target and the acquirer before the announcement of a takeover bid reflects the investors' valuation of the companies' values in a counterfactual scenario. Therefore, if one assumes that there is no anticipation of a takeover bid, the companies' announcement returns will represent value creation compared with if no takeover bid occurs. However, this will only truly represent the total value creation if investors are entirely convinced that the bid will succeed, as they are unlikely to be willing to pay for the total value creation if they are not certain that they will receive it.

We use the PSM to estimate value creation because it accounts for this uncertainty (Bhagat et al., 2005). The PSM estimates value creation by calculating the combined announcement return for the target and the acquirer, normalizing[19] it, and adjusting it for the likelihood of bid success.[20] Essentially, the PSM divides the normalized combined announcement return by the likelihood of bid success.

The central inputs for the PSM are combined announcement return and likelihood of bid success. We estimate announcement return as the CAR around announcement (McWilliams & Siegel, 1997). This is then combined by adding the announcement return in nominal value.

For the likelihood of bid success, we use a variation of the model proposed by Samuelson and Rosenthal (1986), which calculates the likelihood of bid success based on the price movements of the target stock around the announcement of a takeover bid. Simply put, the model states that the target stock will be worth either the offer price or its standalone share price dependent on whether the bid succeeds.[21] The likelihood of bid success is thereby determined by calculating the relative difference between the stock price 1 day after announcement and the present value of these binary outcomes.

[19]Normalizing means to transform the absolute value of value creation to relative values that are more suited for comparison between transactions.

[20]Bhagat et al. (2005) normalizes by the combined equity value of the target and the acquirer pre-announcement, we normalize by the stand-alone equity value of the target.

[21]The concept of stand-alone share price is analogue to the stand-alone equity value of a company, only that it is calculated on per share basis.

The estimations of CAR and probability of bid success are event studies. We set the event window to 7 days before announcement of the bid to 1 day after announcement. We choose this window because it represents a good trade-off between noise and accounting for anticipation.[22]

Above, we provide an overview to enable the necessary understanding of the estimations that is required to understand the subsequent analysis. The following subsections describe in detail, both in words and equations, how the PSM works and how we estimate the CAR and the likelihoods for bid success.

5.3.1 Probability scaling model

The fundamental concept of the PSM of Bhagat et al. (2005) is that the combined equity value of the target and the acquirer after announcement of a takeover bid is a function of their stand-alone equity values, the value creation that is due to the merger, and the likelihood of bid success. Explicitly, the combined value of the acquirer and the target after announcement is assumed to equal their combined stand-alone value *plus* the value creation multiplied by the likelihood of bid success. This is expressed in Equation 5.2:

$$V_1^C = V_0^C + (\phi_1 + \phi_1^L)\overline{V}^I \tag{5.2}$$

where: V_1^C = combined equity value for the acquirer and target after announcement

V_0^C = combined stand-alone equity value for the acquirer and target

$\overline{V}^I$ = value creation

ϕ_1^L = probability of a later successful bidder

ϕ_1 = probability of bid success

We are interested in the value creation, $\overline{V}^I$, of this fundamental equation, but it is unobservable. The valuable aspect of the PSM is that it allows us to work out the value creation because we can estimate all the other inputs of the equation. First, the combined announcement return is, by definition, the difference between the combined value of the

[22] See appendix A6: Predictive power for further justification for the chosen event window, and appendix A9: Event study methodology for description for this technique.

target and the acquirer after announcement *minus* their combined stand-alone value. This means that, given the fundamental equation of the PSM, the combined announcement return is equal to the likelihood of bid success *multiplied* by value creation (Equation 5.3). Note that in Equation 5.3 the combined announcement return, R_1^C, is normalized by the combined stand-alone value of the target and the acquirer.

$$R_1^C = \frac{V_1^C - V_0^C}{V_0^C} = \frac{(\phi_1 + \phi_1^L)\overline{V}^I}{V_0^C} \tag{5.3}$$

where: V_1^C = combined equity value for the acquirer and target after announcement
V_0^C = combined stand-alone equity value for the acquirer and target
$\overline{V}^I$ = value creation
ϕ_1 = probability of bid success
ϕ_1^L = probability of a later successful bidder
R_1^C = combined announcement return, normalized by V_0^C

On this basis, Bhagat et al. (2005) propose that the true combined value creation for the target and the acquirer can be found by dividing the combined announcement return by the likelihood that either the original bid succeeds, ϕ_1, or that another subsequent bid does, ϕ_1^L (Equation 5.4).

$$\frac{R_1^C}{(\phi_1 + \phi_1^L)} = \frac{\overline{V}^I}{V_0^C} \tag{5.4}$$

where: V_0^C = combined stand-alone equity value for the acquirer and target
$\overline{V}^I$ = value creation
ϕ_1 = probability of bid success
ϕ_1^L = probability of a later successful bidder
R_1^C = combined announcement return, normalized by V_0^C

We assume that the likelihood of a subsequent bidder equals zero and defend this by

filtering out takeovers where SDC Platinum has registered information about a competing bidder.

Moreover, we normalize the value creation by the stand-alone equity value of the target, V_0^T, instead of the combined stand-alone equity value for the target and the acquirer, V_0^C. There are two elements to this that depart from the original PSM. First, we consider the equity value of the target to be a more appropriate benchmark than the combined stand-alone equity value for comparison across takeovers, because the relative sizes of merging companies vary. Second, we use the target's stand-alone equity value, as opposed to the target's equity value before announcement, because this, in our opinion, is the best representation of the target's equity value in the counterfactual scenario. Because our event window stretches from 7 days before the announcement, we think it is especially appropriate to account for the index development.[23]

As such, we apply a variation of the PSM where we divide combined announcement return, normalized for the stand-alone equity value of the target, by the likelihood of bid success to estimate value creation (Equation 5.5).

$$Value\ Creation = \frac{\overline{V}^I}{V_0^T} = \frac{R_1^C}{\phi_1} \tag{5.5}$$

where: $Value\ Creation$ = our definition of value creation, normalized

V_0^T = stand-alone equity value for the target

$\overline{V}^I$ = value creation

ϕ_1 = probability of bid success

R_1^C = combined announcement return, normalized by V_0^T

This model allows us to calculate the value creation as per our definition, based on estimates of normalized announcement return, R_1^C, and the likelihood of bid success, ϕ_1. In the following subsection, we describe how we estimate R_1^C and ϕ_1.

[23] Bhagat, Dong, Hirshleifer, and Noah (n.d.) apply the PSM with announcement return calculated over an event window from 1 day before announcement to 1 day after. Their need to account for the index development is therefore comparatively lower.

5.3.2 Estimating the combined CAR

This section describes how we calculate the combined CAR, normalized by the stand-alone equity value of the target, which is our input for the PSM, denoted as R_1^C. First, we use the market model described by McWilliams and Siegel (1997) to calculate the CAR for the target and the acquirer individually. Second, we add together the nominal value of the CAR for the target and the acquirer. Finally, we normalize the combined CAR by dividing the combined CAR by the stand-alone value of the target.

McWilliams and Siegel (1997) define abnormal return for a company as the difference between its expected return and its actual return. The expected return is estimated using the market model. McWilliams and Siegel (1997) specify the market model as follows (Equation 5.6):

$$ER_{i_t} = \alpha + \beta_i R_{m_t} + \epsilon_i \tag{5.6}$$

where: ER = expected return

R = actual return

α = intercept

β = beta, correlation coefficient with market

ϵ_i = error term

i = subscript for company

t = subscript for time period

m = subscript for the market

Daves, Ehrhardt, and Kunkel (2000) show that beta estimation conducted over a 1- to 3-year timeframe yields the most representative estimates. We estimate the beta over a window that stretches from 50 days prior to the announcement back to 1080 days prior to the announcement.[24] The end of the timeframe is set to 50 days prior to announcement, as opposed to 1 day, to minimize the probability of anticipation effects confounding the

[24]The beta is the correlation coefficient between any stock i and the market m.

estimation.[25] The S&P 500 composite index is used as a benchmark for the market, whereas the stock returns are based on prices retrieved from the CRSP.[26] We assume the α to be zero.

Based on the expected return, derived with the market model and daily stock prices of the companies in our data set, we estimate the abnormal returns (Equation 5.7) (McWilliams & Siegel, 1997).

$$AR_{jt} = R_{i_t} - (\alpha + \beta_i R_{m_t}) \tag{5.7}$$

where: AR = abnormal return

R = actual return

α = alpha, excess risk adjusted return

β = beta, correlation coefficient with market

i = subscript for company

t = subscript for time period

m = subscript for the market

In principle, this can be performed over any chosen timeframe. For our thesis, we calculate the daily abnormal log return for all target companies and all acquirer companies over our chosen event window.[27]

Because log returns have additive properties, we can calculate the CAR by summing the abnormal return for each day of the event window (Equation 5.8).

$$CAR_i = \sum_{t=1}^{T} AR_{it} \tag{5.8}$$

[25] Anticipation can naturally occur even earlier, but the occurrence of this is assumed to be neglectable.

[26] The S&P 500 composite index is a value-weighted index of 500 common stocks that is assumed to broadly represent the American stock market.

[27] Explicitly, we calculate the abnormal log return as $ln(P_1/(P_0)$ - $ln((P_0 + Expected\ Return)/P_0)$

where: CAR = cumulative abnormal log return

AR = abnormal return

i = subscript for company

t = subscript for time period

We follow this procedure to estimate the CAR over the event window for every company in our data set.

To combine the CARs of the acquirer and the target, we first calculate the nominal CAR by multiplying a company's CAR by its stand-alone equity. Thereafter, we add the nominal CAR for the target and the acquirer to determine the combined nominal announcement return. Finally, this is divided by the stand-alone equity value of the target to arrive at R_1^C, which is the input that we are seeking for the PSM (Equation 5.9).

$$R_1^C = \frac{CAR^C}{V_0^T} \tag{5.9}$$

where: R_1^C = combined announcement return, normalized by V_0^T

CAR^C = combined announcement return (nominal)

V_0^T = stand-alone equity value for the target

5.3.3 Model for estimating the probability of deal success

Samuelson and Rosenthal (1986) present a model for estimating the probability of bid success for all-cash tender offers. They show that their model can predict the probability of bid success with high precision.[28] Their model is based on price movements of the target company's stock around the time of announcement. Samuelson and Rosenthal (1986) propose that either the bid will succeed and the stock will be worth the offered price per stock or it will fail and the stock price will revert to what they define as the "fallback price". The probability of bid success is determined by the relative difference

[28]See elaboration under the subheading *Prediction results* later in this chapter.

between the price of the stock after announcement and these binary outcomes. The model is specified as follows in Equation 5.10:

$$T_1 = \phi_1 T_2 + (1 - \phi_1) T_0 \tag{5.10}$$

where: T_1 = target price after announcement

T_0 = fallback price of the target

T_2 = value of cash offer

ϕ_1 = probability of bid success

Samuelson and Rosenthal (1986) apply their model exclusively to tender offers. We argue that the model could in principle be used on merger bids as well. Although the mechanisms for merger and tender bids differ, the main concept that is necessary for the proposed model is the same; at the time of announcement the outcome is uncertain, and we expect that the market is able to evaluate the likelihood of bid success with precision.

Moreover, Samuelson and Rosenthal (1986) apply their model to different event windows, with the end date ranging from 1 day after announcement to 1 week before completion. For our thesis, we use an event window of 7 days prior to announcement to 1 day after announcement.

Samuelson and Rosenthal (1986) argue that, in the case of a failed bid, the target does not revert to its value before announcement but that its new value can be expressed as a function of the price before announcement and the value of the cash offer. They base this view on a regression analysis in which the fallback price in the case of a failed bid is expressed as a function of the original price and the offer price.

In our opinion, this technique is open to potential selection bias. That is, failed bids are not representative of successful bids. On this basis, we choose to specify our model with the stand-alone value for the target price because we think that this is logically the best representation of a fallback price.

We calculate the stand-alone price similarly to the stand-alone equity value, except that

we replace the equity value prior to the event window with the stock price prior to the event window.[29]

The offered cash is received by the target company's shareholders at some point in the future when the deal is completed. Because we calculate the likelihood of bid success based on the relative difference between the target's stock price and its binary outcomes (the target's stand-alone share price and the offered cash price), it is appropriate to discount the offered cash with the prevailing risk-free rate at the time of the bid to account for the time value of money.[30] We find that the average time from bid announcement to eventual completion is 117 days. Therefore, we discount the cash offers as follows: $Cash\ offer/(1 + risk\ free\ rate * (117/365))$. The model that we propose is therefore specified as follows (Equation 5.11):

$$T_1 = \phi_1 T_2 + (1 - \phi_1) T_0 \tag{5.11}$$

where: T_1 = target price after announcement

T_0 = stand-alone price for the target

T_2 = present value of cash offer

ϕ_1 = probability of bid success

The model assigns probabilities outside [0,1] for some transactions. Therefore, we constrain the sample by excluding transactions with a likelihood of success outside this interval. However, we register some overrepresentation of probabilities that exceed 1 by a small amount. One reason for this might be the discounting of the offered price. We consider it to be theoretically correct to discount the offered price as the cash payment will be made sometime in the future. In any case, a probability in slight excess of 1 is no different than a probability of close to one. Therefore, we set all probabilities in the interval [1,1.1] to 1. Because our end-purpose is precise estimates of value creation, we think this is a fair assumption.

[29] See appendix A2: Stand-alone equity value for calculation.

[30] The stand-alone stock price and the actual stock price are net present value sizes by nature.

5.3.4 Prediction results

Samuelson and Rosenthal (1986) argue that their model yields highly accurate predictions based on the Brier score.

The Brier score is always in the interval between 0 and 1. An increased forecast accuracy is reflected by a decrease in Brier score. Thus, a perfect accuracy has a Brier score of 0, and a low Brier score is interpreted as a good result. In cases that have only two outcomes, success or failure, the Brier score is defined as in Equation 5.12:

$$B = \frac{\sum_{i=1}^{I}(q_i - s_i)^2}{I} \tag{5.12}$$

where: B = Brier score

I = number of predictions

q = predicted probability

s = actual bid outcome

i = subscript for prediction

For our data, the prediction model yields a Brier score of 0.034. This indicates that for transactions with characteristics that pass our criteria, the model has high predictive power. Without further elaboration on this topic, we argue that on this basis these prediction estimates, when used as inputs for the PSM, should result in high-quality estimates of value creation. For reference, in the original paper by Samuelson and Rosenthal (1986), their prediction for their event window that is closest to ours [0,7] yields a Brier score of 0.194.

6 Variables

In this section, we introduce control variables that have been shown to be associated with value creation, and are therefore relevant for our research design. We restrict this section to company and deal characteristics that do not interfere with the explanatory variable, ROIC, and that we deem relevant.

Notably, all factors that involve market values, such as price-to-equity ratio, price-to-book ratio, are omitted from the analysis because high operational efficiency (ROIC) is assumed to be reflected by higher valuations. As such, we do not want market valuations to influence our analysis.

6.1 Horizontal takeover

Research on the takeovers of industrially related companies indicate a positive effect on abnormal announcement return and post-merger performance (Tuch & O'Sullivan, 2007). The main driver behind this finding is suggested to be that companies in the same industry have similar operations and technology. For instance, this might contribute to synergies through economies of scale and improved R&D. Takeovers involving business-related companies increase the value of transferring knowledge between the entities (Singh & Montgomery, 1987). While several reports suggest a positive relationship for related takeovers and value creation, the research of Limmack and McGregor (1995) suggests that this relationship is negative.

We define "Horizontal Takeover" as a takeover between two companies that operate in the same industry. A takeovers between two companies that are not in the same industry, are defined as a "Diversifying Takeover". Industry classifications are retrieved from SDC Platinum.

6.2 Serial acquirers

Companies that frequently make acquisitions appear to achieve more value-creating acquisitions compared with companies that only occasionally or never buys other companies. According to Li, Qiu, and Shen (2018), serial acquirers are positively associated with post-merger 1-year buy-and-hold abnormal returns. They argue that this impact is related

to serial acquirers being more efficient than other acquirers in transferring organizational capital to the targets.

Fuller, Netter, and Stegemoller (2002) show that there is significant positive abnormal return when serial acquirers acquire private companies but a negative abnormal return for public targets. The negative abnormal return for takeovers of public targets can be explained by abnormal returns for the serial acquirers in the 12 months up to the announcement, and also by the fact that the value creation of the takeovers is already priced into the acquirer's stock prior to the announcement of takeover bids (Schipper & Thompson, 1983).

We define "Serial Acquirer" as an acquirer that has completed at least three takeovers in the five years prior to the announcement. Transaction data are retrieved from SDC Platinum.

6.3 Tender offer

Research has examined the correlation between the use of a tender offer and abnormal return, with the findings indicating a positive association (Li et al., 2018). This correlation is especially positively significant for cash acquisitions of public companies (Moeller, Schlingemann, & Stulz, 2003).

A dummy variable indicating whether a takeover bid is a tender offer is retrieved from SDC Platinum. We define this variable as "Tender Offer" in the subsequent analysis.

6.4 Relative size

Research indicates a significant association between abnormal announcement return and relative size of the acquirer and the target. The literature, in general, indicates that relative size is positively associated with abnormal return (Moeller et al., 2003). The research of Eckbo and Thorburn (2000) supports this as their findings suggest that an increase in relative target size is associated with an increase in value creation for the acquirer. However, Travlos (1987) finds that relative size is negatively associated with abnormal return.

We define "Relative Size" as the relative size of the companies' market capitalization. We

divide the market capitalization of the target 7 days prior to announcement by the market capitalization of the acquirer 7 days prior to announcement. The calculation is based on prices from the CRSP and the number of fully diluted shares from Compustat.

6.5 Leverage (Acquirer)

According to Maloney, McCormick, and Mitchell (1993), bidders with higher leverage achieve higher abnormal returns. They argue that the reason for this is agency cost, and that debt can contribute to mitigate agency problems between stockholders and managers and also to improve managerial decision making. Nevertheless, the literature is yet to provide a clear answer to whether higher leverage alone improves company performance.

We define this variable as the book value of the acquirer's total debt divided by the acquirer's market capitalization. Total debt and market capitalization are based on financial statements for the last available fiscal year prior to the takeover bid, which are retrieved from Compustat.

6.6 Cash holdings (Acquirer)

Empirical studies have shown that cash-rich companies make more acquisitions compared with other companies that have less cash, and that these acquisitions are value decreasing (Harford, 1999). Cash-rich companies tend to have more cash than what is required to handle their expected financing needs, and therefore they make acquisitions they otherwise would not.

The updated free cash flow hypothesis of Jensen (1987) supports these findings due to the increased agency cost. The hypothesis states that managers with excess cash would rather invest in negative net present value projects than pay dividends to shareholders.

We calculate "Cash Holdings (Acquirer)" by dividing cash holdings by the book value of assets, which is based on financial statements for the last available fiscal year prior to the takeover bid, which are retrieved from Compustat.

6.7 R&D expense (acquirer)

R&D has been shown to play a role in the value creation of takeovers. An increase in R&D expenses is negatively associated with CAR (-1, 1) (Li et al., 2018). The literature is inconclusive on R&D's impact on value creation in the long term. The R&D expenses are positively correlated with post-merger 1-year buy-and-hold abnormal returns, but negatively associated with post-merger 3-year long-term operating performance.

We calculate this variable as the acquirer's R&D expenses divided by the book value of its assets. R&D expenses and the book value of assets is based on financial statements for the last available fiscal year prior to the takeover bid, which are retrieved from Compustat.

7 Empirical analysis

This chapter presents our empirical analysis. The presentation is structured around the three hypotheses that are tested as outlined in Chapter 3. All regressions are conducted with robust standard errors due to heteroskedasticity.[31] Furthermore, in this thesis, we only refer to significance for significance levels of 95% or above.

7.1 Do investors believe that corporate takeovers create value?

H1: Corporate takeovers are value-creating on average

Table 7.1 presents the univariate one-sided t-test. As the table demonstrates, the mean value creation for all transactions is significantly greater than 0. Thus, we can reject the null hypothesis (H0).

Moreover, we assess the distribution of value creation descriptively. As we can see from the histogram (Figure 7.1), the majority of the transactions are positive. However, we can see that the value creation varies, and that a substantial number of the transactions are in fact value-destroying. This indicates that investors do not always believe that a corporate takeover will create value.

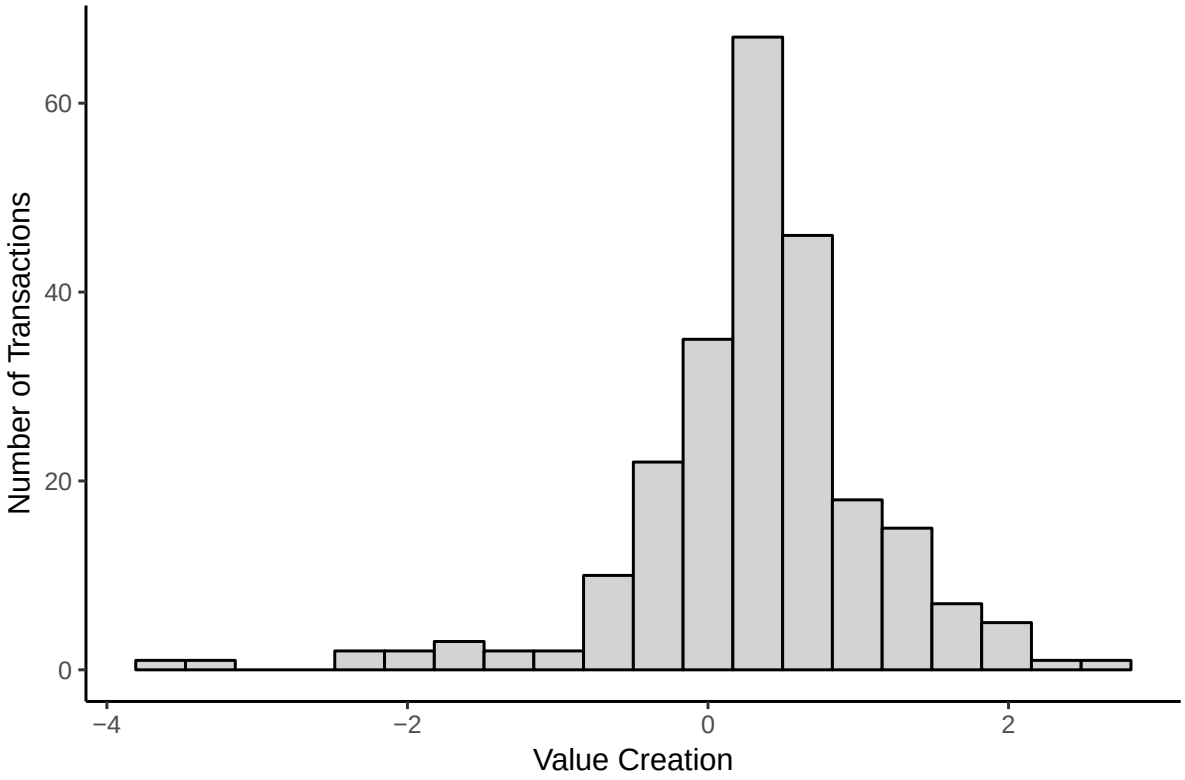
Table 7.1: Univariate one-sided t-test of mean value creation for all transactions

	Statistics			T-test	
Sample	N	Mean value creation	S.error	P value	Sign.
All transactions	240	0.321	0.053	0.000	***

*p<0.05; **p<0.01; ***p<0.001

[31] See appendix A4 for the complete robustness analysis.

Figure 7.1: Distribution of value creation for all transactions



7.2 Do investors value the opportunity to transfer operational efficiency?

H2: The value creation in corporate takeovers increases with the opportunity to transfer operational efficiency between the merging companies

Table 7.2 presents the results from one-sided univariate t-tests conducted on the subsample of takeovers with the opportunity to transfer operational efficiency.[32] The results indicate that the value creation is significantly greater than zero. As such, we conclude that transactions where an opportunity exists for the transfer of operational efficiency, on average, are value-creating.

[32]As mentioned in Chapter 3; for the t-tests, the opportunity to transfer operational efficiency is defined as when the absolute value of the difference in operational efficiency is at least 10%. For the OLS regressions, we treat the opportunity to transfer operational efficiency as a continuous variable measuring the absolute value of the difference in operational efficiency, regardless of whether the difference is more or less than 10%.

Table 7.2: Takeovers with the opportunity for transfer of operational efficiency

N	Mean	S.error	P value	Sign.
131	0.241	0.082	0.002	**

*p<0.05; **p<0.01; ***p<0.001

Moreover, we conduct Welch's t-test to test whether a difference exists in value creation between transactions with an opportunity to transfer operational efficiency compared with those without this opportunity (Table 7.3). The results show that the value creation between the subsamples in not significantly different at the 95% level.

Table 7.3: Welch's test of difference in mean between takeovers with and without the opportunity to transfer efficiency

Opportunity to transfer			No opportunity			Welch's t-test	
N	Mean	S. dev	N	Mean	S. dev	P value	Sign
131	0.241	0.944	109	0.418	0.643	0.085	

*p<0.05; **p<0.01; ***p<0.001

Finally, we conduct the OLS regression (Model 1) to investigate whether a positive association exists between value creation and opportunity to transfer operational efficiency, when controlling for factors that are known to influence value creation (Table 7.4).

Table 7.4: Regression results: Model 1

	Dependent variable:
	Value Creation
Opportunity To Transfer Operational Efficiency	-0.364
	(0.217)
Horizontal Takeover	0.191
	(0.115)
Serial Acquirer	-0.539*
	(0.210)
Relative Size	0.012
	(0.074)
Tender Offer	0.027
	(0.125)
Leverage (Acquirer)	0.381
	(0.254)
R&D Expense (Acquirer)	-0.001
	(0.001)
Cash Holdings (Acquirer)	0.0001
	(0.001)
Constant	0.155
	(0.220)
Observations	240
R^2	0.084
Adjusted R^2	0.053
Residual Std. Error	0.803 (df = 231)
F Statistic	2.655*** (df = 8; 231)

Note: All standard errors are robust. Opportunity To Transfer Operational Efficiency is defined as |Acquirer's ROIC - Target's ROIC|
*p<0.05; **p<0.01; ***p<0.001

The coefficient for "Opportunity To Transfer Operational Efficiency" is not significantly positive. Thus, we cannot reject H0, which is that the value creation in corporate takeovers does not increase with the opportunity to transfer operational efficiency between the merging companies.

In light of this, we move on to distinguish between horizontal and diversifying takeovers. In the next section, we test Hypothesis 3, present relevant statistics and tests, and ultimately draw out the relevance for our overarching question of whether investors value the opportunity to transfer operational efficiency between merging companies.

7.3 Do investors value the opportunity to transfer operational efficiency differently for horizontal and diversifying takeovers?

H3: The association between value creation and the opportunity to transfer operational efficiency between the merging companies is different for horizontal takeovers compared with diversifying takeovers.

Initially, we conduct univariate t-tests to investigate whether the mean value creation is positive for subsamples of horizontal and diversifying takeover bids, respectively. Subsequently, we conduct Welch's t-test to compare the average value creation of subsamples of transactions with the opportunity to transfer operational efficiency for horizontal and diversifying takeovers.

From Table 7.5, we see that when all takeovers are included, the mean value creation is significantly positive for both horizontal and diversifying takeovers. When considering only takeovers with the opportunity to transfer operational efficiency, we find that horizontal takeovers are significantly value-creating, while diversifying takeovers are not.

Table 7.5: Univariate t-tests of value creation for horizontal and diversifying takeovers

All takeovers

	Statistics			T-test	
Sample	N	Mean Value Creation	S. error	P value	Sign
Horizontal	146	0.399	0.057	0.000	***
Diversifying	94	0.201	0.102	0.025	*

Takeovers with the opportunity to transfer operational efficiency

	Statistics			T-test	
Horizontal	73	0.288	0.100	0.000	***
Diversifying	58	0.18	0.138	0.098	

*p<0.05; **p<0.01; ***p<0.001

Through conducting Welch's t-tests, we test whether a significant difference exists in value creation between horizontal and diversifying takeovers that have the opportunity to transfer operational efficiency. However, we do not find that there is a significant group difference in value creation between the two types of takeovers (Table 7.6).

Table 7.6: Welch's tests of difference in mean between horizontal and diversifying takeovers where there is an opportunity to transfer efficiency

Horizontal			Diversifying			Welch's Test	
N	Mean	S.dev	N	Mean	S.dev	P-value	Sign
73	0.288	0.858	58	0.180	1.048	0.526	

*p<0.05; **p<0.01; ***p<0.001

Finally, we perform the OLS regression to test whether the association between value creation and increased opportunity to transfer operational efficiency is significantly different for horizontal takeovers compared with diversifying takeovers, when other known factors that influence value creation are controlled for. This is conducted by including an interaction term between "Opportunity To Transfer Operational Efficiency" and a dummy for horizontal takeovers.

The regression is presented in Table 7.7 (Model 2). The interaction term between "Opportunity To Transfer Operational Efficiency" and "Horizontal Takeover" is significantly positive. This indicates that a significant difference exists in the association between opportunity to transfer operational efficiency and value creation, for horizontal takeovers compared with diversifying takeovers. Specifically, we observe that opportunity to transfer operational efficiency is associated with more value creation for horizontal takeovers compared with diversifying takeovers. On this basis, we can reject the null hypothesis and adopt H3.

Table 7.7: Regression Results: Model 2 & 3

	Dependent variable:	
	Value Creation	
	(2)	(3)
Opportunity To Transfer Operational Efficiency	-1.238**	-0.185
	(0.525)	(0.114)
Horizontal Takeover	-0.0002	-0.0002
	(0.137)	(0.137)
Opportunity To Transfer Operational Efficiency * Horizontal Takeover	1.053** (0.531)	
Opportunity To Transfer Operational Efficiency * Diversifying Takeover		-1.053** (0.531)
Serial Acquirer	-0.569***	-0.569***
	(0.211)	(0.211)
Relative Size	0.003	0.003
	(0.074)	(0.074)
Tender Offer	0.001	0.001
	(0.123)	(0.123)
Leverage (Acquirer)	0.346	0.346
	(0.250)	(0.250)
R&D Expense (Acquirer)	-0.001	-0.001
	(0.001)	(0.001)
Cash Holdings (Acquirer)	0.0001	0.0001
	(0.001)	(0.001)
Constant	0.344	0.344
	(0.228)	(0.228)
Observations	240	240
R^2	0.108	0.108
Adjusted R^2	0.073	0.073
Residual Std. Error (df = 230)	0.794	0.794
F Statistic (df = 9; 230)	3.100***	3.100***

Note: *p<0.1; **p<0.05; ***p<0.01

Note: All standard errors are robust. Opportunity To Transfer Operational Efficiency is defined as |Acquirer's ROIC - Target's ROIC|

*p<0.05; **p<0.01; ***p<0.001

Model 2 (Table 7.7) shows that the overall association between value creation and opportunity to transfer operational efficiency is significantly negative for diversifying takeovers, as this is represented by the coefficient for "Opportunity To Transfer Operational Efficiency." As such, our result from the investigation of H2–where we are not able

to establish a positive association between value creation and opportunity to transfer operational efficiency–holds for diversifying takeovers. However, Model 2 does not reveal the overall significance of the relationship between value creation and opportunity to transfer operational efficiency for horizontal mergers, as this effect is split between the coefficient for "Opportunity To Transfer Operational Efficiency" and the interaction term. We rerun the regression, replacing the dummy for horizontal takeover with a new dummy for diversifying takeover in the interaction term (Model 3). From this, we observe that the association between value creation and opportunity to transfer operational efficiency is not significant in either direction. Thus, we are still unable to reject H2 specifically for either horizontal or diversifying takeovers, but we observe that diversifying takeovers have a significant negative association that we have previously not observed for the whole data set.

8 Discussion

This chapter discusses the findings of the empirical analysis and points out opportunities for further research. Lastly, it presents the limitations of this study.

8.1 Discussion: Hypothesis 1

The result that corporate takeovers, on average, are value-creating (H1) shows that investors generally believe that corporate takeovers do create value. This conclusion is in line with previous studies on value creation. However, it is interesting that there are value-destroying takeovers. These may be a symptom of either misaligned incentives (agency theory), such that the acquiring management is not acting in the best interest of shareholders, or the acquiring management's overestimation of their ability to create value (the hubris hypothesis). As such, the presence of value-destroying takeovers is consistent with both agency theory and the hubris hypothesis.

8.2 Discussion: Hypothesis 2

The investigation of H2 fails to reject the null hypothesis. However, the failure to find a positive association does not indicate that investors do not value the opportunity to transfer operational efficiency between the merging companies. Our sample consists of transactions that the acquiring management consider worthwhile to pursue. Therefore, the benchmark for value creation is transactions that are presumably value-creating. We confirm this when we test H1 and demonstrate that investors, on average, believe that corporate takeovers create value. A significant positive association between value creation and the opportunity to transfer operational efficiency, all else equal, would be indicative that investors value transactions with an increased opportunity to transfer operational efficiency between the merging companies. However, we must consider that our hypothesis and testing design is optimistic due to the benchmark for value creation, and ultimately not successful in enlightening our question of interest; whether investor value the opportunity to transfer operational efficiency between the merging companies in a takeover. An alternative for further research is to verify the communicated motive for each takeover. Adding this element to the analysis would allow a more comprehensive study of

the topic; one can look at the difference in operational efficiency for those transactions that communicate improved overall efficiency as a motive, or simply look at whether takeovers with the transfer of operational efficiency as a motive are creating value.

Another suggestion for further research is to distinguish between opportunity to transfer operational efficiency from the acquirer to the target, and from the target to the acquirer. This thesis focuses solely on the absolute value of the difference in operational efficiency, reflecting our concept that the transfer of operational efficiency is a possibility both from the acquirer to the target, and vice versa. Even though we argue that there should not be any difference between these two scenarios, investors may think so in terms of value creation. Therefore it may be an interesting direction for further research.[33]

8.3 Discussion: Hypothesis 3

When investigating H3, it is puzzling that our analysis reveals a significantly negative association between the opportunity to transfer operational efficiency and value creation for diversifying mergers. It is unclear why, all else being equal, a difference in operational efficiency should be associated with *less* value creation. One reason for this might be that the opportunity to transfer operational efficiency translates into the intent to capitalize on the opportunity. Although, we cannot reject the possibility that some other omitted variable that we are unaware of is causing this.

As such, one explanation for our result, that horizontal takeovers have a significantly more positive association between value creation and opportunity to to transfer operational efficiency than diversifying takeovers, is that investors believe that the differential efficiency motive creates more value than does the inefficient management motive; that is, that the transfer of an industry-specific advantage is more probable in the eyes of the investors, than is the transfer of an overall advantage. In turn, this can be an indication that issues related to the hubris hypothesis are more prevalent for diversifying takeovers that aim to transfer operational efficiency. For example, the acquiring management may underestimate the difficulties in transferring operational efficiency across industries.

[33]Leverty and Qian (2010) investigate solely in the direction from the acquirer to the target.

8.4 Limitations

We use the term "corporate takeover" throughout the thesis. However, we wish to make it clear that the analysis is exclusively on all-cash transactions between public companies in the U.S. The inference made is restricted to this specific subset of transactions.

When we estimate value creation by stock performance around the announcement, we capture only the unanticipated value creation of a takeover. When discussing value creation and opportunity to transfer operational efficiency, this has an important implication; if one of the companies involved is priced as if they have an advantage in operational efficiency that they will capitalize on, the estimate of value creation at announcement will not be representative of the real total value creation; that is, the estimate will be downwardly biased. Explicitly, this would mean that one of the companies is valued higher than it would be if positive value creation through corporate takeover was not a possibility. As such, this adds a layer of complexity in terms of evaluating relative value creation across any dimension. We argue that our results may indicate that investors favor the transfer of operational efficiency in horizontal as opposed to diversifying takeovers. Principally, the situation could be that the value creation for diversifying takeovers is already priced into the stock price. However, we do not think that there is any difference between diversifying and horizontal takeovers in this regard, as such, we do not think that this affects our results.

9 Concluding remarks

In this thesis, we examined the value creation for 240 public, all-cash corporate takeovers in the US between 2003 and 2017, excluding 2008. Moreover, we tested whether corporate takeovers create value, and whether value creation is associated with differences in operational efficiency between the merging companies, which we defined as the opportunity to transfer operational efficiency. We compared the association between value creation and opportunity to transfer operational efficiency for both horizontal and diversifying takeovers, where operational efficiency was gauged by ROIC. For this investigation, we defined value creation as the increase in combined shareholder value for the target and the acquirer that is attributable to the takeover.

We found that value creation in corporate takeovers was significantly greater than zero, but that several transactions appeared to be value-destroying. From this, we concluded that investors, on average, believe that corporate takeovers create value. This finding is in line with previous research in the field. That some takeovers are value-destroying is consistent with theories that claim that takeovers do not create value, such as agency theory (which claims that managers pursue takeovers for the wrong reasons), and the hubris hypothesis (which states that managers overestimate the potential value creation that can be achieved through takeovers).

Ultimately, our results revealed that the correlation between value creation and opportunity to transfer operational efficiency is significantly more positive for horizontal takeovers compared with diversifying takeovers. This suggests that investors do value takeovers where an increased opportunity to transfer operational efficiency exists more favorably for horizontal takeovers compared with diversifying takeovers.[34] We argued that investors generally favoring the prospects of transferring operational efficiency between industry-related companies over non-related companies might explain this result–indicating that the differential efficiency motive is perceived more favorably than the inefficient management motive. This could mean that acquiring management is too optimistic about the prospects for value creation through the transfer of operational efficiency for diversifying takeovers, which is consistent with the hubris hypothesis.

[34]"Opportunity To Transfer Operational Efficiency" is defined as a continuous variable: |Acuirer's ROIC - Target's ROIC|.

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Appendix

A1 Variable definition

Table A1.1: Description and calculation of variables

Variable	Method	Source
Value Creation	Combined abnormal announcement return divided by likelihood of bid success / stand-alone equity value of the target. Event window: [-7, 1]. See Chapter 5.	CRSP
ROIC	Operational income (before tax) / invested capital. Both variables are retrieved from the last financial year before the announcement.	Compustat
Opportunity To Transfer Operational Efficiency	|Acquirer's ROIC - target's ROIC|. Financials are retrieved from the last financial year before the announcement.	Compustat
Horizontal Takeover	Dummy variable equal to one if it is a horizontal takeover, and zero if it is a diversifying takeover. It is a horizontal takeover when both parties have the same two-digits SIC-code.	SDC
Serial Acquirer	Dummy variable equal to one if the bidder has completed at least 3 takeovers in the last 5 years prior to the announcement, and zero otherwise.	SDC
Relative Size	Pre market cap of target / pre market cap of acquirer. Financials are retrieved from one week prior to the announcement.	CRSP
Tender Offer	Dummy variable equal to one if the bid is a tender offer, and zero otherwise.	SDC
Leverage Acquirer	Total debt (book) / market value of equity. Financials are retrieved from the last financial year before the announcement.	Compustat
R&D Expense Acquirer	R&D expense / assets (book). Financials are retrieved from the last financial year before the announcement.	Compustat
Cash Holdings Acquirer	Cash holdings / assets (book). Financials are retrieved from the last financial year before the announcement.	Compustat

A2 Stand-alone equity value

The stand alone equity value at the end of the event window is defined as the company's equity value at the start of the event window extrapolated to the end of the event window with the market model. The following equation describes how we have performed this calculation:

$$S_i = \Pi_{t=1}^{T}(1 + R_{i_t})` * E_i \tag{.1}$$

where: S = stand-alone equity value

Π = mathematical symbol for product

T = set of time periods

E = equity value prior to announcement

ER = daily expected log return based on the market model

t = subscript for time period

i = subscript for company

A3 Description of statistical tests

A3.1 Ordinary least square regression

For the regression analysis to provide insights the OLS estimators needs to be unbiased (Wooldridge, 2016). The estimator is unbiased when the first four of the Gauss-Markov assumptions hold. These assumptions are: linearity in the parameters, random sampling, no perfect collinearity and zero conditional mean. Of these assumptions, in reality we are only concerned about the fourth assumption, zero conditional mean, as we can make corrections to reduce the problem for the other assumptions. Further, the OLS estimator is the best linear, unbiased estimator (BLUE) when the Gauss-Markov's fifth assumption, homoskedasticity, holds. In appendix A4 we test the most concerning assumptions, and also whether the functional form of our OLS regression is acceptable.

A3.2 T-test

A t-test is a statistical hypothesis test. It consists of a null hypothesis and an alternative hypothesis. The null gets rejected when the test supports the alternative hypothesis, and the obtained test results is sufficient unlikely to be a result of chance. Fisher (1992) is often referred to when deciding level of significance used in previous research: "he advocated $P < 0.05$ (5% significance) as a standard level for concluding that there is evidence against the hypothesis tested, though not as an absolute rule."

A3.3 Univariate t-test

Univariate test is a one-sample t-test. A univariate t-test is either one-tailed or two-tailed. A one-tailed univariate test determine whether the mean of a population is significantly higher/lower than a specific number, for example zero. A two-tailed univariate test tests if the mean of a population is significantly different from a specific number.

A3.4 Welch's t-test

Welch t-test is a two sample unequal variance t-test. The test can be one-tailed or twp-tailed. The one-tailed test tests whether a population have significantly higher/lower mean than the compared population. The two-tailed test tests whether two populations have significantly different means. The Welch t-test assume the the populations have

different variances.

A4 Robustness Analysis

The regression models used to test hypothesis 2 and 3 is a result of our work seeking the optimal model for us to investigate the statistical significance our explanatory variable "Opportunity To Transfer Operational Efficiency" has on "Value Creation." The process of deciding on the model is two-fold. Firstly, we identify and argue for what control variables belong in the regression for the model to appropriately reflect the reality. Second, we evaluate the statistical viability of the model proposed. In this chapter, we present our results from our diagnostic of the models and elaborate on the model specification. The most important result from this section is that the proposed model suffer from heteroskedasticity, and that we as a consequences use robust standard errors.

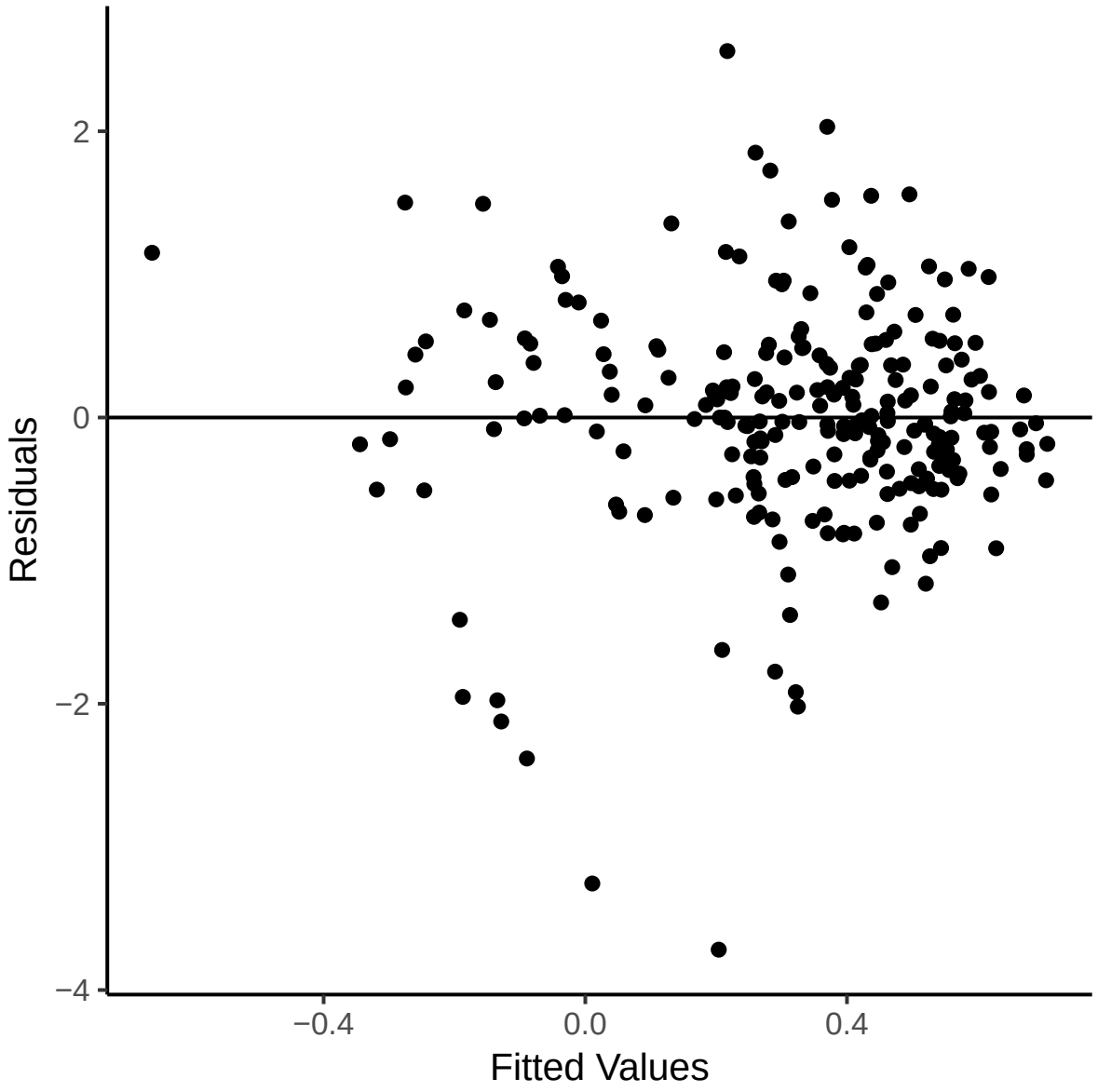
A4.1 Statistical viability

To draw statistical inference on the background of our model, it is important that it fulfills the required assumptions for OLS as presented in appendix A3.1. Our model is linear in parameters, and we assume that our sampling procedure has given us a random sample of transaction. Thus, we will not elaborate further on those assumptions.

A4.2 Zero conditional mean

To test zero conditional mean assumption, we run a plot of residuals against fitted values (see figure A4.1). From the plot, we see that the zero conditional mean assumption is largely over held. As such, we conclude that the zero conditional mean assumption is fulfilled to an acceptable degree.

Figure A4.1: Residuals of regression (1) plotted against fitted values



A4.3 Multicollinearity

A common problem in regard to statistical viability of OLS models is multicollinearity that happens when there are high correlation between two or more explanatory variables. To test for this, we calculate a covariance matrix of our variables (see table A4.1) and run a VIF-test (see table A4.2). According to these, our models do not seem to suffer from multicollinearity issues.

Table A4.1: Correlation matrix for OLS-variables

	AED	HT	SA	RS	TO	LA	R&D	CH
|Efficiency Difference|	1.00	0.03	-0.08	-0.03	0.13	0.09	-0.01	0.02
Horizontal Takeover	0.03	1.00	-0.02	-0.08	0.13	0.04	0.01	0.01
Serial Acquirer	-0.08	-0.02	1.00	-0.15	0.02	0.04	0.09	-0.05
Relative Size	-0.03	-0.08	-0.15	1.00	-0.10	0.10	-0.17	-0.06
Tender Offer	0.13	0.13	0.02	-0.10	1.00	-0.17	0.14	0.13
Leverage Acquirer	0.09	0.04	0.04	0.10	-0.17	1.00	-0.41	-0.39
R&D Expense Acquirer	-0.01	0.01	0.09	-0.17	0.14	-0.41	1.00	0.46
Cash Holdings Acquirer	0.02	0.01	-0.05	-0.06	0.13	-0.39	0.46	1.00

Note: |Efficiency Difference| equals Opportunity To Transfer Operational Efficiency

Table A4.2: VIF-test for multicollinearity of OLS-variables

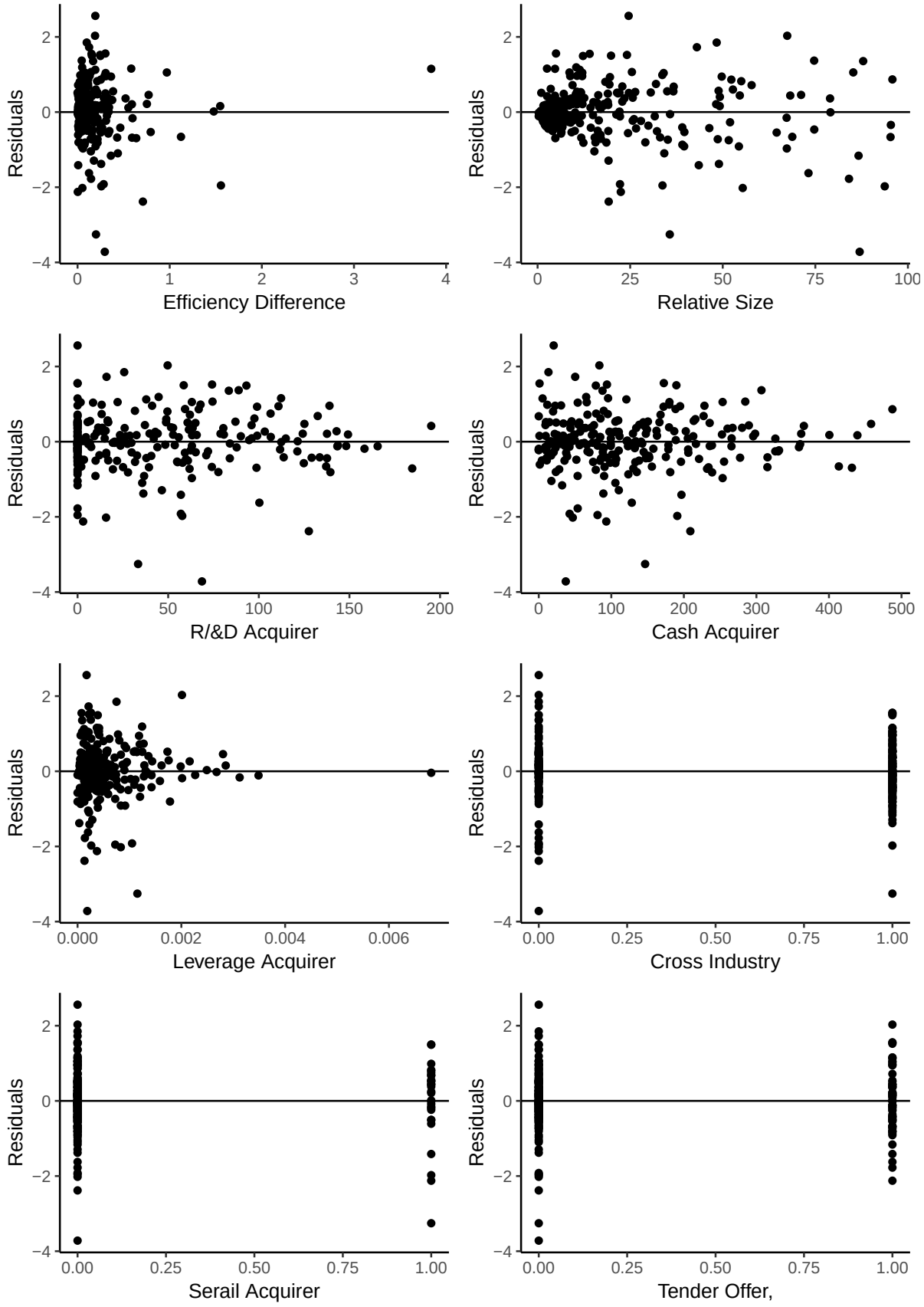
Variable name	(1)
|Efficiency Difference|	
Horizontal Takeover	1.03
Serial Acquirer	1.06
Relative Size	1.07
Tender Offer	1.08
Leverage Acquirer	1.34
R&D Expense Acquirer	1.44
Cash Holdings Acquirer	1.37
Mean_VIF	1.18

Note: |Efficiency Difference| equals Opportunity to Transfer Operational Efficiency

A4.4 Heteroskedasticity

To test whether our model suffers from heteroskedasticity, we first perform a Breusch-Pagan test (see table A4.3), and thereafter plot the residuals of our OLS regression model against the explanatory variable and other control variables (see figure A4.2). Our results from the Breusch-Pagan test strongly indicate that our model suffers from heteroskedasticity. The residual plots are confirming this as the residuals seem to have a trend for several variables. Even if heteroskedasticity does not cause bias, it is problematic as it makes the coefficient estimates less accurate and causes the variance to be biased. Therefore, we introduce robust standard errors to our OLS models to deal with this issue.

Figure A4.2: Residuals of regression (1) plotted against explanatory and control variables



Note: Efficiency Difference equals Opportunity To Transfer Operational Efficiency (/Efficiency Difference/

Table A4.3: Breusch-Pagan test for heteroskedasticity

Breusch-Pagan test		
	(1)	(2)
X^2	19.26	18.51
$P > X^2$	0.01	0.03

A4.5 Model specification

The consequence of incorrect model specification is that we allow for omitted variable bias. That is, correlation that are contributed to our included variables, may be caused by their correlation with some unknown variable that indeed does correlate with the "Value Creation." This may mean that if the *correct* variable is included, the apparent correlation of our variables in our model would disappear.

In Chapter 6 we justify the selection of included control variables. Mainly, these are variables with empirical backing that we believe do not interfere too much with operational efficiency. We have, however, not previously elaborated on variables that we have chosen to leave out. Popular control variables in the literature include variables such as Price-to-Book ratio, Price-to-Earnings ratio, et cetera, that are hybrid estimates of accounting numbers and stock performance. We choose to leave these out as we are concerned that they disturb our explanatory variable "Opportunity To Transfer Operational Efficiency." We think this a natural assumption as one would believe that efficiency measures will correlate with stock performance.

In appendix A4.6, we demonstrate why we choose not to control for industries and years, and run a Ramsey Rest test (regressor) to test for misspecification of the included variables.

A4.6 Why we do not control for Industry and Year in our main regression?

We conduct control regressions with Industry dummies for all industries in or data set with more than 20 transactions (see table A4.4).[35] These controllers do not seem to affect our explanatory variable considerably and are not significant. Therefore, we leave them out of our main regression to preserve the number of degrees of freedom.

Our models do not control for year because we do not see why there should be any specific year effects for how investors evaluate the value creating potential of takeovers. Any

[35]These industries are health care, industrials, information technology, and consumer discretionary.

such effect would potentially be spurious and controlling for it may distort our analysis. Because we have only a few observations per year we are especially concerned of this.

Table A4.4: Regression results

	Dependent variable:
	Value Creation
	(1)
|Efficiency Difference|	-0.369*
	(0.205)
Control Variables	Yes
Industry Dummies	Yes
Constant	0.038
	(0.244)
Observations	240
R^2	0.095
Adjusted R^2	0.047
Residual Std. Error (df = 227)	0.805
F Statistic (df = 12; 227)	1.990**
Note:	*p<0.1; **p<0.05; ***p<0.01

|Efficiency Difference| equals Opportunity to Transfer Operational Efficiency

A4.7 Ramsey RESET-test

We run the Ramsey RESET-test for all included variables for all regressions (see table A4.5). This test is conducted with a power of 2 to 3. The test evaluates whether any of our variables have a non-linear association with value creation. As the test is not significant we have no evidence that indicates that our included variables are misspecified.

Table A4.5: Ramsey RESET-test for mispecification of variables (regressor)

	(1)	(2)
$F[x, y]$	0.40	0.17
$P > F$	0.97	0.99

A5 Event window - trade-off between noise and accounting for anticipation

We set the event window for our estimations to 7 days before announcement to 1 day after announcement. In this subsection, we elaborate on this decision.

The link between our estimation of synergies and deal probabilities is such that the event window for the value creation estimate must correspond to the event window for when we estimate the deal probability. Luckily, the arguments for setting the event windows go along the same lines for both models. Essentially, it is a trade-off between introducing noise to the models and accounting for anticipation. This is described as the truncation dilemma by Bhagat et al. (2005).

When measuring stock performance this can be done either at the time of announcement or completion, or it can be over some period after a completed transaction. For our thesis, we concern ourselves with the implicit valuation around announcement, and we assume that in efficient capital markets this will reflect as true a value of the consolidated company as any.

It can be discussed how long after announcement the window should reach, however, we rest on the assumption that the market prices the day after announcement accurately reflects the proposed consolidation. As such, it seems unnecessary to allow for further noise by expanding the window in that direction.

For the start of the event window we explore the trade-off, and find that there are some predictive gains in moving the start of the window to 1 week before announcement, but that there is no observable gain thereafter (see table A6.1). Therefore, we do not want to allow for more noise by expanding the window further. It is then an assumption on our part that both the estimates of prediction and value creation based on this date will not be biased due to anticipation.

On this background we set our event window for both estimation models to 7 days before announcement to 1 day after announcement.

A6 Predictive power

We calculate the Brier Score for a selection of event windows that vary by the start date. Based on these calculations, we decide to use as event window stretching back to 7 days before announcement, as we do not see predictive gains by stretching it further back. The data set we used for this calculation was similarly filtered as the one used for our analysis, but we have included transactions stretching from 1997 - 2018.

Table A6.1: Brier Scores

Event Window	All	Merger	Tender
[-1,1]	0.062	0.084	0.027
[-7,1]	0.056	0.071	0.023
[-30,1]	0.058	0.076	0.029
[-60,1]	0.058	0.079	0.025
[-90,1]	0.056	0.071	0.031
[-180,1]	0.061	0.074	0.042

A7 Data sampling process

Table A7.1: Data sampling steps

Filter	Transactions	
	Lost	Remaining
All-cash public transactions (2003 - 2017, =/= 2008)	-	1461
Percentage sought = 100%	607	854
No competing bid	60	794
Available information about offered price	47	747
No change in original price	60	687
Bid not publicly known 1 week before announcement	25	650
Linkable between SDC & CRSP	133	517
Premium more than 10%	71	446
Relative size of target min 0.01 (Equity value)	85	361
Likelihood of bid success outside [0,1.1]	19	342
Linkable between CRSP & Compustat	40	302
No NA variables	47	255
Not a Financial Acquirer [0,1.1] (GIC 2 digit)	15	240

A8 Linking process

Link up between CRSP and SDC

1) We sample the 6-digit CUSIP and the ticker for both the acquirer and the target from SDC.

2) Because CRSP use the 8-digit CUSIP, we create potential variants of the 6-digit CUSIP by adding 10, 20, 30, 40, 50, 60, 70, 80, or 90 as the 8-digit CUSIP for the common stock most likely will be one of these combinations. This returns 9 8-CUSIPs per company.

3) These CUSIPs are all matched up against the CRSP database for any daily stock price between 2000 and 2017 by NCUSIP. NCUSIP is the CUSIP the security in CRSP was registered with at date of the price.

4) For all matches we retrieve the PERMCO, which is the identifier we are seeking.

5) This gives an enormous data set, which we reduce by only preserving unique combinations of 6-digit CUSIP and PERMCO.

6) This PERMCO is then linked with our original table.
a. This does create some duplicates, but they will be removed in step 8.

7) For all transactions, we have not identified a PERMCO for we use the same procedure, but we do it for the ticker instead of the CUSIP.

8) We then retrieve daily stock prices between 2000 and 2017 for all PERMCO's we have identified.
a. All transactions that do not have any matches within the last week before announcement are removed (this removes duplicates).
b. Transactions that get multiple hits are also removed (some unfortunately have multiple securities trading under the same PERMCO at time of announcement).

Based on information about outstanding shares and share price 1 week before announcement, we calculate the equity values for the companies (not fully diluted) and the premium the offer represents. This numbers are then used to filter for transactions where the acquirer is more than 100 times bigger than target, and transactions where the premium is less than 10%.

We then calculate the likelihood of bid success and remove transactions that according to our model has a likelihood of being completed outside the [0,1.1] interval.

Link-up between our remaining transactions and Compustat

This part is straight-forward as we use the WRDS linking table to retrieve a GVKEY for each company based on their PERMCO.

1) Retrieve GVKEY for all PERMCO present in our remaining sample

a. Run separately for the acquirer and the target.

2) Retrieve annual report for last fiscal year and last quarterly report for all companies.

a. Quarterly report only used to retrieve fully diluted shares.

3) Calculate all variables. Remove transaction with NA variables.

Verifying matches. Ultimately, all matches are verified manually by visually controlling that the information from SDC, CRSP, Compustat.

A9 Event study methodology

Event studies are a popular technique to understand the impact of certain events in economic studies. The concept of event studies is that unexplained variation in an object within an event window can be contributed to the event. For an event study to viably capture the event effect in capital markets, it is required to be an unexpected event and that there are no confounding factors (McWilliams & Siegel, 1997).