# Determinants of Successful M&As
An Empirical Study of Listed Companies in The United States

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# Abstract

Since 1985, the U.S. market has been facing an increase in merger and acquisition activity. In addition to detect potential determinants of M&A success, this thesis does not only examine the short-term performance of acquirers and targets, but it also determines the long-term M&A performance of U.S. acquirers across all industries. With a sample of 1,288 M&As between 2002 and 2015, we found negative short-term abnormal returns to acquirers using the cumulative abnormal return method. However, since target shareholders gain significantly higher abnormal returns, M&As create value overall from a short-term perspective. Acquirers' negative short-term abnormal returns persist in being negative over the long-term analysis. The buy-and-hold abnormal return method in event-time reveals significant value destruction of 25.8% over a three-year investigation period. Also, the study detects a significant impact of the acquirer´s and target´s price-to-book ratio, method of payment, relative profitability, and deal rationale on the long-term post-acquisition performance. However, the influence of relative size is inconclusive and could not ultimately be determined in this study. Lastly, the acquisition attitude (friendly vs. hostile) and cross-border transactions provided no evidence of affecting deal success.

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# Contents

# 1  Introduction

Empirical research on mergers and acquisitions (M&As) has been popular during the past decades, and some of the questions raised are: does M&As create wealth for the acquiring company, and if it does, what determines the success. The literature defines successful M&As as transactions that provide acquiring shareholders with abnormal returns relative to investments in firms with similar risk profile. Research with a focus on the short-term announcement effects concludes that U.S. M&As, in average, earn negative abnormal returns (Walker, 2000). Moreover, research conducted by Moeller et al. (2003) indicates significant negative long-term post-merger abnormal returns for the acquiring companies. This poses a challenge to the management of acquirers, and it therefore needs to identify determinants of successful M&As.
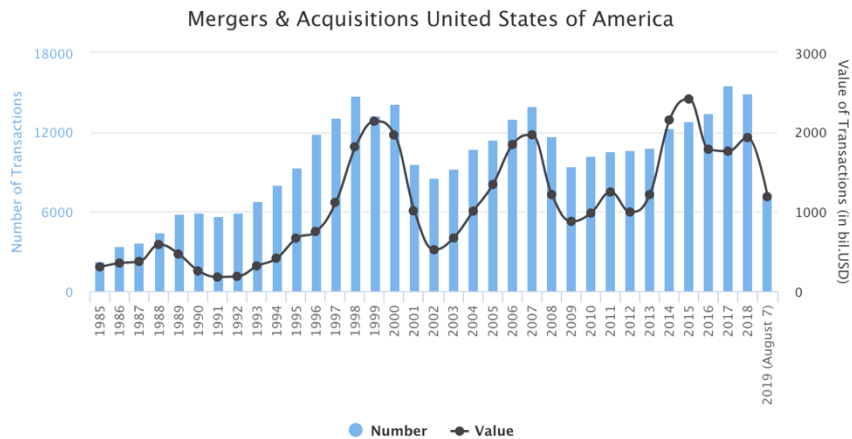


Figure 1: Number of M&As in the U.S. (imaa, 2019).

Since the 19s, companies have undergone a profound change driven by technology and digitalization. Companies have reacted to those shifts in demand by doing M&As. Figure 1 shows the development in M&A activity from 1985 to 2019 in the United States. There have been more than 325,000 M&As since 1985, with an accumulated value of $34,900 billion. 2017 was a record year in terms of number of deals, which ended at a total of 15,100 transactions, a 12.2% increase over 2016. From 1985 to 2018, the compound annual growth rate for the number of deals was 5.86%.

There are some methodological difficulties in assessing abnormal returns, and thus previous studies focus, usually, only on either short- or long-term abnormal returns. Contrary to most prior studies, we are going to analyze both. For the short-term study, we examine acquirers and targets announcement abnormal returns, while for the long-term analysis, we only determine the long-term performance of U.S. acquirers. However, we are not going to look at specific industries, as we want to detect potential generic determinants of M&A success. To evaluate short-term success, we are going to use the cumulative abnormal return (CAR) method, while we focus on the Buy-and-Hold-Abnormal-Return (BHAR) method for the long-term analysis. In addition, we are going to see if CAR produces similar long-term results as BHAR. By using the BHAR method, we should be able to detect statistically reliable indications of success and to identify potential determinants of long-term M&A success with their respective impact.

The market efficiency hypothesis states that stock prices reflect information to the point where the marginal benefits of acting on information (the profits to be made) do not exceed the marginal costs (Jensen, 1978). Put differently; there are no abnormal returns to gain. Therefore, the research questions of this thesis can be stated as follow:

*Is the market efficient? If it´s not, which deal, acquirer and target characteristics contribute towards long-term M&A success (measured by acquirers BHAR)?*

There are two goals of this thesis. Firstly, we want to extend previous research on short-term performance of acquirers and targets by expanding the analysis to include acquirer's long-term performance. Secondly, we will use the observed long-term abnormal returns to examine and, hopefully, identify which aspects of a M&A deal contributes to success.

The remainder of the thesis is organized as follows. In section 2, we discuss what M&A is, the motives behind M&As, how to measure success, effects of doing M&As and what determines abnormal returns. In section 3, we provide our hypotheses regarding the overall short- and long-term effect

of M&As and the impact of potential determinants on long-term performance. Thereafter, in section 4, we discuss different models and which we are going to use. In section 5, we present our data, how we collected it and the choice of independent variables. Lastly, we discuss our results and then provide conclusions.

# 2   Literature Review

## 2.1   General Theory of M&As

We can split M&As into two groups: mergers and consolidations. When we are talking about mergers, two companies become one entity (Gaughan, 2007). The target company does no longer exist as the acquiring company take over its liabilities and assets. However, in a consolidation, two companies become one unit, where both initial companies cease to exist. The two companies form a new entity, where the old shareholders of both companies become shareholders in the new entity (Gaughan, 2007; Kim et al., 2011).

## 2.2   Why Doing M&As

Acquisitions can be thought of as strategic decisions. However, the motives behind acquisitions differ across transactions (Trautwein, 1990). It is argued by several researchers that the main motive behind an acquisition is to gain synergies (Kim et al., 2011; Damodaran, 2005). Synergy is obtained if the value of the combined company exceeds the sum of the two independent companies. We can divide synergies into operating and financial synergies. Operational synergies are defined as achieving economies of scale, higher growth potential and increased pricing power. This should yield higher cash flows, and hence, increase shareholder value. On the other hand, financial synergy results in higher firm value because of tax benefits, diversification and debt capacity. This will be reflected in a lower cost of capital and/or increased cash flows.

| Motives Behind M&As | Explanation |
| --- | --- |
| Economies of Scale | Increased production with lower marginal costs |
| Vertical Integration | Reduced risk by controlling the supply chain |
| Expertise | Gain new expertise that the company does not have nor could learn |
| Efficiency Gains | Reduced costs because of elimination of overlapping tasks |
| Operating Losses | Reduce taxes by acquiring unprofitable businesses |
| Diversification | Diversification should reduce operational risk |
| Earnings Growth | Earnings growth by acquiring high-growth firms |
| Monopoly Gains | Increased market power weakens the competitors |

**Figure 2**: List of motives for doing M&As (Berk & DeMarzo, 2013).

## 2.3   Successful & Unsuccessful M&As

From the perspective of the acquiring company´s shareholders, M&As are value-destroying on average (Rau & Vermaelen, 1998). However, there are different definitions of unsuccessful M&As. One definition is presented by Sevenius (2011). He argues that M&As are unsuccessful if the transaction does not live up to the expectations. Bruner (2009), however, argues that the benchmark for whether a M&A is unsuccessful or not is the investors required rate of return. Hence, if the acquisition delivers a return higher than required by investors, the transaction is successful. In contrast, a return lower than investors required rate of return yields an unsuccessful transaction.

Regardless, there are several important factors impacting the outcome of a M&A. In figure 3, we have listed potential qualitative factors that need to be fulfilled for a M&A to be successful per several researchers.

| Pre-M&A phase | During M&A | Post-M&A phase |
|---|---|---|
| 1. Assessment of strategic issues and fit | 1. Avoiding overpayment | 1. Implementing integration plans at appropriate speed |
| 2. Conducting due diligence and assessment of synergies across hard areas (e.g. financials) as well as soft areas (e.g. culture) | 2. Continued commitment of leadership | 2. Taking tangible steps towards integration |
| 3. Careful planning for integration issues (e.g. financial integration vs. operational integration) | 3. Appropriate communication | 3. Involvement of due diligence team in integration |
| 4. Leveraging prior experience of M&A | | 4. Setting intermediate goals to realize the final benefits of M&A |
| 5. Comprehensive assessment of risk | | 5. Managing HR issues |
| 6. Careful assessment of the capabilities of both companies | | 6. Taking steps to integrate the culture of the two companies |

**Figure 3**: Qualitative factors affecting M&A success (References are removed for making it easier to read).

## 2.4    Effects of Doing M&As

We have introduced different motives behind M&As, and the effects of those motives must be addressed. One should think that M&As are thoroughly thought out investments, and hence be profitable for acquirers. Recent studies on U.S. M&As do not share this view.

| Study | Data | Methodology | Period | Results |
|---|---|---|---|---|
| Loughran & Vijh (1997) | 947 U.S. M&As between 1970-1989 | BHAR after size and book-to-market adjustments | 5 years | -15.9% significant abnormal returns |
| Mitchell & Stafford (2000) | 2,193 U.S. M&As between 1958-1993 | BHAR and calendar time portfolio with FF3F | 3 years | No significant abnormal returns |
| Moeller et al. (2003) | 12,023 U.S. M&As between 1980-2001 | BHAR and calendar time portfolio | 3 years | -16.02% significant abnormal returns |
| Dube & Glascock (2006) | 255 U.S. M&As between 1975-1996 | Calendar time portfolio with FF3F and FF4F | 3 years | No significant abnormal returns |

**Figure 4**: Key papers on U.S. acquirer's long-term post-merger performance.

In the paper of Loughran & Vijh (1997), 947 U.S. acquisitions between 1970-1989 were assessed. Abnormal returns were estimated using the BHAR method with an event-window of five years. They adjusted their benchmark for size and book-to-market effects because the acquisition sample was not distributed equally across the size and book-to-market spectrum. To finish the benchmark, their matching procedure paired acquirers with control firms by their required rate of return. The sample firms earned an average five-year buy-and-hold return of 81.2% compared to 97.1% for their matching firms. This corresponds to an average abnormal return of -15.9% for acquirers, which was statistically significant. Thus, concluding that M&As are value-destroying.

Mitchell & Stafford (2000) analyzed 2,193 U.S. acquisitions from 1958 to 1993 using the BHAR and calendar-time portfolio methods, where abnormal returns were estimated over a three-year time horizon. To determine abnormal returns, they used a benchmark that was created using market capitalization and book-to-market ratios of non-event firms. They show

that event-firm abnormal returns are positively cross-correlated when over-lapping in calendar time. For inference purposes, they adjusted the t-statistics hoping it would give more trustworthy results. They report evidence of negligible long-term abnormal returns when controlling for the positive cross-correlation. Hence, they support the null hypothesis of zero mean abnormal returns.

In another study, Moeller et al. (2003) examined a sample of 12,023 U.S. M&As from 1980 to 2001. Rather than choosing one approach, they used both calendar- and event-time methods. They followed the method proposed by Fama (1998) for the calendar-time approach. For each calendar month, they created an equally weighted portfolio of the firms that made an acquisition in the past three years, measured relative to the completion date of the deal. The result showed an insignificant monthly abnormal return of -0.041% and concluded that there is no evidence of poor long-term performance of U.S. acquirers. However, for the event-time analysis, they followed the approach of Barber & Lyon (1997). The investigation period was set to three years and matched event-firms with control firms using the market value of assets and book-to-market ratios. In contrast to the calendar-time approach, they found a significant abnormal return of -16.02%.

255 U.S. acquisitions were analyzed by Dube & Glascock (2006) from 1975 to 1996, using the calendar-time method over a three-year horizon. To avoid new-listing bias and problems of severe cross-sectional dependence due to overlapping returns, they filtered the sample only to keep firms that participated in one M&A within the next five years. For the calendar-time method, the Fama and French three-factor (FF3F) and the four-factor model was applied. Abnormal return was determined using both value-weighted and equally-weighted approaches. In conformity with Mitchell & Stafford (2000), they did not find significant abnormal returns.

With the four studies above as a basis, M&As provide either negative or zero abnormal returns for acquiring shareholders. In the cases of negative abnormal returns, there are three suggested explanations for this underperformance. First, from a behavioral point of view, the market slowly corrects its overvaluation of the merged firms´ shares (Ruback & Wurgler,

2007; Shleifer & Vishny, 2003). Second, M&As are a reaction to negative industry shocks. However, the merged firm might perform better than it would have without the M&A, which may still be worse than the pre-M&A performance (Hartford, 2005). Lastly, the underperformance is a consequence of the econometric methodology itself (Betton, Eckbo & Thorburn, 2008), where the returns might not be properly adjusted for risk.

## 2.5    Determinants of Abnormal Returns

The majority of prior research estimates abnormal returns in an event study to assess whether a M&A is successful or not. There are several factors that likely may affect abnormal returns, and those can be divided into firm and deal characteristics.

| Factor | Effect | Key papers |
|---|---|---|
| Method of payment: | • Cash payment yields higher abnormal returns than stock payment | Gregory (1997), Loughran & Vijh (1997), Franks et al. (1991), Myers & Majluf (1984), Kaplan & KPMG (2007), Andrade, Mitchell & Stafford (2001) |
| Size: | • Larger acquirers gain higher announcement abnormal returns. In contrast, other studies say that smaller acquirers are on average more successful than bigger acquirers<br>• Negative relationship between deal size and acquirer´s abnormal return | Laabs & Schiereck (2008), Schlingemann & Moeller (2004), Loderer & Martin (1990), Khansa (2015), Fuller et al. (2002), Agrawal et al. (1992), Eckbo et al. (1990), Kaplan & KPMG (2007) |
| Profitability | • Acquirers and targets with lower P/E ratios yield higher abnormal returns than acquirers and targets with high P/E ratios<br>• Inverse relation between targets ROE and acquirer's abnormal returns<br>• Some studies say that relative profitability, measured by ROE, has a significant effect, while other says it has not | Kaplan & KPMG (2007), Moore et al. (2012), Houston & Ryngaert (1994), Hawawini & Swary (1990) |
| Cross-border M&As: | • Divided view in the literature. Some finds positive abnormal returns, while other finds negative or insignificant abnormal returns | Schlingemann & Moeller (2004), Darkow et al. (2008), Bris et al. (2008), Lowinski et al. (2004) nor Higgins & Rodriguez (2006) |
| M&A attitude: | • Friendly takeovers yield 4% higher abnormal returns<br>• Hostile takeovers tend to yield negative abnormal returns | Schleifer & Vishny (2003), Travlos (1987), Wanseley et al. (1983) |

**Figure 5**: Key factors affecting abnormal returns.

### 2.5.1   Method of Payment

M&As financed with stocks may send a negative signal to the market that the acquirers´ stocks is overvalued (Myers & Majluf, 1984). All else equal, stock payments should yield lower abnormal returns than cash payments (Hansen, 1987), which may be a result of asymmetric information. This is supported by the findings of Andrade, Mitchell & Stafford (2001), as they found lower abnormal returns for M&As financed with stocks. In addition, targets prefer cash payments, as the target bear risk in holding the acquirer´s stock (Kirchhoff & Schiereck, 2011). Thus, the literature seems to agree that stock payments affects abnormal return. It is worthwhile to mention that target shareholders pay tax on capital gains immediately in cash-for-stock deals. Hence, cash deals may be costly because the implied capital gains tax penalty forces higher target premiums (Betton, Eckbo & Thorburn, 2008).

### 2.5.2   Size

Schlingemann & Moeller (2004) found that the size of the acquiring company had a significant effect on abnormal returns. Larger acquirers gained higher announcement abnormal returns compared to smaller acquirers. Another size measure used in previous research is deal value. Loderer & Martin (1990) claim that larger deals tend to be value-destroying because acquirers overpay. The overpayments may be due to overconfident managers (Roll, 1986). In conformity, a negative correlation between the acquirer's abnormal return and the deal value was found by Khansa (2015), suggesting that acquiring shareholders regarded larger deals as more risky investments.

### 2.5.3   Profitability

A study conducted by Moore, Braggion & Dwarkasing (2012), examined how the profitability of the target company affects the outcome of a M&A. The result indicates that target's return on equity (ROE) and the acquirer's post-merger return have an inverse relation. Hence, the lower the target ROE, the higher the abnormal return for the acquiring company. That is because the management of the acquiring company may improve the profitability of the target company, thus create substantial additional

value. Furthermore, Houston & Ryngaert (1994) studied the effect of relative profitability on abnormal returns. They measured relative profitability as the difference between the two-year ROE of acquirer and target preceding the announcement. The result showed that the combined entity return was not affected by relative profitability. Even though this study is old, it provides further insight into this potential determinant's impact on deal success. Another alternative to measure profitability is to examine acquirers and targets price-to-earnings ratio (P/E). Kaplan & KPMG (2007) found that acquisitions made by acquirers who had low P/E yielded significantly higher returns than acquirers with high P/E. Similarly, acquisitions of targets with low P/E yielded significantly higher returns than acquisitions of targets with high P/E.

## 2.5.4   Cross-border M&As

One may earn abnormal returns from cross-border transactions when acquiring a target in countries with worse accounting standards and shareholder protection (Bris et al., 2008). It is argued that the cultural differences in cross-border acquisitions might affect M&A volume and abnormal returns (Ahern et al., 2012). Schlingemann & Moeller (2004) found that cross-border M&As provided negative diversification effect. Thus, cross-border deals tend to destroy value. However, neither Lowinski et al. (2004) nor Higgins & Rodriguez (2006) could find cross-border acquisitions to influence M&A success.

## 2.5.5   M&A Attitude

Schleifer & Vishny (2003) studied the effect of friendly vs. hostile takeovers on abnormal returns. For the acquiring company, friendly takeovers provided 4% higher returns than hostile ones. However, for the target company, hostile takeovers yielded a 10% higher return than friendly ones. This probably reflects the higher premiums paid in hostile takeovers or the decrease in enterprise value of the acquiring company due to the takeover defense. A hostile takeover may, however, be viewed as a desperate attempt to improve the business model of the target. Thus, it could send a negative signal to the market, which might cause shareholders to speculate on overvaluation of the acquirer's stock price (Agrawal & Jaffe, 2000). Therefore, hostile takeovers tend to yield lower abnormal returns.

As a conclusion, there are several firm- and deal-characteristics that provide different impacts on abnormal returns. The literature is, however, quite mixed on some of the potential determinants.

# 3   Hypotheses

## 3.1   The Overall Effect on Abnormal Returns

Previous research shows that short-term announcement abnormal returns for U.S. acquiring companies are either insignificant or significantly negative (Walker, 2000). In contrast, targets shareholders tend to earn positive announcement returns. Because prior research is quite consistent on this finding, we expect to find the same. Studies on long-term post-merger performance for acquiring companies indicate negative abnormal returns. This is attributed to several reasons, among them, lack of risk management, wrong motive behind the deal and type of acquisition. Therefore, we expect to find similar results.

H1   Overall, U.S. acquirers experience negative short-term announcement abnormal returns, while targets earn positive short-term abnormal returns. Acquirers negative short-term abnormal returns persists in being negative in the long-run.

## 3.2   The Impact of Acquirer, Target and Deal Characteristics

In this section, we are going to present several hypotheses regarding the impact of the acquirer, target and deal characteristics on long-term abnormal returns for U.S. acquirers.

| Variables | Hypothesis | Short-term | Long-term |
|---|---|---|---|
| Overall effect | 1 | | |
|   Acquirer | | Negative | Negative |
|   Target | | Positive | |
| | | | |
| Cross-border deal | 2 | | Negative |
| | | | |
| Relative profitability | 3 | | Positive |
| | | | |
| P/B acquirer and target | 4 | | Negative |
| | | | |
| Method of payment: | 5 | | |
|   Cash | | | Positive |
|   Stocks | | | Negative |
| | | | |
| M&A attitude: | 6 | | |
|   Friendly | | | Positive |
|   Hostile | | | Negative |
| | 7 | | |
| Relative size | | | Negative |

**Figure 6**: Overview of hypotheses and predicted value impact (Deal rationale is excluded as it contains 10 different rationales).

Many researchers focus on the effect of internationalization on long-run wealth creation for acquirers, and the results are quite consistent. The literature uniformly points to long-term negative abnormal returns for acquirers engaging in cross-border M&As (Black et al., 2001; Chatterjee, 2004). It is argued that cross-border transactions yield more challenging post-merger integration and that acquirers have imperfect information, resulting in negative abnormal returns (Conn et al. 2005).

H2   Cross-border M&As will perform worse than domestic transactions.

There have been several studies in the literature reporting the significance of relative profitability. Relatively more profitable acquirers can improve the targets' business models and thereby create substantial additional value (Hawawini & Swary, 1990). This is supported by Moore, Braggion & Dwarkasing (2012), where they found an inverse relation between targets ROE and acquirers abnormal returns.

H3   The greater the difference in relative profitability between acquirer and target, the greater the positive impact on long-term abnormal returns.

It should be noted, however, most previous studies of M&A success reported in the open literature has some knowledge gaps. To the best of our knowledge, the case of acquirers and targets price-to-book (P/B) ratio has not been given considerable attention by researchers in the past, and this motivated the present study. Instead, the P/E multiple has been examined. Acquisitions made by acquirers with low P/E were more successful than acquirers with high P/E (Kaplan & KPMG, 2007). Furthermore, targets with low P/E yielded higher returns than targets with high P/E. We expect to find similar results for acquirers and targets P/B ratio on M&A success.

H4  Acquirer´s and target´s P/B has a negative impact on abnormal returns.

A large and growing body of literature has investigated the method of payment's impact on M&A success. Travlos (1987) found that M&As financed with cash yielded positive long-term abnormal returns, and in contrast, M&As financed with stocks yielded negative long-term abnormal returns. The above finding is consistent with the study by Antoniou & Zhao (2004).

H5  Cash payments yield higher long-term abnormal returns than stock payments.

The relationship between M&A attitude and success has been widely investigated. Previous research findings have been consistent; friendly takeovers yield higher returns than hostile ones (Servaes, 1991). This is due to that hostile takeovers require higher premiums, and might, therefore, reduce the success potential. Friendly takeovers, however, require lower premiums and may give the acquirer better chances at capitalizing the synergies.

H6  Friendly takeovers perform better than hostile ones.

Following Darkow & Schiereck (2008), relative size can be measured as the deal value divided by the acquirer's size. The relative size of a transaction might reflect the total synergy potential and thus indicates the success potential of a M&A. However, larger transactions are usually more complex; hence integration costs may be much higher (Hawawini & Swary, 1990). It could also be harder to manage and more expensive to acquire larger targets, which may impact the M&A negatively (Agrawal et al., 1992; Fuller et al., 2002).

H7   Higher relative size has a negative impact on abnormal returns.

## 4   Methodology

### 4.1   Event Study Methodology

To assess the impact of a corporate event on stock prices, Fama et al. (1969) developed a method called event study. Event studies give a better understanding of the impact on market returns of corporate decisions and behavior (Campbell et al., 1997; Barber & Lyon, 1997). Event study methodology has become the most common technique to measure an event's impact on short- and long-run returns. The objective of such a study is to determine if the sample firms yield abnormal returns that are statistically significant different from zero. Finding non-zero abnormal returns means that investors have either under-reacted or over-reacted to an event. That is, corporate surprises which are not reflected in the stock price, assuming no inside information trading ("run-up"). One can say that testing for non-zero abnormal returns is the same as testing for market efficiency (Kothari & Warner, 2008).

### 4.2   Models for Estimating and Testing Abnormal Returns

In recent finance literature, two methods are commonly used to test and measure abnormal returns. The CAR method is usually used to estimate and test short-term announcement effects, while the BHAR method is typically used to determine and test long-term abnormal returns. However, the model that forms the basis for estimating abnormal returns in general is the market model:

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it}$$

$$E(e_{it} = 0) \qquad \sigma^2(e_{it}) = \sigma^2_{e_i}$$

(1)

where the residual $e_{it}$, express abnormal return with expectation equal to zero and a constant variance. We can then derive abnormal return to be:

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}).$$

(2)

Some researchers suggest using an adjusted market model instead (Barber & Lyon, 1997). When estimating abnormal returns using an adjusted market model, one simply takes the difference between the buy-and-hold return of a company and an appropriate benchmark:

$$AR_{it} = R_{it} - R_{bm} \ .$$

(3)

By taking the sum of the monthly abnormal returns, we arrive at the CAR model (Fama, 1998):

$$CAR_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{i\tau}$$

(4)

where $CAR_i(\tau_1, \tau_2)$ is the cumulative abnormal return for sample firm i for any time interval $(\tau_1, \tau_2)$. CAR is estimated by taking the sum of the event firm´s realized return less it´s expected return during the event window.

Moving forward, the adjusted market model forms the basis for the BHAR method:

$$BHAR_{it} = \prod_{t=1}^{T}(1 + AR_{it}) - 1$$

(5)

where $BHAR_{it}$ represents the buy-and-hold abnormal return for sample firm *i* in period *t*. The intuition behind the BHAR model is that one buys the merged firm´s stock in the same month as merger completion, and then holding it three to five years, or until delisting, whichever comes first.

Then, one estimate BHAR by compounding the monthly difference between the expected return of the merged company and the realized return to a benchmark.

## 4.3 Benchmarks for Long-Term Abnormal Returns

Earlier event studies by Brown & Warner (1980, 1985), Dyckman, Philbrick & Stephan (1984), and Campbell & Wesley (1993) all used market indexes as a benchmark to the event firms. However, the empirical specification of test statistics they apply were based on abnormal returns for shorter periods, for instance a day or a couple of months. Implementing them over to be employed on long-run abnormal returns will yield misspecified test statistics (empirical rejection rates exceed theoretical rejection rates), as argued by Fama (1998). Barber & Lyon (1997) traces the misspecification to three sources of biases when calculating abnormal returns using an index as a benchmark. The three biases include:

- *New listing bias*, which occurs in long-run event studies using an index as reference. Typically, post-event returns are conducted over three or five years, and indexes used as references might include firms that begin trading subsequent to the event start.
- *Rebalancing bias* is misspecification due to indexes typically being calculated assuming periodic rebalancing, whereas event firms are compounded without rebalancing.
- *The skewness bias* is a positive skew of multi-year returns. The skewness arises as a result of the lower bound being -100%, while returns are unbound on the upside.

Nevertheless, long-term abnormal return event studies are also subject to cross-dependence bias embedded in the sample observations rather than the benchmark (Brav, 1997). Cross-sectional dependence in event studies is caused by overlapping event periods and calendar clustering. Overlapping periods of return calculations occur when the same event firm participates in multiple M&As in the same investigation time. This will yield an outcome of non-independent abnormal returns. While calendar clustering is caused by sample firms sharing the same event date.

The follow-up paper by Barber, Lyon & Tsai (1999) addresses both misspecifications; biases due to utilizing an index portfolio as reference and the cross-dependence bias. They developed elaborate techniques with alternatives to market indexes as a proxy when calculating abnormal returns. The paper presents two different approaches to solve the biases:

(i)     Carefully constructed reference portfolios, such that the population mean abnormal return is assured to be zero. Whereas cross-correlation misspecification is resolved by either using a bootstrapped skewness-adjusted t-statistics or the empirically generated distribution of mean long-run abnormal stock returns from pseudo-portfolios.

(ii)    Non-event control firms as a benchmark selected on the basis of firm-specific characteristics such as industry, market capitalization, book-to-market etc.

However, Mitchell & Stafford (2000) argues that the test statistics obtained through Lyon et al. (1999) techniques require that abnormal returns are independent across firms. Mergers and other corporate actions are not random events, and thus event samples are unlikely to consist of independent observations. That is because mergers seem to be cyclical and happen in waves for industries and thus cluster through time and industry (Gort, 1969). Fortunately, Jegadeesh & Karceski (2009) addresses the shortcomings of Lyon et al. (1999) methodology by proposing test statistics that are well-specified in nonrandom samples. Thus, resolving the issues haunting long-run abnormal return event studies. The approach succeeds by producing a standard error reflecting the properties of the sample.

## 4.4    Construction of Benchmark Portfolios

We follow Barber, Lyon & Tsai (1999) when constructing the benchmark portfolios for the long-run analysis. The first step is to download all stock data for NYSE, AMEX and Nasdaq that is available from CRSP between 2002 and 2015. Since we are interested in the return of common stocks, we exclude ADR's, closed-end funds, foreign-domiciled firms, primes and scores and real estate investments trusts. We then calculate the firm size in June for each year using CRSP end-of-month prices and the total number of shares outstanding. All NYSE firms are then ranked

on the basis of their market capitalization in June to create 10 size decile portfolios. Similar to Jegadeesh & Karceski (2009) and Mitchell & Stafford (2000), AMEX and Nasdaq firms are afterward placed in the appropriate NYSE size decile on the basis of their June firm size. Firms listed on Nasdaq has relatively low market capitalization, resulting in 42% of all Nasdaq firms are placed in the smallest decile of firm size (decile 1). Hence, we further divide it into quintiles without regard to stock exchange, resulting in a total of 14 size categories. Each category is further divided into five book-to-market quintiles. The book-to-market ratio is also computed using June market capitalization, while we use the most recent book-value of equity as of December in each individual year. This process results in a total of 70 size/benchmark reference portfolios, where the firms are annually reclassified into various size and benchmark deciles at the end of June every year using constant breakpoints. To finish off the benchmark portfolio, all firms that had participated in M&As after 1995 were removed, such that the benchmark contains only non-event firms.

## 4.5 The Choice of Methodology

### 4.5.1 Short-Term Methodology

The short-term announcement abnormal returns are determined following the methodology of Brown & Warner (1985), using the CAR method. This model is commonly used for short-term studies (see, e.g. Laabs & Schiereck, 2008). To determine abnormal returns, we use the standard market model from equation (1), where the S&P 500 serves as the market index for the U.S. acquirers and targets. For cross-border targets, their respective domestic market indexes have been used. The market model is estimated using OLS regression over a 230-trading day period. The trading period starts at day $t = -250$ relative to the announcement date of the M&A. Based on the estimated expected returns, abnormal returns for all acquirers and targets were determined. The longest event window examined is 41 days: $T = [-20; +20]$ days, $t = 0$ being the announcement day of the M&A.

Three t-statistics are used to test for statistical significance (see appendix for formulas). The first is a crude dependence adjusted t-test by Brown

& Warner (1980), where a single variance is estimated for the entire portfolio. Second, the cross-sectional test, as proposed by Boehmer et al. (1991) considers potential event-induced increase in standard deviation by combining variance information from the event and the estimation period. Lastly, some research provides evidence that non-parametric t-statistics can be more powerful than parametric t-statistics (Barber & Lyon, 1996). Therefore the non-parametric GST is also applied (Cowan et al., 1990).

## 4.5.2 Long-Term Methodology

Earlier discussion denotes BHAR and calendar-time portfolios as the two most popular estimators of long-term stock performance. There have been suggested multiple modified versions of the two methodologies coupled with a vast number of different correctional and statistical tests. Our research's general assignment is to decompose the abnormal returns of merged companies to extract the sources of abnormalities. Under this conception, it is required to have a well specified stock performance measure. We find that the buy-and-hold abnormal return as advocated by Lyon et al. (1999) is the most appropriate choice for our research objective. First, BHAR is a better measure of investors' actual long-run experience. Second, it is less prone to bad model problems, as it investigates the difference in return between the merged firm and the benchmark (Loughran & Ritter, 2000). Third, recent simulation studies by Ang & Zhang (2015), reveals that the calendar time portfolio is less powerful compared to BHAR when applied for horizons longer than a year. This is because the calendar-time portfolio method did not catch the effect when the researchers added synthetic abnormal returns to the portfolio each month. Thus, it is neither practical nor sensible to use any further testing procedures other than BHAR for the long-term analysis. Regardless, as a supplement, we will check whether the long-term CAR method yields the same results as BHAR, while our study´s focus will lie on the BHAR results.

As for the benchmark, we use seventy size/book-to-market reference portfolios, formed as described in the section "4.4 Construction of Benchmark Portfolios". The reason is that both rebalancing and new listing biases are eliminated by the construction of the abnormal return measure. In addition, Barber & Lyon (1997) report that standard tests based on a con-

trol firm are not as powerful as those based on reference portfolio approach. The reason is that the use of a control firm is subject to higher noise exposure.

We apply three test-statistics to test the null hypothesis that the mean long-run abnormal return is zero (see appendix for formulas). A conventional t-test, bootstrapped Johnson's t-test as advocated by Lyon et. al (1999) and a serial correlation consistent t-test proposed by Jegadeesh & Karceski (2009) (adjusted t-test). The advocated bootstrapping procedure corrects for cross-correlation under the assumption of independent abnormal returns. The advantage of the adjusted t-test is that it overcomes the cross-correlation bias in non-random samples. The adjusted t-test is more appropriate to apply since M&As can be concentrated in specific industries/periods, thus non-random events. The test is a generalized version of Hansen & Hodrick (1980), allowing serial correlation and assuming homoskedasticity.

# 5   Data

## 5.1   Sample Selection

The data of U.S. M&As is obtained from SDC Thomson Financial Database. This includes all deals between January 1$^{st}$ 2002 and December 31$^{st}$ 2015 that fulfills a set of constraints. We ended up with 1,288 M&As after applying the following constraints:

- Both acquirer and target are publicly traded
- The deal must be defined as a merger or acquisition by SDC Thomson Financial Database
- All acquirers are listed in the U.S.
- The M&A must be completed
- Deal value accumulates to at least $50 million
- The deal must be completed within December 31$^{st}$ 2015
- The acquirer's ownership post acquisition is above 50%
- Sufficient stock return data must be available for estimation purposes

- Accounting information of acquirer and target must be available from Compustat IQ for estimation of market capitalization, market-to-book ratio and return on capital employed (ROCE)

The choice of time dimension is due to two important reasons. Following previous studies presented in figure 4, the end date is chosen accordingly to satisfy an investigation period for the long-run BHAR analysis of three years. As a result, the latest completion date of a M&A is no later than December 31$^{st}$ 2015. This is because CRSP only has available data until December 2018. Secondly, the start date is set to January 1$^{st}$ 2002 to avoid outcomes from the dotcom debacle and the effect of pooling on the choice of payment method. Prior to 2002, acquirers had the possibility of pooling their assets with the target, given that the payment was all-stock. The method was synthesized by a reevaluation of the target´s assets and liabilities at fair value and allowing to acknowledge goodwill under the circumstance of difference between deal value and reevaluated net assets (Bodt, Cousin & Roll, 2016). Thus, acquirers could diminish the effect on their financial ratios due to the acquisition (Reda, 1999).

Following Darkow & Schiereck (2008) and Laabs & Schiereck (2008), we constrain the deal value to be at least $50 million. Bigger acquisitions are of greater economic significance and worth more attention (Gregory, 1997).

## 5.2  Start of The Event Window

Following Mitchell & Stafford (1999), we set the start of the event window at the end of the completion month for the long-run BHAR analysis.

## 5.3  Returns, Size and Book-to-Market

Monthly holding period return data and stock prices for acquirers and targets listed on NYSE, AMEX and Nasdaq are retrieved from CRSP. For targets in cross-border acquisitions, stock prices are collected from SDC Thomson Financial Database. Firm size is computed by multiplying the average monthly stock price with the number of common stocks outstanding at the end of the month. The book value per share is retrieved from Compustat IQ, where book value is defined as:

- The sum of the following:

- ▪ Common stock
- ▪ Capital surplus
- ▪ Retained earnings
- ▪ Self-insurance reserves
- ▪ Capital stock premium
- • Less the following:
  - ▪ Common treasury stock
  - ▪ Accumulated unpaid preferred dividends
  - ▪ Excess of involuntary liquidation value of preferred stock over carrying value

Computing the book-to-market ratio, we again follow Mitchell & Stafford (1999) and take fiscal year-end book value of equity divided by market capitalization of common stocks at calendar year-end. The most recent fiscal year-end book value of equity is used, as long as it´s no later than the calendar year-end market value of equity. Consequently, all annual data reported in January through May fiscal year basis is considered to be in the preceding year. Lastly, 36 acquirers had a negative book value per share. Since this is relatively rare, they were excluded from the analysis (Lyon, Barber, Tsai 1999).

## 5.4    Selection of Independent Variables

The independent variables are selected based on previous literature discussed in section 2.5 and the qualitative factors affecting M&As in figure 3. However, because we are looking at several industries, some other measures than those commonly used in the literature must be applied, as most studies are focusing on specific industries.

## 5.4.1    Cross-Border

Cross-border is a variable taking the value 1 if the target is listed outside the U.S. and taking the value 0 if the target is U.S. listed. This variable is included in most studies regarding M&A success and is therefore seen as a potential determinant of success. Also, in figure 3, under the post-M&A phase column, it´s stated that one needs to integrate the culture of the merging firms. Cross-border as a variable might capture the extent to

which firms are successfully able, on average, to integrate the two firms`
culture into the new entity or not.

## 5.4.2   Relative Profitability

Relative profitability between acquirer and target is often tested as a de-
terminant of successful M&As. This is tested by taking the difference of
the two-year average ROE before the announcement for acquirer and tar-
get. Furthermore, in figure 3, under the pre-M&A phase column, it is
stated that one needs to assess the management capabilities of the acquirer
and target to increase the probability of yielding a successful transaction.
Relative profitability may be a good proxy for the management capabili-
ties of the acquirer and target. However, ROE may give us problems when
comparing profitability. That is because our data contain companies across
industries. Different industries tend to have a different amount of debt,
which is something we need to adjust for. On this basis, it is more appro-
priate to use ROCE, which is defined as $ROCE = \frac{EBIT}{Capital\ Employed}$. Thus,
ROCE measures how efficiently a firm utilizes all available capital to gen-
erate additional profits, as opposed to ROE, which only measures how effi-
ciently a firm uses equity. However, besides our initial analysis, we are go-
ing to see if ROE produces similar results.

## 5.4.3   Price-to-Book

While previous research does not necessarily examine the impact of ac-
quirers and targets P/B on M&A success, Kaplan & KPMG (2007) did as-
sess acquirers and targets P/E on deal success. As they say, less is more.
They found that acquirers and targets with low P/E were more successful
than acquirers and targets with high P/E. However, using P/E may cause
some problems. Firstly, P/E does not provide any meaning if a company
has low or negative earnings (Pereiro, 2002). Secondly, targets outside the
U.S. may follow other accounting rules, which affects earnings. Nonethe-
less, P/B is suitable for firms in capital-intensive industries (Frykman &
Toleryd, 2003). Our dataset is dominated by firms in capital-intensive in-
dustries. Thus P/B is a more suitable multiple than P/E. However, we are
going to see if P/E produces similar results as P/B.

### 5.4.4   Method of Payment

Many prior studies have found that method of payment has a significant effect on M&A performance: stock payments yields lower success than cash payments (Myers & Majluf, 1984; Brown & Ryngaert, 1991; Fuller & Glatzer, 2003). Stock payment sends a signal to the market that the stock price may be quoted above its fundamental value. Hence, one expects these transactions to be less successful than transactions paid with cash (Myers & Majluf, 1984). To measure the difference in effect between the payment methods, we include all-stock and all-cash as two separate dummies, thus excluding combined stock and cash payment.

### 5.4.5   Friendly Takeovers

In the pre-2000 period, hostile takeovers were quite normal. However, hostile takeovers have become uncommon in the post-2000 period. Regardless, prior research seems to agree on that friendly takeovers is a determinant for success, and should, therefore, be included in our analysis.

### 5.4.6   Deal Rationale

The deal rationale is based on ten dummy variables, which are not mutually exclusive. We are using the rationales explicitly stated for each deal in the SDC Thomson Financial database. Those are:

- Expand presence in primary market
- Expand presence in new/foreign markets
- Expand presence in new geographical regions
- Concentrate on core business
- Expand presence in secondary market
- Competitors market position
- Offer new products
- Create synergies
- Increase shareholder value
- Proceed used to pay down existing outstanding debt

We have not seen research on those M&A motives previously, but we think that some might be determinants of M&A success.

## 5.4.7  Relative Size

One of the important factors that might determine M&A success is the relative size of the target and acquirer. It is measured as the transaction value over acquirer's size (measured by market capitalization). Studies by Ramaswamy & Waegelein (2003) and Healy, Palepu & Ruback (1992) found that relative size might be a determinant. Their studies were consistent, suggesting that M&A performance is negatively correlated with relative size. We choose to include this variable because we think it might be a proxy for both the expected synergy potential and the integration difficulty/costs. Acquiring relatively bigger companies should yield higher integration costs and synergies. Larger targets may also require higher premiums and it should be harder to manage, which might impact the post-M&A abnormal return.

## 5.5   Descriptive Statistics

| Year | M&As | %Cross Border | %Friendly Takeovers | %Stock payments | %Cash payments | Avg. P/B Acquirer | Avg. P/B Target | Avg. Diff. ROCE | Avg. Deal Size | Avg. Rel. Size | Avg. Mark. Cap. |
|------|------|-------|-----------|---------|---------|------|------|-------|-------|-------|--------|
| 2002 | 60 | 15% | 97% | 26.7% | 33.3% | 3.1 | 2.8 | 14.7% | 511 | 0.23 | 21,419 |
| 2003 | 95 | 13.7% | 95.7% | 27.4% | 30.5% | 2.4 | 6.2 | 24.9% | 1,318 | 0.288 | 20,962 |
| 2004 | 124 | 14.5% | 99.2% | 25.8% | 33.9% | 2.5 | 2.7 | 2.8% | 2,015 | 0.214 | 23,249 |
| 2005 | 123 | 10.6% | 96.7% | 21.1% | 38.2% | 2.8 | 3.3 | 5.5% | 2,453 | 0.306 | 19,848 |
| 2006 | 117 | 10.2% | 97.4% | 15.4% | 44.4% | 2.7 | 3.0 | 3.1% | 2,984 | 0.295 | 29,237 |
| 2007 | 152 | 11.1% | 98.7% | 15.1% | 51.3% | 2.9 | 3.3 | 6.6% | 1,768 | 0.312 | 23,296 |
| 2008 | 100 | 15% | 99% | 22% | 44% | 3.2 | 3.7 | 9.7% | 1,539 | 0.41 | 17,657 |
| 2009 | 48 | 16.7% | 97.9% | 25% | 35.4% | 2.4 | 4.1 | 11.1% | 4,701 | 0.26 | 34,825 |
| 2010 | 83 | 15.6% | 98.8% | 15.7% | 49.4% | 2.5 | 2.7 | 11.5% | 1,931 | 0.177 | 30,719 |
| 2011 | 59 | 23.7% | 96.6% | 22% | 33.9% | 1.8 | 2.4 | 5.9% | 1,740 | 0.312 | 15,601 |
| 2012 | 72 | 15.2% | 98.6% | 18% | 51.4% | 2.4 | 2.5 | 6.3% | 3,074 | 0.303 | 29,702 |
| 2013 | 74 | 13.5% | 100% | 21.6% | 43.2% | 2.2 | 2.8 | 4.8% | 2,278 | 0.553 | 19,704 |
| 2014 | 80 | 12.5% | 100% | 20% | 42.5% | 2.4 | 2.5 | 1.5% | 2,449 | 0.301 | 20,002 |
| 2015 | 101 | 11.9% | 99% | 20.7% | 30.7% | 3.5 | 2.9 | 4.9% | 3,333 | 0.415 | 20,692 |
| Mean | 92 | 14.2% | 98.2% | 21.1% | 40.1% | 2.6 | 3.2 | 8.1% | 2,292 | 0.312 | 23,351 |

**Figure 7**: Sample statistics. Average market capitalization (acquirers) and deal size is measured in millions. Deal rationale is excluded.

From figure 7, we see that there have been 1,288 M&As from the year 2002 until 2015, after taking our constraints into account. This is equivalent to 92 M&As per year. Our data is dominated by domestic acquisitions, whereas cross-border deals represent 14.2% of the M&As. Not surprisingly, almost every M&A is friendly. 98.2% of the deals are friendly,

which stands in contrast to M&As in the pre-2000 period, where hostile takeovers were common. As mentioned earlier, acquirers prefer cash payment over stock payment. Yet, one-fifth of the M&As are paid with stocks, whereas 40.1% are paid with cash, and the rest is paid with a combination of stocks and cash. One might, therefore, think that 21.1% of our sample acquirers were overvalued in the stock market. The average P/B for acquirers over the sample period is 2.6, while 3.2 for targets. Thus, acquirers are buying relatively more expensive companies compared to themselves. This might reflect that targets are smaller and have higher growth opportunities compared to acquirers. The average difference in ROCE is positive for every year in our sample period and corresponds to an average of 8.1%. Acquirers are therefore buying relatively less profitable targets, suggesting that they believe additional value can be generated. Moreover, we can see that the average deal value per year far exceeds our constraint of minimum $50 million. In fact, the average deal value is $2,291 million, which accumulates to $32,094 million over the sample period. As suspected, acquirers are in fact buying smaller targets. The average market capitalization for acquirers is $23,351 million, which surpasses the average deal size of $2,292 million. This is also reflected in the average relative size, which is less than one for every year.

# 6 Results

## 6.1 Overall Short-Term Effect

Figure 8 reports the short-term announcement effect of M&As on the total sample of U.S. acquirers. This table is quite revealing in several ways. First, the same day as announcement, acquiring shareholders lose a statistically significant -0.67% (z-value = -4.5) abnormal return in the [0, 0] event-window. In the [-10, 10] event-window, the loss is reduced to -0.22%. Second, positive CAARs are only obtained in the [-20, 20], [-20, -1] and [1, 20] event-window, but only [-20, -1] is statistically significant. The [-20, -1] event-window is, however, before announcement day. As mentioned, previous findings suggest that U.S. acquirers CARs are slightly negative or insignificant (Walker, 2000). This is consistent with our findings, indicating negative announcement abnormal returns or insignificant positive abnormal returns. This finding may reflect that the capital market has a negative perception of the deal´s synergy potentials as soon as the M&A has

been announced, and therefore destroys value for acquiring shareholders. However, since the announcement abnormal returns are slightly negative or zero, the market seems to be quite efficient.

| Event-window | CAAR | t-test | | z-test | | Gen. sign test | |
|---|---|---|---|---|---|---|---|
| | | t-value | p-value | z-value | p-value | z-value | p-value |
| [-20, 20] | 0.39% | 0.8 | 0.37 | 0.14 | 0.88 | 0.68 | 0.49 |
| [-10, 10] | -0.22% | -0.8 | 0.39 | -1.6 | 0.1 | -1.9 | 0.05 |
| [-5, 5] | -0.44% | -2.3 | 0.019 | -2.2 | 0.02 | -1.6 | 0.114 |
| [-1, 1] | -0.79% | -7.1 | <.001 | -4.0 | <.001 | -4.5 | <.001 |
| [0, 0] | -0.67% | -10.1 | <.001 | -4.5 | <.001 | -4.7 | <.001 |
| [-20, -1] | 0.89% | 3.2 | 0.0013 | 2.6 | 0.009 | 2.5 | 0.013 |
| [1, 20] | 0.17% | 0.6 | 0.5 | 0.8 | 0.4 | 0.5 | 0.6 |

Figure 8: Equally-weighted CAR (CAAR) for sample acquirers. See appendix (figure A) for value-weighted CAR.

In figure 9, there is a clear trend of positive statistically significant cumulative abnormal returns for sample targets. The same day as announcement, in contrast to acquirers, targets earn a significant 16.9% (z-value = 29.5) abnormal return in the [0, 0] event-window. This increases to an outstanding 25.79% statistically significant abnormal return in the [10, 10] event-window. The current findings add to a growing body of studies on short-term M&A wealth creation. Both Netter et al. (2011) and Dodd & Ruback (1977) found an announcement abnormal return of around 20% for targets. Targets have been paid an average premium of around 20% and thus creates wealth for the shareholders.

| Event-window | CAAR | t-test | | z-test | | Gen. sign test | |
|---|---|---|---|---|---|---|---|
| | | t-value | p-value | z-value | p-value | z-value | p-value |
| [-20, 20] | 26.54% | 49.0 | <.001 | 38.7 | <.001 | 29.0 | <.001 |
| [-10, 10] | 25.79% | 66.6 | <.001 | 40.6 | <.001 | 30.3 | <.001 |
| [-5, 5] | 25.4% | 90.7 | <.001 | 41.1 | <.001 | 31.4 | <.001 |
| [-1, 1] | 24.21% | 165.5 | <.001 | 40.4 | <.001 | 31.9 | <.001 |
| [0, 0] | 16.9% | 200.1 | <.001 | 29.5 | <.001 | 23.4 | <.001 |
| [-20, -1] | 3.12% | 8.2 | <.001 | 9.2 | <.001 | 8.5 | <.001 |
| [1, 20] | 6.52% | 17.2 | <.001 | 13.3 | <.001 | 6.8 | <.001 |

Figure 9: Equally-weighted CAR (CAAR) for sample targets. See appendix (figure B) for value-weighted CAR.

Figure 10 shows the development of acquirers, targets and the theoretical combined entity´s CAARs for the whole event-window. From day -20 to -1, we can see that there is a "run-up," indicating inside information trading or leakage of information. Because of the run-up in acquirers CAAR, the market seems to perceive the M&A as good news. However, on announcement day, the CAAR drops heavily. This suggests that the market overreacted to the rumors/inside information, resulting in lower abnormal returns. While the CAARs are positive for all days except days 1 and 7, the heavy drop at announcement day is the reason for the negative results in figure 8. Moreover, targets CAAR experiences an extreme increase on announcement day. This suggests that their stock price increases with the premium paid by acquirers, and thereafter flattens out. Lastly, the theoretical combined entity CAARs are only slightly positive, even with the dramatic increase of targets CAARs. That is because acquirers are weighted more heavily.
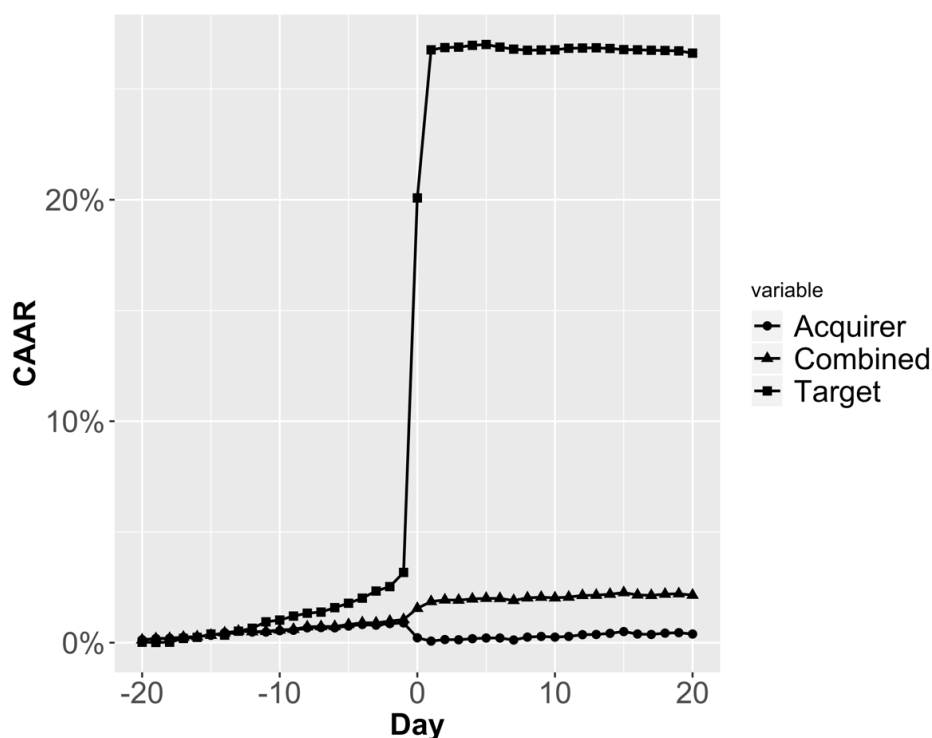


**Figure 10**: CAARs to acquirers, targets and the theoretical combined entity.

From the descriptive statistics, the reported average market capitalization for acquirers is $23,351 million. By taking the negative announcement abnormal returns into account, acquirers have lost on average $156 million

on announcement day. Moreover, the average market capitalization for targets is $1,656 million. On announcement day, target shareholders have earned around $280 million. M&As, therefore, have delivered a net-economic gain of $124 million and thus creates value overall, which supports the findings of Bradley et al. (1988). This is also reflected in the theoretical combined entity graph in figure 10.

## 6.2   Overall Long-Term Effect

Figure 11 represents the long-term BHARs (Buy-and-Hold Abnormal Returns) of U.S. acquirers across all industries. Overall, during the three-year investigation period, BHARs are found to be consistently negative for both equally- and value-weighted methods. The three-year buy-and-hold abnormal returns for the equal-weighted method is estimated to be -25.8%. This is consistent with previous findings, which report long-term BHARs of around -20% (Black et al., 2001; Gregory & Matatko, 2004). The regular t-test is reported to be -13.7. Thus, it seems to be highly significant. However, we put a great amount of effort in the methodology section to discuss the severe bias that arises in the regular t-stat for the BHAR method. After adjusting this following Lyon et al. (1999) and Jegadeesh & Karceski (2009), we got a bootstrapped t-test of -10.51 and a serial-correlation consistent t-test (adjusted t-test) of -2.09. This even more confirms the statistical significance of the equally-weighted method. Furthermore, the value-weighted method, estimated using market capitalization, yields a BHAR of -34%. The regular, bootstrapped and adjusted t-tests are -10.5, -12.1 and -1.85 respectively. Contrary to the equally-weighted method, the adjusted t-test indicates a lower significance level (10%). The different results between the equally- and value-weighted method can be addressed to the delayed effects of the dotcom bubble. Larger firms were more heavily affected, resulting in lower BHARs for the value-weighted method.

| Time | Equally-weighted BHAR | | | | Value-weighted BHAR | | | |
|---|---|---|---|---|---|---|---|---|
| | BHAR | t-test | Boot.str. t-test | Adj. t-test | BHAR | t-test | Boot.str. t-test | Adj. t-test |
| 3 years | -25.8% | -13.7 | -10.51 | -2.09 | -34% | -10.5 | -12.1 | -1.85 |

**Figure 11**: Acquirers BHAR with regular t-test, bootstrapped t-test (Lyon et al. (1999)) and adjusted t-test (Jegadeesh & Karceski (2009)).

To test the credibility of the BHAR results, a long-term CAR analysis was conducted (see figure 12). In conformity with the equally-weighted BHAR result, acquirers yielded an equally-weighted long-term CAR of -19.1%, with a regular, bootstrapped, and adjusted t-test of -12.69, -13.2 and -1.63. The CAR seems to be significant, but the adjusted t-test raises some concerns. Although the literature is consistent with our findings, it is questionable to find such a negative result. Prior studies have emphasized on the importance of using the right benchmark, as the results are subject to severe bias when not using an appropriate reference group. Even tough M&As in general might be value-destroying, it is natural to think that most studies, including ours, are not appropriately adjusted for risk (Betton, Eckbo & Thorburn, 2008). Alternatively, M&As might be a reaction of negative macroeconomic shocks. The merged firm might perform better than it would have without the M&A, which may still be worse than the pre-M&A performance (Hartford, 2005), resulting in severe negative BHARs. However, the current findings add to a growing body of literature that M&As tend to be value-destroying in a long-term perspective.

| Time | Equally-weighted CAR | | | | Value-weighted CAR | | | |
|------|------|--------|----------------|-------------|------|--------|----------------|-------------|
|      | CAR  | t-test | Boot.str. t-test | Adj. t-test | CAR  | t-test | Boot.str. t-test | Adj. t-test |
| 3 years | -19.1% | -12.69 | -13.2 | -1.63 | -24.2% | -8.51 | -12.45 | -1.92 |

Figure 12: Acquirers CAR with regular t-test, bootstrapped t-test (Lyon et al. (1999)) and adjusted t-test (Jegadeesh & Karceski (2009)).

Data from figure 13, which shows the development of acquirers BHARs over the whole sample period, can be compared with the data in figure 11. The BHARs are severely negative for both equally- and value-weighted methods in the year 2002. This may be a result of the delayed effects of the dotcom bubble. Our data contains some big tech firms, and since larger tech firms were more heavily affected, it may explain why the value-weighted method yields significantly lower abnormal returns. Acquirers that experienced the negative shocks may have reacted by doing M&As in a desperate attempt to increase their profitability. As argued, they may have performed better than without the M&A, which may still be worse than the pre-M&A performance, resulting in negative BHARs. After 2002 and all the way to 2007, M&As were performing significantly better. However, at the forefront of the financial crisis in 2008, the value-weighted BHARs drops heavily. In the aftermath of the financial crisis, BHARs

steadily increases until 2014, where the BHARs average around 0%. Hence, M&As in 2014 seems to be neither value-destroying nor value-creating. Finally, by averaging the two graphed lines, we arrive at the reported BHARs in figure 11.



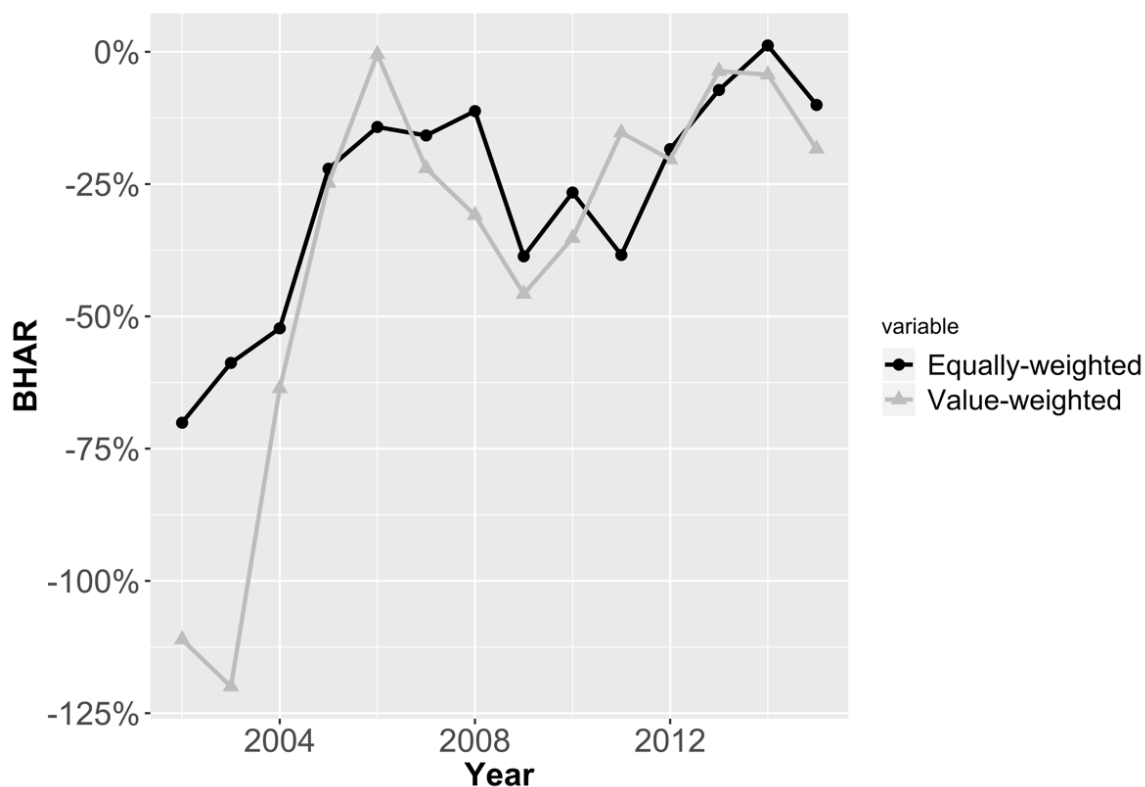**Figure 13**: BHARs to acquirers.

## 6.3 Determinants of M&A Success

Figure 14 presents findings about the impact of the potential determinants on the acquirer's long-term abnormal returns. The three-year BHARs has been regressed on six different models, where Reg.2 includes all independent variables previously discussed. We finally arrived at the following coefficients and significance levels:

## Regressions

| Variables | Reg.1 | Reg.2 | Reg.3 | Reg.4 | Reg.5 | Reg.6 |
|---|---|---|---|---|---|---|
| Intercept | -0.19*** | 0.013 | 0.015 | 0.018 | 0.149 | -0.101 |
| Rel. Size | 0.05** | 0.037 | 0.036 | 0.036 | 0.033 | 0.043* |
| P/B Acquirer | -0.028*** | -0.029*** | -0.029*** | -0.029*** | -0.089*** | |
| P/B Target | -0.003** | -0.003** | -0.003** | -0.003** | -0.003** | |
| Rel. Profit. (ROCE) | -0.138** | -0.135** | -0.131* | -0.131* | -0.128* | |
| All-Stock | -0.083 | -0.097* | -0.097* | -0.096* | -0.204** | -0.082 |
| All-Cash | 0.096** | 0.109** | 0.108** | 0.109** | -0.084 | 0.059 |
| Friendly | | -0.222 | -0.223 | -0.225 | -0.219 | |
| Cross-Border | | -0.079 | -0.079 | 0.079 | -0.066 | -0.11** |
| CMP | | -0.14* | -0.14* | -0.141* | -0.144** | -0.15** |
| SYN | | 0.127*** | 0.127*** | 0.123*** | 0.129*** | 0.12*** |
| ESM | | -0.271*** | -0.271*** | -0.314*** | -0.314*** | -0.27*** |
| Rel.Prof.*Rel.Size | | | -0.031 | -0.033 | -0.015 | |
| ESM*SYN | | | | 0.141 | 0.152 | |
| P/B Acq.*All-Stock | | | | | 0.045 | |
| P/B Acq.*All-Cash | | | | | 0.075*** | |
| Rel.Prof.*CMP | | | | | 0.027 | |
| P/E Acquirer | | | | | | 0.0009* |
| P/E Target | | | | | | 0.0009** |
| Rel. Profit. (ROE) | | | | | | -0.008 |

**Figure 14**: Acquirers BHARs regressed on the potential determinants. All deal rationale dummies (see section 5.4.6) that were statistically insignificant were removed from the table. The deal rationales included in the table is: Expansion of presence in secondary market (ESM), Acquiring competitors because of their market position (CMP) and Creating synergies (SYN). All numbers are in decimals.

Note: ***$p<0.01$, **$p<0.05$, *$p<0.1$

### 6.3.1 Relative Size

From the data in figure 14 under the first column, it is apparent that the coefficient on relative size is positive and statistically significant at a 5% level. The calculations in this work, therefore, suggest that larger relative size contributes to M&A success. This contradicts the study of Laabs & Schiereck (2008). They argue that larger transactions are usually more complex. Hence, integration costs might be much higher compared to smaller deals. In addition, higher relative transactions might suffer from

overpayment. Among the plausible explanations for our finding is that larger transactions are more likely to result in economies of scale (Ferris & Park, 2001). In conformity, Durand & Vargas (2003) argues that company size can be regarded as an indicator of a certain level of productive efficiency, accumulated over time. The larger the targets, the higher their implied efficiency and the larger the economies of scale potentially realized through the deal. Thus, one might get rid of overlapping tasks resulting in efficiency gains and cost savings. Moreover, large firms are usually characterized by a low P/B ratio, which may represent more fairly priced targets. It can therefore be argued that larger targets will give the acquirers better chances at utilizing the expected synergies because they may not be overpriced. There might be, however, several other reasons for such a finding. Although relative size is significant in Reg.1, it remains statistically insignificant when controlling for other variables through Reg.2-Reg.5. Therefore, the result from Reg.1 can only serve as an indication.

## 6.3.2  P/B Acquirer

It was found that the coefficient on P/B Acquirer is negative, and its highly statistically significant at a 1% level for all regressions. Hence, the acquirer's P/B ratio is negatively correlated with M&A success. Kaplan & KPMG (2007) found a negative relation between abnormal returns and the acquirer's P/E ratio, which is in good agreement with the results of the present study. The finding provides evidence that M&As conducted by acquirers with lower P/B ratios perform better. Interestingly, this correlation might be related to several factors. First, acquirers with low P/B ratios might not be as willing as high P/B acquirers to participate in riskier deals because their stock price might reflect fair value. Since high P/B firms may have an overvalued stock price, they might have a difficult time increasing their value after a M&A and might see their stock price revert to the industry average (Kaplan & KPMG, 2007). As a result, low P/B acquirers might pay with cash, while high P/B acquirers may prefer stock payments. As argued, stock payments might send a negative signal to the market, resulting in negative returns. This argument is supported by the highly statistically significant interaction term (P/B Acq.*All-Cash) in Reg.5, where cash payments yield a higher coefficient on P/B Acquirer of

-0.014 (0.075-0.089). However, there could be many other possible explanations for our findings. The relevance of acquirer's P/B ratio is clearly supported by the current findings.

As mentioned in the selection of the independent variables section, we have tested if the acquirer´s P/E ratio produces similar results as P/B in Reg.6. Surprisingly, P/E Acquirer indicates a minor positive impact on M&A success at a significance level of 10%. Since we argued that P/B is a better valuation metric for our data combined with the fact that P/E has a considerable small coefficient, we find the effect of P/E irrelevant on abnormal returns.

### 6.3.3   P/B Target

The results of the present study also suggest that targets P/B has a statistically significant negative effect on deal success, which also is in line with the findings of Kaplan & KPMG (2007). Hence, acquisitions of low P/B targets seem to perform better than acquisitions of high P/B targets. A reason for this might be that low P/B targets are likely to represent acquisitions that are more fairly priced or where an underperforming business is present. In the case of fairly priced targets, the expected synergies are more likely to outweigh the premium paid, which should result in higher abnormal returns. For underperforming targets, however, it should be easier to turn the target around and create substantial additional value. Another potential reason might be that value targets often have better routines and practices than growth targets, which should result in additional synergy-gains.

Similarly, as for P/B acquirer, we tested if targets P/E yielded the same result as targets P/B. The result again contradicts, implying a positive relationship between deal success and targets P/E. Once again, we consider the result of P/E irrelevant, due to its minor impact on abnormal returns.

### 6.3.4   Relative Profitability

The single most striking observation to emerge from figure 14 is relative profitability. Interestingly, it yields a negative coefficient that is significant at either a 10% or 5% level for all regressions. Hence, the present finding

suggests that relatively less profitable acquirers earn higher abnormal returns. However, several studies show that serious differences do exist, albeit findings are somewhat contradictory: both Hawawini & Swary (1990) and Moore, Braggion & Dwarkasing (2012) found a positive relationship between acquirer's abnormal return and relative profitability. However, our findings might reflect that acquirers may benefit from acquiring profitable targets rather than improving their business model to create substantial additional value. That is because relatively profitable targets might have more capable managers. Thus, the acquirer can gain new expertise, which may result in additional value-creation.

To test if more profitable and larger targets jointly affect deal success, we included an interaction term in Reg.3. This variable is statistically insignificant, indicating that larger and more profitable targets do not jointly affect deal success. However, less profitable targets might be viewed as more risky investments, which may lower acquirer's stock price and result in an unsuccessful deal. Since our data, and M&As in general, are dominated by horizontal deals, another potential reason may be that more profitable targets are acquired to reduce competition. We tested this argument in Reg.5 by the interaction term Rel.prof.*CMP. The variable is not statistically significant, causing the argument to fail. Regardless, the result of this investigation shows that relatively less profitable acquirers might be a determinant of M&A success.

Because relative profitability is usually determined using ROE in prior studies, we tested its impact in Reg.6. It is evident that ROE is statistically insignificant and does not provide evidence for having the same impact as ROCE.

### 6.3.5 Method of Payment

Consistent with findings by Gregory (1997) and Loughran & Vijh (1997), we found all-cash payments having a positive impact on the acquirer's abnormal returns. This variable is consistently statistically significant at a 5% level through Reg.1-Reg.4. Cash payments may therefore provide higher abnormal returns than combined cash and stock payments. In contrast, all-stock payments have a negative coefficient in Reg.2-Reg.4, in-

dicating that all-stock payments yield lower abnormal returns than combined cash and stock payments. The findings suggest that companies financing M&As with stocks sometimes perceive their stock to be a cheaper payment method because it may be overvalued. Especially if their P/B value, or other valuation metrics, is higher than average. This argument reflects the findings of Martin (1996), which reports that stock payments are associated with low book-to-market ratios (growth firms) while cash payments are associated with high book-to-market ratios (value firms). Furthermore, because cash deals are often financed with debt, acquirers might yield an added return on equity benefit from the effects of leverage, resulting in more successful M&As. With our regression result as a basis, all-cash payments seem to be a determinant for M&A success.

## 6.3.6   Friendly Takeovers

One of the most surprising results to emerge from the analysis is that friendly/hostile takeovers do not affect abnormal returns, as it´s not statistically significant. The above findings contradict the study by Schleifer & Vishny (2003). A likely explanation might be due to that 98.2% of the deals in our data are friendly, and might therefore not provide a clear distinction between friendly and hostile takeovers. As a result, neither friendly nor hostile takeovers seem to provide evidence for being a determinant for successful M&As. This result is probably subject to the nature of our data, as the literature is quite consistent on that friendly takeovers perform better than hostile takeovers.

## 6.3.7   Cross-Border

Another variable that is not statistically significant is cross-border acquisition. The literature is, as previously stated, concur on the topic: cross-border deals tend to destroy value. Our result might, however, be explained by globalization. The degree of globalization has dramatically increased in the post-2000 period, forcing companies to adapt. Large U.S. firms tend to be internationally integrated, and they might therefore be indifferent between domestic and cross-border acquisitions, causing the variable to be insignificant.

### 6.3.8 Deal Rationale

Among the several deal rationales, only three were statistically significant. Expansion of presence in secondary market (ESM) yields a negative coefficient and is statistically significant at a 5% level, suggesting a decrease in abnormal returns when ESM is the rationale. Moreover, the coefficient on synergies (SYN) is positive, which indicates an increase in abnormal returns when the rationale is to realize synergies. This variable is statistically significant at a 1% level. Lastly, competitors market position (CMP) reports, similarly to ESM, a negative coefficient with a significance level of 10%. Hence, when the deal rationale is to acquire a competitor because of its technology/strategic assets, one expects a decrease in abnormal returns. There are few studies of deal rationale on abnormal returns, however, Kaplan & KPMG (2007) did examine different rationales on the acquirer's stock return. They found that acquisitions that were motivated by increasing financial wealth, improving distribution channels or increasing earnings, yielded positive effects on M&A success. That is in good agreement with the results of SYN, which can be seen as obtaining either operational or financial synergies.

Regarding ESM and CMP, the present finding also supports Kaplan & KPMGs (2007) study, which concluded that the rationale of vertical integration or acquiring competitors based on their market position yielded negative effects on M&A success. Our findings may be explained by the fact that companies motivated by synergies have generally identified specific areas of synergies and cost reduction that may be implemented relatively easily. In addition, the deal rationale of ESM and CMP may be deals that were motivated by a desire to purchase intellectual property or technology of targets with very high financial multiples. Because targets with a unique intellectual property may be able to demand a high price, one that might not be justified, could explain the negative effect on abnormal returns. However, acquirers might sometimes perform vertical acquisitions with the goal of achieving synergies and controlling supplier's production. This joint effect was tested in the interaction term ESM*SYN in Reg.4. As it is statistically insignificant, it does not seem to affect deal success. Regardless, the rationale of gaining synergies seems to be the only motive that might be a determinant of M&A success.

## 6.4 Robustness Checks

After running the initial regression Reg.2, a variance inflation factor (VIF), Breusch-Pagan and Ramsey Reset test was conducted. The VIF quantifies the correlation between one factor and the other factors in our model. The Breusch-Pagan test examines whether the variance of the errors from our regression is dependent on the value of the independent variables. Lastly, The Ramsey Reset test determines whether non-linear combinations of the fitted values could explain the dependent variable (BHAR). We obtained low VIF values for every independent variable, well below the scientifically accepted threshold value of 10. This result is supported by the correlation matrix in the appendix (figure C). Thus, there seem to be no multicollinearity issues in our data.

From the Breusch-Pagan test of homoscedasticity, we got a p-value of 0.98, suggesting that we support the null hypothesis of homoscedasticity. This is confirmed by the informal heteroscedasticity test in the appendix (figure D).

We also checked whether our variables need non-linear specifications using the Ramsey Reset test. The Ramsey Reset test yielded a p-value of 0.27, indicating that we support the null hypothesis that we don't need further non-linear specifications.

When excluding/including variables in figure 14, the coefficients and their significance level remain pretty constant, except for relative size. Hence, the variables consistently have the same correlation with BHAR through Reg.1-Reg.5, and therefore provides the same conclusions as provided in section 6.3. However, when testing relative profitability (measured by ROE), P/E acquirer and P/E target in Reg.6, we saw some changes in three of the potential determinants. Both all-cash and all-stock payments became insignificant, while cross-border became significant. However, the changes in the coefficients were small, and therefore suggests the same impact on deal success. Because those variables that were tested are not appropriate measurements for our data, we are not particularly concerned with those findings.

In conclusion, the predictors neither suffer from biases due to correlation nor non-linear misspecifications. Also, the data has a constant residual variance implying a homoscedastic distributed data sample.

# 7    Conclusion

## 7.1    Summary

The present study investigated potential determinants of M&A success by examining acquirers long-run abnormal returns. For this purpose, a sample of 1,288 U.S. transactions including all industries between 2002 and 2015 were used to compute the three-year buy-and-hold abnormal returns. In addition, we studied the short-term announcement effects for both the acquirers and targets using the cumulative abnormal returns. Most of our findings are confirming previous reported results of potential determinants on M&A success and its corresponding evaluation through capital markets, with some exceptions.

First, before analyzing potential determinants of success, we assessed the short-term performance of M&As using the cumulative abnormal return method. Our finding is consistent with findings of past studies by Bradley et al. (1988); M&As are value-creating in a short-term perspective. Nonetheless, this short-term gain is mostly earned by the shareholders of the target companies, whereas the acquiring shareholders has a small loss. Therefore, our analysis confirms the slightly negative announcement abnormal returns for U.S. acquirers as identified by Walker (2000).

Second, acquirers' short-term value-destruction persist in being destructive in the long-run. The long-term results using BHAR suggests value-destruction of 25.8% over a three-year investigation period, which is consistent with Moeller et al. (2003). Likewise, the long-term CAR analysis reports a value-destruction of -19.1%. Therefore, it seems like the negative synergy potentials perceived by capital markets at announcement day for acquirers are consistent with the results of the long-term analysis.

Third, since our study suggests that the market efficiency hypothesis does not hold, we used the long-term BHARs to find potential determinants of M&A success. Our results provide evidence for a negative impact

of acquirers and targets P/B ratio, relative profitability of acquirers vs. targets, all-stock payments and deal rationale (expanding the presence in secondary market and acquiring competitors because of their assets) on long-term post-M&A performance. In conformity with the findings of Kaplan & KPMG (2007), acquirers and targets P/B ratios yielded a negative impact on long-term post-M&A performance. High P/B acquirers might have an overvalued stock; thus, they may participate in riskier deals causing a negative impact on long-term performance. Likewise, high P/B targets may be overpriced, causing the premium paid to be greater than the expected synergies.

Our findings on relative profitability stand in contrast to the study of Braggion & Dwarkasing (2012). Relatively more profitable acquirers perform worse (measured relative to the target), suggesting it's harder to create substantial additional value when acquiring a less profitable target. Less profitable targets might be viewed as more risky investments or represent high P/B firms. High P/B targets might be overvalued, which could cause the M&A to fail.

The evidence from this study suggests the same as Loughran & Vijh (1997); M&As fully paid with stocks have a negative impact on long-term M&A success. It is assumed that "all-stock" payments signal overvalued acquirers (Myers & Majluf, 1984), resulting in acquirers to underperform relatively to our benchmark.

Lastly, consistent with the findings of Kaplan & KPMG (2007), the deal rationale of expanding the presence in secondary market (ESM) and acquiring competitors because of their market position (CMP) contributes towards unsuccessful M&As. ESM and CMP may be deals that were motivated by a desire to purchase intellectual property or technology of very high financial multiples targets. Because targets with a unique intellectual property may be able to command a high price, the premium may exceed the synergy potentials.

On the other hand, this study also determines a consistent positive effect of "all-cash" payments on long-term success, which reflects the findings of Fuller & Glatzer (2003). This may represent acquirers that are fairly

priced or acquirers that finance the deal with debt, which yields an added return on equity benefit from the effects of leverage. However, acquirers with a deal rationale of gaining synergies uniformly point towards M&A success. Companies motivated by synergies should generally have identified specific areas of synergies and cost reduction that may be implemented relatively easily, giving the acquirer better chances at succeeding. Lastly, the influence of relative size remains inconclusive and could not ultimately be determined in this study. Our first regression indicates a positive impact of relative size. Thus, larger relative transactions should yield more synergies. When controlling for other variables, however, relative size becomes consistently statistically insignificant.

At last, cross-border and friendly/hostile M&As were found to be statistically insignificant. Large acquirers, as in our dataset, tend to be globally integrated. Therefore, one might be indifferent between domestic and cross-border deals. Out of the 1,288 M&As analyzed, however, 98.2% were categorized as friendly, and a clear distinction between hostile and friendly takeovers could not be made.

## 7.2 Caveats, Limitations and Suggestions for Further Research

We should present some potential caveats for this study. First, the study of potential determinants of successful M&As was only conducted for U.S. listed acquirers across all industries. Thus, we are careful about generalizing our findings. Listed companies tend to be larger, and our results may not be representative for non-listed firms. In addition, different industries tend to have different characteristics, and our findings may not be representative for every industry. Differences in culture and legal environment might also affect the determinants in other ways.

This study may also be subject to two kinds of biases. First, when determining long-term M&A success, we estimate buy-and-hold abnormal returns using a benchmark portfolio, which should represent non-event firms with similar risk as to the event firms. Although we are following classical studies in constructing those benchmark portfolios, our reference benchmarks are not likely to be sufficiently adjusted for risk. Thus, our BHAR results may suffer from some bias. However, we believe that our results

give a good indication of whether M&As are successful or not. Second, when determining potential determinants of M&A success, a fixed number of independent variables were chosen. When performing the robustness checks, the coefficients and their significance level remain pretty constant through every regression. Even though the variables seem to be robust, there are other factors that influence abnormal returns, implying the possibility of omitted variable bias. Regardless, since our analysis points toward robust variables and the determinants are consistent with most prior studies, we believe that the results give a fair indication of the impact of the determinants on long-term M&A success.

Lastly, prior research on determinants of successful M&As has focused on ROE and P/E rather than ROCE and P/B. Based on the little attention given to ROCE and P/B as potential determinants, future research should aim to detect its relevance on long-term M&A performance.

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# 9   Appendix

## Significance Tests Short-Term CAR:

### Crude Dependence Test:

The crude dependence test uses the entire sample to calculate the variance. Let $S_{AAR}$ be the standard deviation of the average abnormal return and $T_2 - T_1$ is the event window length with $T_2$ as the latest day of the event window relative to the event day. The test statistic is given by:

$$t_{CAAR} = \frac{CAAR}{\sqrt{T_2 - T_1} * S_{AAR}}$$

### Conventional Cross-Sectional Test:

$$t_{CAAR} = \sqrt{N} * \frac{CAAR}{S_{CAAR}}$$

Where $S_{CAAR}$ is the standard deviation of the cumulative abnormal returns across the sample.

### Generalized Rank Sign Test:

Let $L_1 = T_1 - T_0 + 1$ be the estimation window length with $T_0$ as the earliest day of the estimation window, and $T_1$ the latest day of the estimation window relative to the event day. $N$ is the sample size and $\bar{K}_0$ is the mean rank of abnormal returns for $t = 0$. The variance and z-value can then be computed as:

$$S_{\bar{K}_0}^2 = \frac{L_1}{12N(L_1 + 2)}$$

$$z = \frac{\bar{K}_0}{S_{\bar{K}_0}} = \sqrt{\frac{12N(L_1 + 2)}{L_1}} * \bar{K}_0$$

## Significance Tests Long-Term BHAR:

**Conventional Test:**

Let $\overline{BHAR}$ be the average buy-and-hold abnormal return. The conventional t-test is given by:

$$t_{\overline{BHAR}} = \sqrt{N} * \frac{\overline{BHAR}}{S_{\overline{BHAR}}}$$

Where $S_{\overline{BHAR}}$ is the standard deviation of the BHARs across the sample.

**Bootstrapped Johnson's Test:**

The bootstrapping that we employ proceeds as follows: Draw 1,000 bootstrapped resamples from the original sample of size $N_b = N/4$. In each resample, the t-test underneath is calculated. Let $\hat{\gamma}$ be an estimate of the coefficient of skewness and $\sqrt{N_b}S$ is the conventional t-statistic. The bootstrapped t-test is given by:

$$t_{\overline{BHAR}} = \sqrt{N_b}(S + \frac{1}{3} * \hat{\gamma}S^2 + \frac{1}{6N_b}\hat{\gamma})$$

**Adjusted T-Test:**

First, we define the average abnormal holding period return across all event firms that enters the sample in calendar month t as:

$$\overline{AR} = \begin{cases} \frac{1}{N}\sum_{i=1}^{N_t} AR_i(t, H) \text{ if } N_t > 0 \\ 0, \quad otherwise \end{cases}$$

Where $N_t$ is the number of observations in month $t$.

Let $w$ be a monthly weight vector, where each weight is based on how many observations enters the specific month and $v$ a modified variance-covariance matrix. The autocorrelation-consistent t-statistic that we propose is given by:

$$t_{Adjusted} = \frac{\overline{BHAR}}{\sqrt{w'vw}}$$

The modified variance-covariance matrix is determined as:

$$v_{i,j} = \begin{cases} \sigma^2 = \dfrac{1}{T_N} \sum\limits_{\substack{t=1 \\ N_t>0}}^{T} \overline{AR}(t,H)^2, & if\ i=j \\[2ex] p_j = \dfrac{1}{T_{N,j}} \sum\limits_{\substack{t=1 \\ N_t>0 \\ N_{t+j}>0}}^{T} \left[\overline{AR}(t,H) * \overline{AR}(t+j,H)\right], & if \le |i-j| \le H-1\ and\ T_{Nj} \ge 5 \\[2ex] 0, & otherwise \end{cases}$$

where $T_N$ is the number of months that have at least one event, $T_{N,j}$ is the number of months where both month $t$ and month $t+j$ have at least one event. $\sigma^2$ is the variance of the $H$-period abnormal returns of monthly cohorts. $p_j$ is the estimator of covariance between the abnormal returns of monthly portfolios that are separated by j months. To guard against large estimation errors in covariances, we require at least five cases where month $t$ and month $t+j$ both have at least one event. If $T_{Nj} < 5$, we set the covariance to equal zero.

## Value-Weighted CAAR for Acquirers and Targets:

| Event-window | CAAR | t-test | | z-test | | Gen. sign test | |
|---|---|---|---|---|---|---|---|
| | | t-value | p-value | z-value | p-value | z-value | p-value |
| [-20, 20] | -1.65% | -4.35 | <.001 | -4.57 | <.001 | -3.05 | <.01 |
| [-10, 10] | -1.29% | -4.75 | <.001 | -4.84 | <.001 | -3.45 | <.001 |
| [-5, 5] | -0.98% | -4.98 | <.001 | -3.75 | <.001 | -3.67 | <.001 |
| [-1, 1] | -0.89% | -8.69 | <.001 | -4.24 | <.001 | -3.67 | <.001 |
| [0, 0] | -0.66% | -11.1 | <.001 | -4.21 | <.001 | -4.4 | <.001 |
| [-20, -1] | -0.15% | -0.55 | >.1 | -1.8 | <.1 | -1.54 | >.1 |
| [1, 20] | -0.85% | -3.19 | <.01 | -2.68 | <.01 | -3.05 | <.01 |

**Figure A**: Value-weighted CAR (acquirers).

| Event-window | CAAR | t-test | | z-test | | Gen. sign test | |
|---|---|---|---|---|---|---|---|
| | | t-value | p-value | z-value | p-value | z-value | p-value |
| [-20, 20] | 26.64% | 49.54 | <.001 | 38.84 | <.001 | 29.13 | <.001 |
| [-10, 10] | 25.83% | 67.12 | <.001 | 40.78 | <.001 | 30.78 | <.001 |
| [-5, 5] | 25.43% | 91.29 | <.001 | 41.14 | <.001 | 31.61 | <.001 |
| [-1, 1] | 24.24% | 166.64 | <.001 | 40.48 | <.001 | 31.99 | <.001 |
| [0, 0] | 16.91% | 201.3 | <.001 | 29.46 | <.001 | 23.57 | <.001 |
| [-20, -1] | 3.16% | 8.42 | <.001 | 9.38 | <.001 | 8.6 | <.001 |
| [1, 20] | 6.57% | 17.5 | <.001 | 13.42 | <.001 | 6.71 | <.001 |

**Figure B**: Value-weighted CAR (targets).
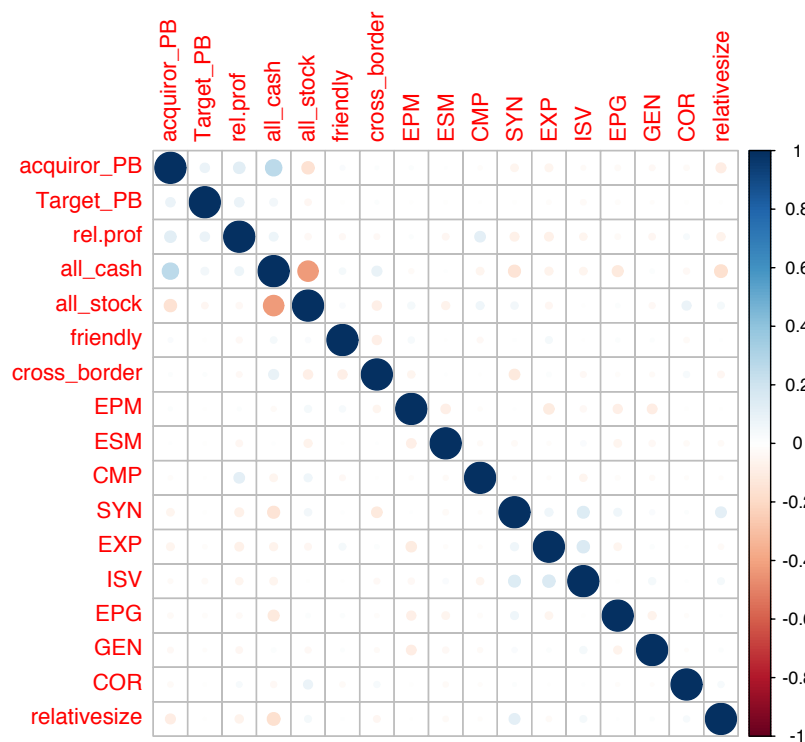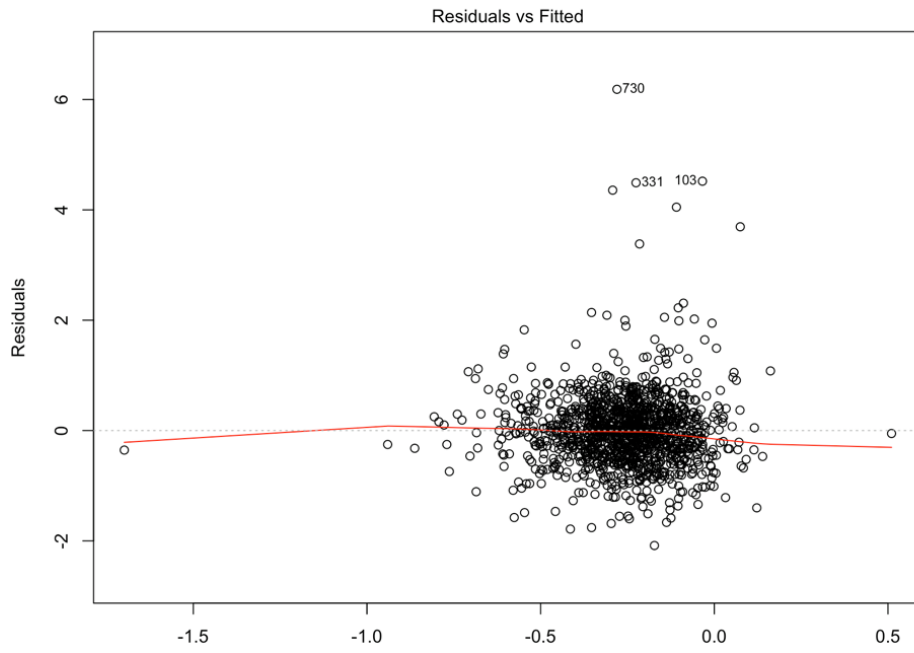
## Robustness Checks:



**Figure C**: Correlation matrix of independent variables.

**Figure D**: Informal heteroscedasticity test.