

**ERASMUS UNIVERSITY ROTTERDAM**  
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# **Shareholder wealth creation from mergers and acquisitions in the high-technology sector**

**Evidence from North-American bidders**



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## **Abstract**

This research focusses on the shareholder value creation for North-American companies, acquiring a high-technology target. The dataset consists of takeovers in the period from January 1, 2001 until December 31, 2015. It appears there is a negative cumulative abnormal return around the announcement date. Both the calendar-time approach and the buy-and-hold method show a significant long-term underperformance up to three years. When combining the pre-acquisition period starting two days before the announcement, with the three-year post-acquisition period shows there is shareholder value destruction. The most important explanatory factors are the method of payment, the type of offer, relative size, time period, industry relatedness and whether it is a cross-border acquisition or a domestic acquisition.

## **Keywords**

Event studies, Market Efficiency, Mergers, Acquisitions, Technology

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# 1. Introduction

## 1.1 Background and motivation

This thesis investigates the shareholder wealth effects for bidders around mergers and acquisitions (M&A) in high-technology industries. Technology mergers and acquisitions rose to an all-time high in 2015, with a deal value of \$313 billion announced in the United States. Notable news last year was the acquisition of EMC by Dell, with a deal value of \$67 billion the largest technology deal in history (Molenaar, 2015).

Corporate acquisitions have been studied extensively throughout the years. Usually the following patterns were found around the announcement: 1) a significant positive abnormal return for target shareholders, 2) little or no abnormal return earned by acquiring shareholders after an acquisition, and 3) a merger leads to negative abnormal returns for the bidders' shareholders (Loughran & Vijh, 1997).

In line with these patterns are the results of Franks, Harris, and Titman (1991) who found a negative abnormal return around the announcement of -1.02% for the acquiring party. More recently, also the results of Moeller, Schlingemann and Stulz (2004) show the same pattern. However, considering the bidders' short-term wealth effect there is no general conclusion, as there are also studies reporting zero or even positive announcement returns. For example, Goergen and Renneboog (2004) found a significant positive announcement effect of 0.7% for European countries. Also Masulis, Wang and Xie (2007) report an average abnormal return of 0.22% for the US, mainly driven by all cash financed deals.

The results of Kohers and Kohers (2000) are also contrary to the general pattern of negative bidder announcement returns. They investigated the announcement return for high-technology takeovers only, and found a positive abnormal return of 1.26%. As a possible explanation they mention that high-technology targets contain a lot of growth opportunities, what makes them attractive for the bidders' shareholders.

In the long-run it appears that acquiring firms underperform relative to their benchmarks. Rau and Vermaelen (1998) found that bidders experienced a negative abnormal return of -2.58% for merger offers, using a three-year holding period. In a subsample they show a positive abnormal return of 8.56% after a tender offer. Similar results are found by Loughran and Vijh (1997), Savor and Lu (2009) and others. Despite a positive reaction after the announcement, in the long-run Kohers and Kohers (2001) found significant underperformance after acquiring a high-technology target.

A frequently mentioned factor influencing the value creation process is the method of payment hypothesis. This argues that stock-financed takeovers result in less favourable wealth effects than cash-financed takeovers. Another important factor is whether the acquirer is under- or overvalued, this relates to the method of payment hypothesis as using stock is an indication for being overvalued. The performance extrapolation hypothesis states that managers who performed well in the past, are less fastidious in picking a takeover project and thus create less value.

The existence of abnormal returns indicates that the Efficient Market Hypothesis (EMH) is violated. Fama (1970) came up with this hypothesis which states that an efficient market reflects all available information in the prices. An event study can check to what extent the market processes all new information. When an event leads to abnormal returns, it can be considered as a violation of the semi-strong form of the EMH<sup>1</sup>. The combination of a short- and long-term event study can give insights in whether the market under- or overreacts to recent news.

The goal of this thesis is to provide managers and other stakeholders with knowledge about takeovers in general, and specifically for the high-technology sector. This sector has some distinctive features which Section 2.2 will explain. It is worth looking if the results for this specific sector are different from the mainstream researches. Also because the high-technology sector is an important part of worldwide M&A market, and quite often in the financial news. For example, the 22<sup>nd</sup> of June 2016 the CEO of Tesla Motors, Elon Musk, announced that the company submitted an offer to buy SolarCity which is a high-technology firm (Waters, 2016). What should be the reaction of the shareholders, and how will the market react to this?

The question is whether the results of Kohers and Kohers for the short- (2000) and long-term (2001) still hold with recent data, or that the results were sample- or time specific. It is also interesting to combine these two event studies into an event window capturing both the announcement and the long-term price performance. The authors found contradictory results for the short (positive) and long-term (negative), but a combination will decide whether the takeover is a value creating event or not.

Another addition to these researches is the inclusion of other explaining variables, like proxies for overvaluation. Also the influence of the latest financial crisis can be taken into consideration, which was not possible for previous authors.

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<sup>1</sup> The semi-strong form means that all information from historical prices is incorporated (weak form), as well as other publicly available information (Fama, Efficient capital markets: A review of theory and empirical work\*, 1970).

After checking which factors drive the value creation in a takeover, managers and shareholders can respond to this. The decision whether to decide to engage in a takeover (manager) or to approve a takeover (shareholder) can depend on certain conditions which the cross-section part will examine in Section 5.1.2.

## **1.2 Research question and main findings**

This thesis investigates both the short- and long-term, and focuses on the share price performance of firms acquiring high-technology related targets. North-American bidders are under consideration, including domestic and cross-border mergers and acquisitions of listed targets. This region is selected because the value of announced deals rose to a record \$313 billion in the United States (PricewaterhouseCoopers LLP, 2016). The period of interest is from 01/01/2001 until 12/31/2015, because previous researchers were not able to include these recent data in their sample.

*The research question is: **Do mergers and acquisitions in the high-technology sector create shareholder value, and which factors could drive these effects?***

Section 5.1 starts with the short term analysis, which is based on the announcement return for bidder firms. The computation of abnormal returns uses the market model to compute the normal returns. Thereafter the cumulative abnormal return is the dependent variable in the cross-section part, where will be tested which factors influence the abnormal returns. Section 4.3 explains which proxies will test the hypotheses of Section 3.

When looking at the long-term price performance, first the calendar-time portfolio approach will be applied following André, Kooli and L'Her (2004). This method uses the Fama and French (1992) risk factors.

Loughran and Vijh (1997) argue that it is important to analyse the whole event period. They start an analysis two days before the announcement date, until five years after the effective date for target shareholders<sup>2</sup>. The combination between an announcement return and the long-term price performance reveals the true value creation for the shareholder. This analysis in Section 5.3 follows Loughran and Vijh (1997) by using the buy-and-hold abnormal return. Both methods have their advantages and disadvantages, further explained in the methodology Section 4.2.

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<sup>2</sup> Loughran and Vijh (1997) start the value creation process from the target shareholder perspective, and they roll the proceeds over after the takeover. In this research the analysis will start and end from the perspective of an acquiring firm shareholder.



In the remainder of this thesis it appears that bidders acquiring a high-technology target experience a negative abnormal return of -1.02% in the three days around the announcement date [-1,+1]. Also in the long-run there is significant underperformance, with an average abnormal return of -0.36% (-0.28%) per month in the first 12 (24) months after completing the takeover. It follows from the analysis that the method of payment, the type of offer, relative size, time period, whether the takeover is cross-border or domestic and whether it is a focus-increasing or a diversifying takeover are the most important factors which influence the post-acquisition performance. Analysing the returns starting two days before the takeover announcement, until three years after the completion of the takeover shows a significant underperformance of -13.89%.

### **1.3 Structure**

Section 2 highlights the existing literature on mergers and acquisitions, including the definition and why managers decide to engage in a takeover. Section 2.2 also describes the unique features of high-technology targets. Section 2.5 elaborates on which factors might influence the takeover-return relationship. The hypotheses which will be tested are in Section 3, including the main research question. Section 4.1 describes the data obtaining process, and Section 4.2.1 explains the cumulative abnormal return method used to test whether there is value creation on the short-term. For the long-term the calendar-time portfolio approach will be explained in Section 4.2.2. The final analysis contains the combined event-window, its buy-and-hold methodology will be elaborated in Section 4.2.3. In Section 5 are the results from the different analyses, and Section 5.4 concludes the results with the interpretation. Section 6 shows recommendations and suggestions for further research.

## 2. Literature

### 2.1 Definitions

Mergers and acquisitions are both changes in corporate control, executed in attempt to create value for the company and its shareholders. On the one hand there is the buyer of a firm, called the acquirer or the bidder. On the other side there is the seller, which is called the target firm.

With a merger, the bidder offers cash or securities for the shares of the target firm. The shareholders of the target must vote to accept or reject the merger proposal (Kargin, 2001). This is after permission from the board of the target, so a merger is in accordance of both parties. When approved, the acquirer obtains the shares or assets of the target, and the target ceases to exist.

The difference between a merger and an acquisition, like a tender offer, is that the acquirer can approach the target's shareholders directly. This means every shareholder needs to decide whether to accept the offer or not, and there is no permission needed from the board of directors (Jensen & Ruback, 1983).

Following Berk and DeMarzo (2011) there are three different types of mergers and acquisitions, related to the business segment of the buyer and target. When a firm merges with a company which is in the same industry, it is a horizontal merger. When the target buys from- or sells to the bidders' industry and therefor the takeover increases the control of the supply chain, it is called a vertical merger. The third and last type of merger is a conglomerate merger. This is the case when acquirer and target operate in different industries.

All takeovers have their own features, but in general the process can be divided in multiple steps (Galpin & Herndon, 2014). They distinguish the following steps, form the buyers' perspective:

1. Formulate a thorough strategic analysis;  
Make an analysis about the objectives and potential synergies. Choose the type of deal-, and financing structure that fits the companies' goals. Now the acquisition criteria can be defined. This formulate stage establishes a solid foundation for the rest of the process.
2. Locating and approaching potential targets;  
Identify target markets and companies. After approaching the target, and both sides agreed to develop a strategic plan and timetable to complete the deal, the buyer issues a letter of intent. This is a set of binding and nonbinding terms which serve as a roadmap for the transaction (Sherman & Hart, 2006). Before the due diligence part, both parties sign a letter of confidentiality.

3. Investigation phase;

Conduct the due diligence and summarize the findings. Another important step is to make the valuation, which is one of the key drivers of a deal (Frankel, 2005).

4. Negotiate the deal conditions;

Set the deal terms for reaching a definitive agreement between the firms. This includes legal agreements, as well as approval by the SEC. Also the structural- and financial conditions need to be defined.

5. Integrate stage;

Execute the plans with prudent speed. A fast integration leads to a greater likelihood of transaction success due to more employee confidence in management. This results in higher cash flows, higher operating margins and therefore more profitability in comparison with companies having a slow transition.

## **2.2 Feature high-technology industry**

The high-technology industry includes areas in biotechnology, ICT, electronics and telecommunications (Rossi, Yedidia Tarba, & Raviv, 2013).

A feature of the high-technology sector is the high growth potential these firms usually have. The sector is responsible for developing and manufacturing new technology, resulting in valuable assets. While a lot of projects are still under development, the outcome is highly uncertain as the growth prospects may actually never be realized by the acquirer. This uncertainty makes the sector riskier, in comparison to other industries (Kohers & Kohers, 2000).

Another factor contributing to this uncertainty is the complexity of the projects, which investors may not fully understand (Kohers & Kohers, 2001). A high uncertainty causes troubles with the valuation and could lead to an overpriced takeover.

## **2.3 Motivations for takeovers**

The reasons to engage in a takeover can be divided in four categories, which are: value creation, managerial self-interest, environmental factors, and firm characteristics (Haleblian, Devers, McNamara, Carpenter, & Davison, 2009). The following sections will describe these factors.

### **2.3.1 Value Creation**

Firms can use a takeover to increase market power. Acquiring a high-technology target can be an entrance in a certain market, when a firm wants to diversify. The target provides the acquirer with valuable market information, like supplier and customer relationships (Graebner, Eisenhardt, &

Roundy, 2010). Another way to increase market power is to buy a competitor, and take it out of the market.

Also an increase in efficiency is often stated as a channel for potential gains. Efficiency can be related to economies of scale, and economies of scope. Economies of scale are advantages to a large company, that are not available to a small company. Efficiencies arise from a larger production of a specific product. Economies of scope is an advantage when both resources are used to produce two or more products (Singh & Montgomery, 1987).

Market discipline is an agency theory channel where value can be created. It shows that firms with ineffective and overcompensated management are more often the target of takeovers (Agrawal & Walkling, 1994). Agrawal and Walkling also state that target's management is often replaced after a takeover. Value creation appears by replacing the ineffective and overpaid management.

### **2.3.2 Managerial self-interest**

Managers sometimes decide to make an acquisition not based on the objective to maximize shareholder value. Often one of the motivations is to increase management compensation after an acquisition. CEO compensation increases in general after an acquisition, even when the stock price does not (Harford & Li, 2007). This is an incentive for management to acquire targets, even when it is not value creating for the shareholders.

Takeover activity can also be explained by manager overconfidence. When a manager performed well in the past, he might pursue mergers and acquisition with a low chance for value creation. They do not do this on purpose, but fully convinced their ability to manage it to a success. This is the Hubris hypothesis (Roll, 1986). Under the Hubris hypothesis, managers still think they act in the interest of shareholders.

### **2.3.3 Environmental factors**

Acquisition likelihood is influenced by external governance structures. Rossi and Volpin (2004) argue that for countries with better accounting standards and shareholder protection, the mergers and acquisition volume is larger. Scholes and Wolfson (1989) stated that corporate restructuring activity in the US is affected by changes in tax regulations.

Companies are looking for ways to maintain and upgrade their portfolios of strategically valuable resources to maintain or improve their competitive position (Graebner, Eisenhardt, & Roundy, 2010).

Acquiring the knowledge or products is often preferred over developing these resources internally through R&D, which is more for the long-term.

Network ties are a factor determining takeover activity. When two firms are related to each other through the board, it appears that the takeover activities are also tied to each other (Haleblian et al., 2009), because they imitate each other.

#### **2.3.4 Firm characteristics**

Experience in acquisitions increases the likelihood of a subsequent acquisition (Haleblian et al., 2009). This likelihood is higher when a previous acquisition is rewarded with a good post-performance. Collins, Holcomb, Certo, Hitt and Lester (2009) concluded the same, but related with cross-border takeovers.

### **2.4 Previous research**

#### **2.4.1 Short term**

There has been a lot of research considering the short-term price performance after a takeover, especially for the United States. Franks, Harris and Titman (1991) found a mean cumulative abnormal return of -1.02% in the eleven day interval before and after including the announcement date [-5,+5]. The period under investigation was from 1975 till 1984, with 399 observations. Andrade, Mitchell and Stafford (2001) found similar results. They report an abnormal return of -0.7% for the interval [-1,+1]. The research period is starting in 1973 till 1998.

For a more recent sample Moeller, Schlingemann and Stulz (2004) found comparable results analyzing a sample including 1980 until 2001. They reported a negative abnormal return of -1.02% for only public targets in the United States. Alexandridis, Petmezas and Travlos (2010) made a comparison of announcement returns between different countries and regions. The sample of acquisitions of listed targets includes 1990 to 2007 and they compute the abnormal return for the five-day period around the announcement day [-2,+2]. The results show that for the US, UK and Canada there is a statistically significant announcement return of -1.34%, -1.58% and -1.54% respectively. Despite these negative effects, they found a positive abnormal return for the rest of Europe of 1.65%.

Contrary to the general negative returns, and in line with the findings of Alexandridis, Petmezas and Travlos (2010) for Europe, Goergen and Renneboog (2004) show a positive abnormal return of 0.7% for the interval [-1,0]. The analysis is based on a European sample, consisting of 156 takeovers. Also investigating European mergers and acquisitions, Campa and Hernando (2004) analyzed 262 observations divided over 18 different countries. But in contrast to Goergen and Renneboog they have

not found statistically significant results for acquiring firms. Also for the United States there are positive announcement returns found by Masulis, Wang and Xie (2007). They computed a 0.22% abnormal return for the interval [-2,+2], with a sample period of 1990 until 2003. These results are mainly driven by the subsample of takeovers financed with cash only, as stock-financed takeovers show negative announcement returns. The same conclusion with the subsample for public targets, which results in a negative announcement return of -1.48%.

An analysis specifically focused on takeovers in the high-technology industry is performed by Kohers and Kohers (2000). A statistically significant 1.26% abnormal return after announcement is found, so they conclude that acquiring attractive growth targets causes positive reactions from the bidders' shareholders. These shareholders are optimistic about the future benefits of the acquired technology.

Table 1: Overview of previous literature for announcement return

Overview of existing literature. \* denotes significant at a 10% level, \*\* on a 5% level and \*\*\* on a 1% level. The country abbreviations are as follows: US stands for United States, EU for European Union, UK for United Kingdom, Can for Canada and RoE for Rest of Europe.

Author(s)	Year	CAR	Interval	#obs.	Period	Country
Franks, Harris, and Titman	1991	-1.02%*	[-5,+5]	399	1975-1984	US
Kohers and Kohers	2000	1.26%***	[0,+1]	1634	1987-1996	US
Andrade, Mitchell and Stafford	2001	-0.70%	[-1,+1]	3688	1973-1998	US
Campa, J., & Hernando, I.	2004	0.44%	[-1,+1]	262	1998-2000	EU
Moeller, Schlingemann and stulz	2004	-1.02%***	[-1,+1]	2642	1980-2001	US
Goergen and Renneboog	2004	0.70%***	[-1,0]	142	1993-2000	EU
Masulis, Wang and Xie	2007	0.22%**	[-2,+2]	3333	1990-2003	US
Alexandridis, Petmezas and Travlos	2010	-1.34%***	[-2,+2]	3171	1990-2007	US
Alexandridis, Petmezas and Travlos	2010	-1.58%***	[-2,+2]	354	1990-2007	UK
Alexandridis, Petmezas and Travlos	2010	-1.54%***	[-2,+2]	325	1990-2007	CAN
Alexandridis, Petmezas and Travlos	2010	1.65%***	[-2,+2]	212	1990-2007	RoE

#### 2.4.2 Long term

Looking at the long-term performance after a takeover, there is more of a general consensus. Previous research shows that the acquiring firm underperforms after the event, relative to several benchmarks.

The buy-and-hold abnormal return method is frequently used, for example by Loughran and Vjih (1997). Starting at the day after the announcement, the buy-and-hold return is calculated up to five years after the acquisition for a US sample. After a merger there is a significant underperformance of -15.9% relative to matching firms. For tender offers there is no significant under- or outperformance found. The sample size is 788 merger cases, and 135 tender offers. All observations fall into the period 1970 until 1989. When looking at public targets only, Rau and Vermaelen (1998) also report a

significant underperformance of -2.58%<sup>3</sup> three years after the merger. For tender offers they found a positive performance relative to the benchmark, but this result was not significant.

In contrast to many other researchers, Moeller, Schlingemann and Stulz (2004) found no statistically significant underperformance after acquisition. Their sample includes takeovers from 1980 to 2001, and contains 12,023 observations. Using the calendar-time portfolio approach they show an abnormal return of 0.02% per month, but insignificant.

André, Kooli and L'Her (2004) investigated the Canadian takeover market, with a sample from 1980 till 2000. Using a calendar-time portfolio approach, they found significant underperformance of -0.52% per month, considering the three-year post acquisition period. The results become even more pronounced when using a non-overlapping sample, leading to a -0.75% underperformance per month. Dutta and Jog (2007) found comparable results for a Canadian sample using the calendar-time portfolio approach, and report a -0.4% underperformance per month.

Again Kohers and Kohers (2001) analysed the long-term performance of the specific high-technology industry, including 304 US mergers over the period from 1984 through 1995. As mentioned in 2.4.1, the announcement of a high-technology takeover was optimistically received by the bidders' investors. The average three-year holding period return of those firms is 32.09%, while for the industry-matched firms it is 49.54%. The resulting significant abnormal return for the merged firms is thus -17.45%, and as a robustness check they used the returns across time and securities (RATS) methodology resulting in a -0.34% underperformance per month. This suggests that the initial reaction to the announcement was too optimistic, and that the growth potential is often not (fully) realized.

## **2.5 Moderators acquisition-performance relationship**

In previous literature there are multiple factors that tend to influence the value creation process. The following nine subsections will describe these factors, and explain their influence.

### **2.5.1 Method of payment**

Loughran and Vijh (1997) argued that the method of payment matters. They show that acquiring firms experience a negative abnormal return after a stock-offer and after a cash-financed deal the results are often insignificant. As an explanation they mention Myers and Majluf (1984) who stated that firms issue equity, when management knows they are overvalued. When applied to mergers and acquisitions, it means an acquirer finances a takeover with stock when management believes the

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<sup>3</sup> Rau and Vermaelen (1998) used bias-adjusted cumulative abnormal returns. They computed the abnormal returns with size- and book-to-market-based benchmark portfolios, and subtracted the mean of the empirical distribution for each case.

company is overvalued. Rau and Vermaelen (1998) called this phenomenon the method of payment hypothesis. This is an explanation for the fact that the results of Loughran and Vijh, long-term underperformance, are driven by equity-financed deals.

The general finding that stock-financed takeovers result in significant more negative returns is found by many other researchers including André, Kooli and L'Her (2004), Huang and Walkling (1987) and others. However, the findings of Kohers and Kohers (2000) do not support this hypothesis. They found both methods of payment to produce significant positive abnormal announcement returns. As an explanation they mention that when acquiring a high-growth target, offering equity gives the bidder more financial flexibility so the firm can exploit future investment probabilities when they arrive. This could also be the explanation for the fact that in the long-run Kohers and Kohers (2001) found no significant difference between stock and cash deals.

### **2.5.2 Type of offer**

A tender offer produces more beneficial returns for the bidder than a merger. Moeller, Schlingemann and Schulz (2004) show that a tender offer leads to a 1.53% higher abnormal announcement return. Both Loughran and Vijh (1997) as well as Rau and Vermaelen (1998) found that mergers result in negative abnormal returns, while tender offers produce insignificant positive results. Mergers are considered to be friendly acquisitions, and tender offers appear to be more often as hostile.

The reason for the difference between the post-acquisition performance for a tender offer and a merger is an unresolved issue. Following Travlos (1987) it might be related to the method of payment hypothesis, as tender offers are more often cash-offers and mergers are more often equity-financed. Another possible explanation given by Loughran and Vijh (1997) is that after a hostile takeover the management is usually replaced by the acquirer, which is in the best interest of the bidders' shareholders because of more control over the acquired target.

### **2.5.3 Book-to-market ratio**

Another hypothesis given by Rau and Vermaelen (1998) is the performance extrapolation hypothesis. This hypothesis argues that the market over-extrapolates the past performance of the bidder when it assesses the value of an acquisition. Shareholders of a low book-to-market firm, a glamour firm, approve more often the managers' acquisition plans because the manager performed well in the past. On the other side, shareholders of a high book-to-market firm (value firm) are more fastidious, and therefore they only approve the more profitable projects.



Also Kohers and Kohers (2001) found that book-to-market has an influence on the long-term performance after acquiring a high-technology target. They state that glamour firms report a negative significant abnormal return of -72.61% in the three-year post acquisition performance. For value firms there are no significant results found. An explanation is that in acquiring high-technology targets the chance of buying the wrong firms is higher because of more uncertainty, so overconfident managers from glamour firms engage more often in bad takeovers. The book-to-market thus affects the performance. On the other hand, Mitchel and Stafford (2000) found no difference between the post-performance of value and glamour firms.

#### **2.5.4 Tobin's Q**

After adding control variables, Servaes (1991) reported that the bidders' and the target's Tobin's Q-ratio<sup>4</sup> has a significant impact on the bidders' announcement return. The abnormal return from the announcement until the effective date is 6.36% higher when the acquirer has a Q-ratio bigger than one. A takeover where the Q-ratio of the acquirer is high, and the target's ratio is low, creates the most value for shareholders.

#### **2.5.5 Size**

In previous literature the relative size variable is often significant, but the coefficient varies from positive to negative. When the target is relatively small, the effect of buying it will have a small influence on the bidders' return when the bidder is a big company. This variable is often included to correct for the impact of an acquisition on the equity of the bidder.

Asquith, Bruner and Mullins (1983) found a positive significant effect between the excess returns and the relative size which is the transaction value divided by the market value of the acquirer. Moeller, Schlingemann and Stulz (2004) found a significant positive relationship as well. So when the relative size variable is lower, the excess return is lower. A high market value of the bidder leads to a low relative size variable, since the bidders market value is in the denominator of the relative size variable. Indirectly they conclude that the market value of the acquirer has a negative relationship with the excess return.

Also Kohers and Kohers (2000) report a positive relation between the relative size of the target with the cumulative abnormal return. Bidders' shareholders prefer larger targets, as they believe these targets have more synergies to offer.

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<sup>4</sup> The Tobin's Q-ratio is defined as:  $\frac{\text{Total Market value}}{\text{Total asset value}}$ . A ratio >1 means the stock is more expensive than the replacement costs of assets, so the firm is overvalued and vice versa.

In contrast to these findings are the results of Fuller, Nette and Stegemoller (2002). When acquiring public firms, the larger the target is relative to the bidder, the more negative the acquirers cumulative abnormal return. The authors mention the possible explanation that the larger a target is relative to bidder, the stronger the negotiation position of the target. Another reason could be that acquirers may find it harder to incorporate large targets.

### **2.5.6 Time period**

Loderer and Martin (1992) found evidence for negative abnormal returns in the three year following after a takeover. But they argue this effect decreased in the 1960s and 1970s, and even disappeared in the 1980s. Kohers and Kohers made a distinction between takeovers in three periods, and found statistical significant differences.

With respect to the sample in this research, it seems interesting to analyse whether the results for the crisis period<sup>5</sup> differ from the other time periods. One of the conditions for a robust mergers and acquisition market is an expanding economy (Gaughan, 2009), what leads to a decrease in M&A volume during a crisis. Chidambaran, John, Shangguan and Vasudevan (2010) found a negative relationship between the amount of takeover announcements<sup>6</sup> in the last 12 months and the announcement return.

### **2.5.7 Diversify**

Moeller, Schlingemann and Schulz (2004) used the first two digits of the SIC code of the buyer and target as a proxy of relatedness. When both firms have identical first two digits, they classify it as a related acquisition. When the digits are different, it is called a conglomerate takeover. In their regression they found that conglomerate deals have a significantly lower abnormal announcement return.

An explanation could be that managers acquiring in a different industry lack the sector-knowledge, and therefore it is difficult to create value. However, André, Kooli and L'Her (2004) did not found a significant difference between the long-run performance of conglomerate and non-conglomerate takeovers.

This specific industry-knowledge for high-technology is even more complex for an outsider, so the expectation is that the abnormal returns are higher for bidders' in the high-technology sector (Kohers

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<sup>5</sup> Crisis period starts in 2008 and ends in 2013.

<sup>6</sup> The authors make a distinction between 'hot' and 'cold' merger markets. When:  $\text{LN}(\# \text{ all takeovers for year } X) > \text{median LN}(\# \text{ takeovers in sample})$ , it is called a hot market and otherwise a cold market.

& Kohers, 2000). They indeed found a significant positive effect for a relatedness proxy, influencing the announcement return. But in contrary, Kohers and Kohers (2001) found no significant difference regarding the long term performance.

#### **2.5.8 Cross-border**

Acquirers obtain a higher announcement return when they engage in a domestic takeover, than would be the case with a cross-border takeover (Campa & Hernando, 2004). Only when considering a long pre-announcement period the result is significant, indicating a 3.86% higher return when the takeover is domestic. They mention as a possible explanation the cultural differences, what might lead to obstacles in the integration process. Goergen and Renneboog (2004) found no difference for cross-border and domestic deals.

Also for the Canadian bidders, André, Kooli and L'Her (2004) found a negative effect for cross-border takeovers. They report cross-border takeovers lead to a 1.15% lower return in the three-year post-acquisition performance.

#### **2.5.9 Number of patents**

In their research, Bena and Li (2014) showed that more innovative firms are more likely to engage in a takeover. They also analysed the post-acquisition performance. The target patent index, which measures the targets' quantity of innovation, has a significant negative relation with the three-day cumulative abnormal return around the announcement date. The authors lack an explanation for this negative relationship.

Innovation-driven takeovers result in more future innovation, and a higher operating and stock-price performance. Bena and Li (2014) found positive relations considering the measurements of innovation and the acquirers' long-term buy-and-hold abnormal return, however not significant. What they did find is that the buy-and-hold abnormal return is higher when the knowledge of the buyer and the target is related, indicating a focus-increasing acquisition is more value creating than a diversifying acquisition.

### 3. Hypotheses

This chapter explains the hypotheses, which will help to answer the research question. The build-up is in a logical way, starting with the short-term shareholder wealth effect. Hypothesis two focuses on the long-term shareholder wealth effects, and the other hypotheses are based on the factors explaining these abnormal stock price movements. The main research question is:

***Do mergers and acquisitions in the high-technology sector create shareholder value, and which factors could drive these effects?***

*Hypothesis 1: Mergers and acquisitions in the high-technology sector create positive shareholder wealth effects around the announcement.*

Section 2.4.1 shows that there are different results found in the short-run for bidders. However, a sector specific research reported positive announcement effects, indicating shareholders are optimistic about the targets growth prospects.

*Hypothesis 2: In the long-run acquirers underperform relative to their benchmark after completing the takeover.*

Previous research concluded there is significant underperformance after acquiring, which is discussed in Section 2.4.2. A potential explanation is that the predicted growth opportunities may not be realized.

*Hypothesis 3: Stock-financed deals result in more shareholder wealth destruction.*

This method of payment hypothesis is explained in Section 2.5.1 and argues that equity-financing is an indication of being overvalued. When overvalued, managers choose to finance the deal with stock. Cash-financed deals often result in non-significant results. There are some contradictory findings, as high-technology takeovers could result in non-significant differences between cash- and stock-financed deals.

*Hypothesis 4: Tender offers create more shareholder wealth than mergers.*

Tender offers are often cash-financed and hostile deals, whereafter target management is replaced. This is in the interest of the bidders' shareholders as explained in Section 2.5.2. Mergers result in significant negative abnormal returns.

*Hypothesis 5: Undervalued firms create more shareholder wealth than overvalued firms.*

This hypothesis relates to the Performance extrapolation hypothesis explained in Section 2.5.3. This hypothesis states that glamour firms' shareholders are more likely to approve the managers' takeover

plans. For high book-to-market firms only the managers' best plans are approved, and therefore the value creation is higher.

*Hypothesis 6: Acquiring a relatively big target creates more shareholder value.*

Acquiring a relatively big target has a bigger influence on the equity of the acquiring company, and therefore also on the returns. Also, relatively large targets provide more potential synergies. This leads to more value creation, as explained in Section 2.5.5. Also a view in contrary to this is provided, small targets usually having a weaker negotiation position and the premium paid by the bidder is thus lower.

*Hypothesis 7: Acquiring during a crisis period creates more shareholder value.*

A feature of a crisis period is a lower M&A market volume. Due to bad market conditions, managers only select the best takeover opportunities which result in the most value creation. The explanation can be found in Section 2.5.6.

*Hypothesis 8: Focus-increasing deals create more shareholder wealth than conglomerate deals.*

As Section 2.5.7 argues, conglomerate takeovers fail to create shareholder value because of a lack of industry knowledge by the manager. For focus-increasing takeovers it is more feasible to exploit the potential synergies.

*Hypothesis 9: Cross-border deals result in more shareholder wealth destruction than domestic deals.*

Cultural differences make it more difficult to integrate the foreign target, and therefore less value is created for the shareholder. Section 2.5.8 explains this.

*Hypothesis 10: Acquiring more innovative targets creates more shareholder value in the long-run.*

More patents means more potential synergies to be exploited by the acquirer, more future innovation and thus a better stock price performance after the acquisition. See Section 2.5.9.

## **4. Data description and methodology**

This chapter describes the sample selection procedure in Section 4.1, and the methodology used in Section 4.2. This latter Section will also give some advantages and disadvantages of the models used for the empirical analysis. Section 4.3 concludes this chapter elaborating which variables will test the different hypotheses.

### **4.1 Sample selection and descriptive**

The sample for this research contains North-American takeovers in the high-technology sector, with an announcement date between 01/01/2001 and 12/31/2015. North-American means the acquirer is located in the United States or Canada. Target location is all over the world, so there are domestic and cross-border deals in the sample.

The Securities Data Company (SDC) database provides the observations with information about the announcement date and the effective date, transaction value and the method of payment. Also other deal characteristics like the industry codes from the acquirer and the target, the deal type, and information considering the nation of the companies.

The following criteria are set in the SDC database: both acquirer and target have to be public companies, deal value is at least \$50 million to exclude small-firm effects, the percent of shares owned after transaction need to be higher than 50 percent and the deal has to be completed. The high-technology sector includes the following mid-industries following Kohers and Kohers (2000): Biotech and Health Care, Communications, Computer Hardware, Computer Software/Service, Electronics and Defense related. These criteria lead to a number of 800 observations. An overview of the selection process can be found in Appendix 1.

Stock-data like the price, shares outstanding and the benchmark return is obtained from the CRSP database. Data with respect to the companies is retrieved from the Compustat database. This database provides the total value of assets and liabilities, and the value of equity. Two additional databases are used to make the dataset complete. First Datastream provides the Return on equity (ROE) variable, and the Orbis database is used to get the number of patents from target company. Due to missing data in the CRSP and Compustat databases the total sample now has 615 observations, this varies a bit by analysis.

In the short-term analysis both the CRSP value-weighted and the CRSP equally-weighted market index are used as a benchmark. However, the long-term analysis follows Kohers and Kohers (2001) to use

only the CRSP value-weighted market index. This value-weighted approach eliminates a size effect in the market index.

Table 2 gives an overview of the distribution of takeovers over time, and whether it is in a crisis period or not. It can be seen that there is not much clustering of the events, as the percentage of events for every year is under the 10 percent. Another thing to mention is the slightly lower amount of events during the crisis, which is in line with the conditions for an active M&A market by Gaughan (2009). For a distribution of the sample by industry, see Appendix 2.

Table 2: Distribution events over time  
Distribution of takeovers by year. A \* means the takeovers are in a crisis period. Percent indicates the percentage of the frequency divided by total. The last column stands for cumulative.

Year		Freq.	Percent	Cum.
2001		51	8.29	8.29
2002		49	7.97	16.26
2003		55	8.94	25.20
2004		38	6.18	31.38
2005		52	8.46	39.84
2006		59	9.59	49.43
2007		56	9.11	58.54
2008	*	39	6.34	64.88
2009	*	30	4.88	69.76
2010	*	43	6.99	76.75
2011	*	20	3.25	80.00
2012	*	40	6.50	86.50
2013	*	24	3.90	90.40
2014		29	4.72	95.12
2015		30	4.88	100.00
Total		615	100.00	

When looking at the descriptive statistics in Table 3 it shows that the biggest merger in the sample had a value of \$67.3 billion. This horizontal merger was executed by Pfizer, the world's largest drug maker, taking over its rival Wyeth (Sorkin & Wilson, 2009). Another important fact to mention is the existence of possible outliers. As can be seen in the table there are variables with high maximum- and low minimum values, sometimes more than the mean  $\pm$  two standard deviations<sup>7</sup>.

<sup>7</sup> During the analysis the variables will be checked for outliers which influence the results. When necessary, the variable will be winsorized at a 99% level (Ghosh & Vogt, 2012).

The variables related to the method of payment show that the transactions are more often cash-financed instead of equity-financed. A transaction is on average financed with 68.23% cash and 24.74% equity. There are more deals financed with all cash (346) than with all equity (87). Managers prefer to use cash for financing their takeovers, and also prefer a merger (431) instead of a tender offer (184).

Table 3: Descriptive statistics

Descriptive statistics for company and deal characteristics. \* denotes a variable displayed in millions. Measurement of the variables explained in Section 4.3.

Variable	Mean	Median	N	St. Dev	Min.	Max.	Skewness	Kurtosis
<b>Deal characteristics</b>								
<i>Transaction value*</i>	1,570	419	615	4,510	50	67,300	9.52	121.94
<i>Relative size</i>	0.28	0.12	608	0.45	0.00	4.56	3.77	24.47
<i>perc. Of Cash used</i>	68.23	100	608	41.88	0	100	-1.74	4.65
<i>perc. Of Stock used</i>	24.74	0	608	28.96	0	100	-0.64	2.05
<b>Dummy variables</b>								
					<b>(#1)</b>	<b>(#0)</b>		
<i>All Cash deals</i>	0.56	1.00	615	0.50	346	269	-0.25	1.06
<i>All Stock deals</i>	0.14	0	615	0.35	87	528	2.06	5.23
<i>Crisis period</i>	0.32	0	615	0.47	196	419	0.78	1.60
<i>Cross-border</i>	0.16	0	615	0.36	95	520	1.91	4.65
<i>Focus</i>	0.65	1.00	615	0.48	403	212	-0.65	1.42
<i>Tender offer</i>	0.30	0	615	0.46	184	431	0.86	1.74
<b>Company characteristics</b>								
<i>ROE acquirer</i>	6.31	10.78	600	38.20	-389.40	215.85	-3.67	36.32
<i>Market value acquirer*</i>	29,200	4,840	611	56,700	46	398,000	3.01	13.62
<i>Tobin's Q acquirer</i>	2.87	1.68	611	18.39	0.16	454.98	24.36	599.22
<i>Book-to-market acquirer</i>	0.45	0.32	600	0.88	0.01	14.45	12.74	190.96
<i>Number of target patents</i>	128	13	320	585.64	0	6977	8.76	89.97
<i>Number of target trademarks</i>	23.74	10.00	315	58.07	0	810	9.16	113.49

When observing the 184 tender offers only, it appears that the average percentage cash used for financing is 84.08%, instead of 68.23% for the whole sample. This could be an indication that a possible difference between the post-performance of mergers and tender offers can be explained by the method of financing as Travlos (1987) argued.

Also with respect to the effects of a crisis period, there is a difference of the percentage of cash used. When analysing the takeovers during a crisis period it appears the average percentage of cash used is 79.85%. This is comparable to the amount of cash used for tender offers only. The histograms related to the cash percentage used for all subsamples are in Appendix 3.



## 4.2 Methodology

Section 4.2.1 deals with the methodology used to decide whether there is short-term value creation. This analysis uses the cumulative abnormal return, and the benchmark is set with the Market model. Section 4.2.2 is about the long-term analysis and consists the calendar-time portfolio approach. Section 4.2.3 deals with the combined event window, and uses the buy-and-hold method. This part makes a separation between the combined event window and the post-effective takeover window, which serves as a benchmark for the calendar-time portfolio method.

### 4.2.1 Cumulative abnormal return

To start with the methodology, first some general notations:  $i$  stands for the particular stock,  $N$  the number of observations in the sample and  $t$  is the indicator for the time period. For the computation of the abnormal returns you analyse whether the realized return for stock  $i$  during event-period  $t$  deviates from the expected or predicted return under normal circumstances. This gives the following equation:

$$(1) \quad ar_{it} = R_{it} - R_{it}^*$$

$R_{it}^*$  in Equation (1) shows that you need a benchmark return, often called the normal return. The normal return is the predicted return for stock  $i$  when the event would not have occurred. The most common way to arrive at the normal return is through the Market model. The Market model equation is:

$$(2) \quad R_{it}^* = \hat{a}_i + \hat{b}_i * R_{m,t}$$

The intercept  $\hat{a}_i$  captures the influence of firm specific factors with time, and the slope  $\hat{b}_i$  is a measure of sensitivity of the stock with the market index. The market index  $R_{m,t}$  denotes the benchmark which is in this research the CRSP value-weighted market index or the CRSP equally-weighted market index. The coefficients of the Market model Equation (2) are ordinary least-squares (OLS) regression estimates over the time period [-250,-51], ending well before the event windows.

When the abnormal returns are computed for all  $N$  firms, it can be combined into an average abnormal return for day  $t$ . The equation computing the average abnormal return is:

$$(3) \quad AR_t = \frac{1}{N} \sum_{i=1}^N ar_{it}$$

For every event window [K,L] the average abnormal return for day  $t$  will be computed, and these averages combined lead to the cumulative average abnormal return (CAR). The formula to arrive at the CAR is:

$$(4) \quad CAR_{KL} = \sum_{t=K}^L AR_t$$

The following event windows are in the analysis: [-5,+5], [-2,+2], [-1,+1], the days around the announcement date [t-1] and [t+1], and the announcement date [t=0] separately. A t-test checks whether the cumulative abnormal returns are significantly different from zero. When significant, this three-day cumulative abnormal return is the dependent variable in the cross-section analysis. First the univariate regressions will decide which factors have significant explanatory power for the announcement return. The formula (5) is as follows:

$$(5) \quad CAR_{[-1,1]} = \alpha + \beta_1 * X_1 + \varepsilon_t$$

The multivariate regressions will explore which combination of the in formula 5 significant variables has the most explanatory power.

$$(6) \quad CAR_{[-1,1]} = \alpha + \beta_1 * X_1 + \beta_2 * X_2 + \dots + \beta_n * X_n + \varepsilon_t$$

Formula 6 shows the equation for the multivariate regressions, where  $n$  is the number of different variables used in the regression.

#### 4.2.2 Calendar-time portfolio approach

The long-term analysis uses the calendar-time portfolio (CTP) approach, regarding the stock-price performance of 12 (24, 36) months after the date when the takeover is effective and unconditional. A portfolio is formed for every month, consisting of firms that executed a takeover in the previous  $T$  months. Then the portfolios excess return is the dependent variable in the following regression:

$$(7) \quad R_{pt} - R_{ft} = \alpha_p + \beta_p (R_{mt} - R_{ft}) + s_p SMB_t + h_p HML_t + e_{pt}$$

The risk-free rate ( $R_{ft}$ ) is the 30-day US Treasury bill. As independent variables there is the Fama and French three-factor model. These factors are the excess market return<sup>8</sup> and two risk factors with respect to size and book-to-market respectively. The SMB factor captures the difference between the average return of the portfolio on the smallest size quintile and the portfolio on the biggest size quintile. The same applies to the HML, which captures the difference between the average return of

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<sup>8</sup> The market index which is used as the benchmark ( $R_{mt}$ ) is the CRSP value-weighted market index.

the portfolio on the highest book-to-market quintile and the portfolio on the lowest book-to-market quintile (Fama & French, 1993).

The intercept alpha ( $\alpha_p$ ) in Equation (7) measures the monthly average abnormal return. To test the hypotheses for the long-term subsamples are made following Kohers and Kohers (2001), to divide the total sample on the basis of the median value for that particular variable.

Fama (1998) advocates a CTP method as the methodology for long horizon event studies, and is against the BHAR method. An advantage of this approach is that by forming monthly calendar-time portfolios, all cross-correlations of event-firm abnormal returns are accounted for in the variance of the portfolio. Another advantage is that this method suffers less from the bad-model problem, because the systematic errors are not compounded over a long horizon. Also the distribution of the estimator is better approximated by the normal distribution, and therefore the statistical tests are more reliable.

#### 4.2.3 Buy-and-hold abnormal return

To decide whether a takeover creates shareholder value, the short-term and the long-term analysis can be combined. The computation of the BHAR follows from Equation (8):

$$(8) \quad BHAR_i = \prod_{t=1}^T (1 + R_{it}) - \prod_{t=1}^T (1 + R_{it}^*)$$

As with all event studies, it is important how to determine “abnormal”. Following Lyon, Barber and Tsai (1999) and Kohers and Kohers (2001) the normal return is the return of a reference portfolio. These reference portfolios are created by industry and based on size- and the book-to-market ratio deciles<sup>9</sup>. This means there are 900 different portfolios.

This event window can be divided into two different parts following Loughran and Vijh (1997): two days before the announcement until the date when the takeover is effective, and the 12 (24, 36) months after the effective date. This latter part can serve as a benchmark for the CTP approach of Section 4.2.2.

The BHAR method has the advantage over the CTP approach that it better resembles the actual experiences of the investor, because there is no monthly rebalancing (Kothari & Warner, 2004). Loughran and Ritter (1997) favour the BHAR method because they argue the CTP approach has low

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<sup>9</sup> By industry means here, based on the first-digit SIC code. So there are nine different categories as regards the acquirers industry. Then there are ten categories for size, and ten categories for book-to-market ratio. This leads to (9x10x10) reference portfolios.

power to detect abnormal performance. Because this method averages months of high and low event activity.

### **4.3 Proxy variables**

This subsection explains which variables will proxy the several explanations. First these variables are input in the univariate and multivariate regressions in Section 5.1.2 and 5.1.3 to find significant effects in the short-term analysis. When looking at the long-term analysis in Section 5.2, these variables will divide the total sample in subsamples for the CTP approach.

To test whether the method of payment influences the value creation process, multiple variables are in the analyses following Faccio and Masulis (2005). First the proportion of cash and stock in each deal is obtained from the SDC database and this forms the variables percentage of cash and percentage of stock respectively. Using these variables, dummy-variables for deals financed with cash or stocks only can be generated.

Testing the performance extrapolation hypothesis of Rau and Vermaelen (1998) will be done through two different variables, because previous researchers found significant relationships for two overvaluation proxies. The first proxy for overvaluation is the book-to-market ratio (book value divided by the market value), and the second proxy is the Tobin's Q ratio (total market value divided by the total asset value). Both ratios are obtained at the end of the fiscal year prior to announcement because at this point in time the variable is not biased yet. When determining the variable at the date of the announcement, the value can be biased because of a pre-event run-up due to the leakage of information to the market.

The return on equity (ROE) variable relates to the performance extrapolation hypothesis and serves as a control variable, following Kohers and Kohers (2001). This captures the performance prior to the takeover announcement, and therefore the role of other factors can be determined more clearly. The bidders' return on equity 6 months before the announcement is included in the regressions.

Size and relative size are in the analysis to correct for possible size effects. Size is measured at the end of the fiscal year prior to the announcement, and captured with the logarithm to deal with the extremely large numbers. The absolute size variable is used for the relative size variable, where the transaction value is divided by the absolute value of the size.

There are multiple dummy variables to proxy an effect. The effect of a crisis-period will be captured by a dummy variable which is equal to one when the announcement is between 01/01/2008 and

12/31/2013. Two more dummy variables are the fact whether a deal is a cross-border (=1) takeover or a domestic takeover (=0), and whether a deal is a tender offer (=1) or a merger (=0).

Whether there is a significant difference in the abnormal returns between focus increasing and diversifying deals is measured through a dummy variable. Following Doukas and Kan (2004) it is a diversifying deal when the first two digits of the SIC-code from the acquirer does not match those from the target. A focus increasing deal is thus when acquirer and target share the same first two digits of the SIC code.

The measure of innovativeness for the target is through the number of patents owned by the target at the year before the deal-announcement. Another proxy for this is the amount of trademarks, measured at the same time before the announcement.

## 5. Results

This section starts with the short term analysis in Section 5.1. Hereafter the long-term analysis and the combination of both in Section 5.2 and 5.3 respectively. Section 5.4 discusses the hypotheses stated in Section 3, and relates the outcomes of the analysis to the theory.

### 5.1 Short-term analysis

#### 5.1.1 Short-term shareholder wealth effects

Table 4 shows the abnormal returns for acquirers around the announcement date, for the intervals: [-1,+1], [1], [0], [-1], [-1,0], [0,+1], [-2,+2] and [-5,+5]. Examining the stock-price reaction of firms acquiring a high-technology target, shows a significant negative reaction after the announcement. As can be seen in Table 4 Panel A, in the three-day interval around the announcement there is a -1.02% cumulative abnormal return. Panel A shows the averages of winsorized variables, because Appendix 4 shows there are multiple outliers in the initial distributions.

Table 4: Abnormal returns short-term  
Short term analysis around the announcement of takeovers. Panel A is the three-day interval around the announcement date [t=0] which will serve as the dependant variable in the cross-section analysis, and Panel B are additional intervals. Both the value-weighted CRSP market index as the equally-weighted CRSP market index are used as a benchmark. A \* denotes significant at a 10% level, \*\* on a 5% level and \*\*\* on a 1% level.

Panel A	Value-weighted benchmark	Equally-weighted benchmark
[-1,+1]	-1.02 (-3.57)***	-1.09 (-3.77)***
Panel B		
[1]	-0.38 (-1.87)*	-0.39 (-1.88)*
[0]	-0.55 (-2.77)***	-0.58 (-2.91)***
[-1]	-0.15 (-1.58)	-0.19 (-1.98)**
[-1,0]	-0.70 (-3.23)***	-0.77 (-3.51)***
[0,+1]	-0.93 (-3.22)***	-0.97 (-3.31)***
[-2,+2]	-1.23 (-3.85)***	-1.31 (-3.99)***
[-5,+5]	-1.21 (-3.17)***	-1.36 (-3.39)***

It shows from Table 4 that the abnormal returns computed with an equally-weighted market index are more pronounced when comparing it to a value-weighted market index. This suggests that small firms experience higher returns, and therefore the 'normal' return becomes higher. For the remainder of the results and the cross-section part, the analysis uses the value-weighted benchmark following Kohers and Kohers (2000) and others.

Analysing the individual days of the event window in Table 4 Panel B produces comparable results, as all days of the three-day interval of Panel A are negative. The announcement day is the day where the most information is processed by the market, as the magnitude of the reaction at  $[t=0]$  is higher than at  $[t-1]$  and  $[t+1]$ . At  $[t-1]$  there is no significant abnormal return.

When testing the alternative event windows in Panel B all results are negative and highly significant. The results of the  $[-2,+2]$  and  $[-5,+5]$  interval suggest the existence of abnormal return in the days before and after the event. It seems the market underreacts at the announcement date, resulting in significant abnormal returns in longer intervals.

### **5.1.2 Univariate cross-section analysis**

The cross-section part explores which factors explain the negative stock-price reaction around the announcement of a takeover. Univariate regressions are executed and the results are displayed in Table 5. For a description of all variables see Section 4.3.

Regression A in Table 5 shows a significant positive effect for deals which are financed with cash only. When this dummy variable is equal to one, the CAR is 2.7% higher than for deals using also other forms of financing. On the opposite, Regression B result in a significant negative coefficient for the dummy variable when the deal is financed with stock only. When this latter is the case, the CAR is 3.7% lower than deals financed with other forms of payment.

Because these dummy-variables only capture the extreme observations with 100% cash or equity, and therefore not when financed with slightly less than 100% cash or equity, Regressions C and D are with the percentage variables of financing method. Surprisingly, only the percentage of cash used is significant as there is no statistical relation between the percentage of equity used and the CAR.

Book-to-market has no influence on the CAR, as can be seen in Regression E. Another proxy for overvaluation does have a significant effect, the Tobin's' Q in Regression F. The coefficient is -0.02%, so the higher the Tobin's' Q which proxies overvaluation, the lower the CAR. Pre-announcement performance has a positive effect.

A tender offer results in higher announcement returns than mergers do, as can be seen in Regression J. Tender offers earn 1.46% more compared to mergers around the announcement. Also the dummy-variables of the deal taking place in a crisis period and if the deal is a cross-border deal or not are significant. During a crisis the CAR is 1.81% higher. As expected following the economic theory, there is a negative relation between the cross-border dummy and the CAR. This indicates that acquiring international targets result in a 1.38% higher CAR.

It seems from the results in Regression M that focus-increasing deals do not lead to statistically higher returns around the announcement. Also whether the target is innovative has no significant influence on the three-day CAR as shown in Regression N and O.



Table 5: Univariate regressions announcement returns

Sample includes North-American mergers and acquisitions between 2001 and 2015, and all companies are listed. The dependent variable is the three-day CAR [-1,+1] around the event date, which is the announcement of the takeover. This dependent variable is winsorized at a 1% level. Normal return computed with the market model, using the CRSP value-weighted index as a benchmark. Formula 5 shows the equation:  $CAR_{[-1,1]} = \alpha + \beta_1 * X_1 + \varepsilon_t$ . The E(sign) gives a prediction of the sign of the beta coefficient following the theory. All\_Cash and All\_Stock are both dummy variable, which are equal to one when the deal is financed with 100% cash or stock respectively. Cash\_perc and Stock\_perc are the real percentage used for financing. Book-to-market B\_M is obtained at the end of the fiscal year prior to the announcement, which is also the case for the Q-ratio, log(Market\_Cap), number of patents and number of trademarks. ROE is the return on equity 6 months prior to the announcement. Rel\_size is the size of the target relative to the size of the acquirer, at the end of the fiscal year prior to the announcement. Tender\_Offer, Crisis, Cross-border and focus are all dummy variables. Values of the coefficients are in percentages. White-adjusted standard errors are used in the statistical tests. The t-value is displayed between parentheses. A <sup>\*\*\*</sup>, <sup>\*\*</sup> and <sup>\*</sup> denote statistical significance at the 1%, 5% and 10% level respectively.

Variable	E(sign)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Intercept		-2.545 (-4.74) <sup>***</sup>	-0.498 (-1.80) <sup>*</sup>	-4.615 (-3.78) <sup>***</sup>	-2.190 (-1.17)	-0.941 (-3.20) <sup>***</sup>	-0.958 (-3.33) <sup>***</sup>	-1.228 (-3.98) <sup>***</sup>	-0.806 (-2.56) <sup>**</sup>	-6.431 (-1.72) <sup>*</sup>	-1.462 (-3.99) <sup>***</sup>	-1.595 (-4.38) <sup>***</sup>	-1.232 (-3.84) <sup>***</sup>	-1.211 (-2.52) <sup>**</sup>	-0.997 (-2.71) <sup>***</sup>	-1.063 (-2.67) <sup>***</sup>
All_Cash	+/-	2.721 (4.53) <sup>***</sup>														
All_Stock	-		-3.687 (-3.36) <sup>***</sup>													
Cash_perc	+/-			0.048 (3.71) <sup>***</sup>												
Stock_perc	-				-0.022 (-0.92)											
B_M	+					-0.257 (-1.24)										
Q	-						-0.017 (-6.19) <sup>***</sup>									
ROE	+							0.021 (2.31) <sup>**</sup>								
Rel_size	+								-0.719 (-0.67)							
Log(Market_Cap)	-									0.242 (1.53)						
Tender_Offer	+										1.464 (2.65) <sup>**</sup>					
Crisis	+											1.806 (3.20) <sup>***</sup>				
Crossborder	-												1.376 (2.11) <sup>**</sup>			
Focus	+													0.294 (0.49)		
# patents	+														-0.001 (-1.38)	
# trademarks	+															-0.001 (-0.12)
Sample		608	608	608	608	600	606	594	606	606	608	608	608	608	315	315
Adj. R2		3.535	3.185	3.736	0.012	-0.064	0.025	1.163	0.047	0.325	0.753	1.272	0.337	-0.126	0.088	-0.311

### 5.1.3 Multivariate cross-section analysis

The coefficients and t-values in Table 5 are the basis of the multivariate regressions in Table 6. Starting with the variables which are significant, and almost significant, leads to the output in Regression P. It follows that the method of payment matters for acquiring a high-technology target, because almost all coefficients regarding this hypothesis are significant in all regressions. Deals financed with cash only result in a significant higher announcement return, while an increase of 1% in cash used produces contradictory results. Both variables regarding equity financing, All Stock and Stock %, are significantly negative.

Overvaluation is captured by the Q-ratio, which is highly significant in all regressions. The same explanation applies as in the univariate regression: a higher Q-ratio which indicates overvaluation leads to a lower announcement return. The control variable ROE does not have a significant effect anymore. Also for some other variables the t-values are different from the values in the univariate regressions, for example the tender offer- and the crisis variable.

Removing non-significant variables leads to the Regressions S and Y with only significant variables. These variables include the method of payment variables and the Q-ratio. When using the dummy-variables for the method of payment in Regression S, there is a significant higher announcement return for deals in a crisis period.

The adjusted- $R^2$  is maximized when the variable which captures the number of target patents is included. However, this variable is not significant (only in Regression Q). It could be the case that this high adjusted  $R^2$  is because of a reduction in the sample, as this variable is missing data.

Table 6: Multivariate regressions announcement returns

Sample includes North-American mergers and acquisitions between 2001 and 2015, and all companies are listed. The dependent variable is the three-day CAR [-1,+1] around the event date, which is the announcement of the takeover. This dependent variable is winsorized at a 1%level. Normal return computed with the market model, using the CRSP value-weighted index as a benchmark. Formula 6 shows the equation:  $CAR_{[-1,1]} = \alpha + \beta_1 * X_1 + \beta_2 * X_2 + \dots + \beta_n * X_n + \varepsilon_t$ . E(sign) gives a prediction of the sign of the coefficient following the theory. All\_Cash and All\_Stock are both dummy variable, which are equal to one when the deal is financed with 100% cash or stock respectively. Cash\_perc and Stock\_perc are the real percentage used for financing. Book-to-market B\_M is obtained at the end of the fiscal year prior to the announcement, which is also the case for the Q-ratio, log(Market\_Cap), number of patents and number of trademarks. ROE is the return on equity 6 months prior to the announcement. Rel\_size is the size of the target relative to the size of the acquirer, at the end of the fiscal year prior to the announcement. Tender\_Offer, Crisis, Cross-border and focus are all dummy variables. Values of the coefficients are in percentages. White-adjusted standard errors are used in the statistical tests. The t-value is displayed between parentheses. A <sup>\*\*\*</sup>, <sup>\*\*</sup> and <sup>\*</sup> denote statistical significance at the 1%, 5% and 10% level respectively.

Variable	E(sign)	P	Q	R	S	T	U	V	W	X	Y
Intercept		2.397 (0.48)	-1.911 (-2.29)**	-2.2193 (-3.47)	-2.060 (-3.29)***	4.205 (0.86)	-0.588 (-0.47)	0.810 (0.81)	1.482 (1.36)	1.667 (1.60)	2.016 (2.10)**
All Cash	+/-	1.627 (1.83)*	1.417 (1.65)*	1.8082 (2.75)***	1.832 (2.78)***						
All Stock	-	-3.285 (-1.98)**	-3.219 (1.94)*	-2.1442 (-1.73)*	-2.229 (-1.79)*						
Cash %	+/-					0.005 (0.44)	0.003 (0.23)	-0.014 (-1.42)	-0.018 (-1.69)*	-0.018 (-1.77)*	-0.019 (-1.87)*
Stock %	-					-0.044 (-2.53)**	-0.043 (-2.42)**	-0.057 (-4.32)***	-0.065 (-4.62)***	-0.066 (-4.79)***	-0.069 (-5.21)***
Q	-	-0.015 (-9.00)***	-0.015 (-10.67)***	-0.0167 (-8.78)***	-0.017 (-9.18)***	-0.016 (-9.27)***	-0.016 (-11.26)***	-0.016 (-10.06)***	-0.016 (-10.26)***	-0.017 (-10.67)***	-0.017 (-11.37)***
ROE	+	0.015 (1.38)	0.012 (1.19)			0.013 (1.16)	0.010 (0.95)	0.009 (1.04)			
log(Market Cap)	-	-0.197 (-0.92)				-0.218 (-1.02)					
Tender Offer	+	0.046 (0.07)				-0.073 (-0.11)					
Crisis	+	1.015 (1.31)	1.066 (1.38)	1.208 (2.10)**	1.193 (2.08)**	0.735 (0.93)	0.783 (0.99)	0.920 (1.53)	0.776 (1.31)	0.758 (1.28)	
Crossborder	-	1.867 (1.97)**	1.980 (2.16)**	0.995 (1.53)		1.687 (1.80)*	1.806 (1.97)**	0.824 (1.28)	0.666 (1.04)		
# patents	+	-0.001 (-1.45)	-0.001 (-1.66)*			-0.001 (-1.35)	-0.001 (-1.57)				
Sample		308	308	606	606	308	308	593	606	606	606
Adj. R2		8.290	8.617	5.043	4.940	9.164	9.412	7.808	7.861	7.898	7.813

## 5.2 Long-term analysis

The long-term analysis focuses on the stock-price performance after the date when the takeover is effective and unconditional. The event-windows are 12, 24 and 36 months after the event date, and the coefficient of interest is the alpha in Equation 7 in Section 4.2.2.

Analysing the full sample in Table 7 Panel A shows a significant underperformance in the first 12-, and 24 months after the takeover is effective and unconditional. There is a declining pattern, as for the first 12 months the average abnormal monthly return is -0.36% and for the 24 months it is -0.28%. When looking at the 36-month interval there is a monthly underperformance of -0.21%, however not significant.

To see whether the method of payment matters for the long-term performance after the event date, the sample is divided into subsamples based on the dummy-variable cash- and stock only. The remaining observations are in the mixed-financed subsample. It seems that equity financing leads to a negative abnormal price performance on the long-run, with a magnitude of -0.89% (-1.08%, -0.81%) average abnormal return per month, all statistically significant.

Panel B shows the results regarding whether the bidder is over- or undervalued. Only the 308 observations with a book-to-market ratio above the samples' median value produce a significant negative long-term abnormal price performance. This indicates that undervalued firms (high book-to-market) report negative long-term returns. For the other proxy of overvaluation, the Tobin's Q, there is a similar result. A Tobin's Q above 1 is regarded as an overvalued company, and the 308 bidders with a Q above the samples' median value have no abnormal performance. But the subsample with a Q below the median value does report a significant negative abnormal return.

The 431 mergers clearly underperform relative to the 184 tender offers in the long-run, as shown in Panel C. A tender offer faces no significant over- or underperformance relative to the benchmark, but the mergers do underperform based on a 12-, 24- and 36-month interval. The monthly average abnormal returns are -0.45%, -0.43% and -0.37% respectively. Panel C also demonstrates the significant underperformance of the high relative-size subsample.

A takeover in a crisis period does not underperform in the long-term, while a takeover in a non-crisis period does underperform relative to the benchmark. The monthly average abnormal returns for firms acquiring during the crisis is not statistically different from zero. In contrary acquiring during a non-crisis period leads to abnormal performance of -0.39% and -0.52% during the 24 and 36-month interval as shown in Panel D.

Another clear relation in Panel D is the highly significant negative abnormal performance of diversifying deals, opposed to the non-significant results for focus-increasing deals. The 212 diversifying deals report a -0.75% (-0.56%, -0.40%) during the 12 (24, 36)-month event-window.

A similar result with an even bigger magnitude is for the cross-border deals. These deals in Panel F experience a -0.95% underperformance on average per month, for the first 12 months after the takeover. For the 24- and 36-month period after the takeover the average underperformance is -0.70% and -0.54% per month.

Table 7: Monthly average abnormal returns

Table displays the monthly average abnormal returns for a sample of 615 North-American companies acquiring a high-technology target. Panel A: full sample analysis and method of payment subsamples. Panel B subsamples regarding book-to-market and Tobin's Q. Panel C has subsamples regarding the type of offer and the relative size. Panel D has subsamples for crisis and focus dummy-variables and Panel E has subsamples for cross-border dummy and the amount of patents. Firms are assigned to their subsample based on the samples median value of the value of the dummy (1 or 0). To compute the monthly AR value-weighted calendar-time portfolios are used, and consists of event firms which have announced a takeover in the past 12(24, 36) months. One time-series regression with the excess return as dependent variable, and the Fama and French (1993) risk factors as independent variables. This leads to the following regression:

$$R_{pt} - R_{ft} = \alpha_p + \beta_p(R_{mt} - R_{ft}) + s_pSMB_t + h_pHML_t + e_{pt}$$

The alpha in the regression stands for the average monthly abnormal return, which is tested with a t-test. An \*\*\*, \*\* and \* denotes statistically significant on a 1%, 5% and 10% level respectively. The monthly returns are in percentages

Panel A: Fama-French calendar-time approach with full sample and method of payment subsamples

Months	Full sample		Cash only		Stock only		Mixed	
	Monthly average AR	t-statistic	Monthly average AR	t-statistic	Monthly average AR	t-statistic	Monthly average AR	t-statistic
12 mths	-0.36	(-2.13)**	-0.11	(-0.51)	-0.89	(-1.88)*	-0.38	(-1.28)
24 mths	-0.28	(-1.84)*	0.01	(0.06)	-1.08	(-2.86)***	-0.26	(-1.10)
36 mths	-0.21	(-1.42)	0.10	(0.54)	-0.81	(-2.50)**	-0.21	(-0.89)
Sample	615		346		87		182	

Panel B: Fama-French calendar-time approach with subsamples regarding overvaluation

Months	Book-to-market < median value		Book-to-market > median value		Tobin's Q < median value		Tobin's Q > median value	
	Monthly average AR	t-statistic	Monthly average AR	t-statistic	Monthly average AR	t-statistic	Monthly average AR	t-statistic
12 mths	0.03	(0.13)	-0.54	(-2.36)**	-0.52	(-1.67)*	-0.34	(-1.59)
24 mths	-0.05	(-0.25)	-0.46	(-2.21)**	-0.51	(-1.78)*	-0.23	(-1.27)
36 mths	0.02	(0.11)	-0.39	(-1.99)**	-0.48	(-1.65)	-0.11	(-0.65)
Sample	307		308		307		308	

Panel C: Fama-French calendar-time approach with subsamples regarding type of offer and relative size

Months	Tender Offer		Merger		Relative Size < median value		Relative Size > median value	
	Monthly		Monthly		Monthly		Monthly	
	average AR	<i>t</i> -statistic	average AR	<i>t</i> -statistic	average AR	<i>t</i> -statistic	average AR	<i>t</i> -statistic
12 mths	-0.29	<i>(-1.24)</i>	-0.45	<i>(-1.95)*</i>	0.15	<i>(0.60)</i>	-0.69	<i>(-2.82)***</i>
24 mths	-0.08	<i>(-0.36)</i>	-0.43	<i>(-2.19)**</i>	0.18	<i>(0.76)</i>	-0.59	<i>(-2.82)***</i>
36 mths	0.02	<i>(0.10)</i>	-0.37	<i>(-1.95)*</i>	0.23	<i>(1.02)</i>	-0.52	<i>(-2.64)***</i>
Sample	184		431		307		308	

Panel D: Fama-French calendar-time approach with subsamples regarding time and focus increasing deals

Months	Crisis period		Non-crisis period		Focus increasing deal		Diversifying deal	
	Monthly		Monthly		Monthly		Monthly	
	average AR	<i>t</i> -statistic	average AR	<i>t</i> -statistic	average AR	<i>t</i> -statistic	average AR	<i>t</i> -statistic
12 mths	0.03	<i>(0.14)</i>	-0.40	<i>(-1.55)</i>	-0.14	<i>(-0.54)</i>	-0.75	<i>(-3.23)***</i>
24 mths	0.21	<i>(0.96)</i>	-0.39	<i>(-1.80)*</i>	-0.07	<i>(-0.29)</i>	-0.56	<i>(-2.97)***</i>
36 mths	0.19	<i>(0.94)</i>	-0.52	<i>(-2.14)**</i>	-0.06	<i>(-0.25)</i>	-0.40	<i>(-2.17)**</i>
Sample	196		419		403		212	

Panel E: Fama-French calendar-time approach with subsamples regarding cross-border deals and # of patents

Months	Cross-border deal		Domestic deal		Number of patents < median value		Number of patents > median value	
	Monthly		Monthly		Monthly		Monthly	
	average AR	<i>t</i> -statistic	average AR	<i>t</i> -statistic	average AR	<i>t</i> -statistic	average AR	<i>t</i> -statistic
12 mths	-0.95	<i>(-3.04)***</i>	-0.29	<i>(-1.62)</i>	-0.33	<i>(-1.09)</i>	-0.35	<i>(-1.95)*</i>
24 mths	-0.70	<i>(-3.02)***</i>	-0.22	<i>(-1.43)</i>	-0.35	<i>(-1.33)</i>	-0.23	<i>(-1.49)</i>
36 mths	-0.54	<i>(-2.47)**</i>	-0.16	<i>(-1.02)</i>	-0.20	<i>(-0.82)</i>	-0.19	<i>(-1.25)</i>
Sample	95		520		160		160	

### 5.3 Combined event-window

The buy-and-hold returns in Table 8 display comparable results for the long-term performance. The same as in Table 7, it shows there is significant underperformance after acquiring a high-technology target. This suggests the long-term underperformance found in Table 7 is robust. A difference is that with the calendar-time approach the underperformance is significant during the first two years after completing the takeover. Contrary to this, the buy-and-hold method indicates the underperformance is significant in the second and third year after completing the takeover.

After one year the bidders have an underperformance relative to their reference portfolio of 2.70%. In year two there is a higher abnormal return, as the sample underperforms by 9.70%. And in year three the difference even increases to -15.86%.

A remarkable result in Table 8 is the positive abnormal return in the interval starting two days before the announcement date until the date when the takeover is effective. However, the result is not statistically significant.

The combination of the period from the announcement date to the effective date, and the three-year period thereafter result in a significant underperformance. Overall the underperformance is 13.89%.

Table 8: Buy-and-hold abnormal returns

Table displays the average buy-and-hold abnormal returns for a sample of 615 North-American companies acquiring a high-technology target. To compute the abnormal returns, reference portfolios are created based on size, book-to-market and the first digit SIC-code. Equally-weighted portfolios are formed, and used in the regression:

$$BHAR_i = \prod_{t=1}^T (1 + R_{it}) - \prod_{t=1}^T (1 + R_{it}^*)$$

AD-2 indicates the event window is starting two days before the announcement date, ending when the takeover is effective and unconditional. Year 1, Year 2 and Year 3 are the abnormal returns after 1, 2 and 3 year after the date when the takeover is effective and unconditional. T-value is based on a t-test whether the average is different from zero. An <sup>\*\*\*</sup>, <sup>\*\*</sup> and <sup>\*</sup> denotes statistically significant on a 1%, 5% and 10% level respectively. The returns are in percentages.

	AD-2 to ED	Year 1	Year 2	Year 3	Combined window
Abnormal return	0.920	-2.701	-9.700	-15.858	-13.891
<i>t-value</i>	(0.73)	(-1.58)	(-4.68) <sup>***</sup>	(-4.60) <sup>***</sup>	(-3.62) <sup>***</sup>
Sample	615	512	465	374	374

## 5.4 Interpretation results

### *Hypothesis 1*

Kohers and Kohers (2000) found a positive abnormal return of 1.26% around the announcement of the bidder acquiring a high-technology target. This finding relates to the first hypothesis, which stated that announcing a takeover of a high-technology target leads to short-term shareholder value creation. Despite the findings of positive effects also by Goergen and Renneboog (2004), and Masulis, Wang and Xie (2007) the mainstream literature found negative announcement returns.

The analysis in Section 5.1.1 shows a significant negative abnormal return around the announcement date, which is in line with the mainstream findings. Table 4 shows that companies announcing a takeover of a high-technology target experienced a -1.02% [-1,+1] lower return than in the case they would not have announced a takeover.

These results in Table 4 indicate that the shareholders are not too optimistic about the growth-potential of the high-technology targets. The negative abnormal return even shows shareholders are on average pessimistic about the takeover plans.

**The hypothesis can thus be rejected:** *Takeovers do not lead to shareholder value creation in the short-run, there is even a significant negative shareholder wealth effect.*

### *Hypothesis 2*

Most of the previous literature showed a significant underperformance in the long-term, including Kohers and Kohers (2001) with only high-technology targets. They found a -17.45% bidder-underperformance after three years, using the buy-and-hold methodology. A robustness check with a calendar-time approach resulted in an average monthly underperformance of 0.34%.

The long-term analysis in Section 5.2 and 5.3 confirm the expectations for underperformance. The calendar-time approach shows a significant underperformance of 0.36% and 0.28% during the first- and second year after the takeover respectively. This is in line with the findings Kohers and Kohers (2001) but also the results from André, Kooli and L'Her (2004). Also the buy-and-hold approach produces significant underperformance which is in line with Loughran and Vijh (1997), Rau and Vermaelen (1998) and others.

The finding of a long-term underperformance suggests that the predicted growth opportunities are often not realized. A possible reason for this could be a lack of knowledge, especially in the highly uncertain high-technology sector. When management does not have the knowledge to exploit the acquired technology, the growth opportunities can not be realized. Long-term underperformance also indicates that the market underreacted to the announcement, which is a violation of the EMH.

**The hypothesis can not be rejected:** *Acquirers do underperform relative to their benchmarks after completing a takeover.*

### *Hypothesis 3*

The method of payment hypothesis of Rau and Vermaelen (1998) means that takeovers financed with equity underperform relative to deals which are financed otherwise. This is also the third hypothesis in this research. Loughran and Vijh (1997) found significant underperformance for stock-financed deals while the takeovers financed with cash do not have significant abnormal returns.

The cross-section analysis of Section 5.1 confirms the method of payment hypothesis. The relatively more stock used, the more negative the announcement returns are. In the long-run the results are comparable, as Table 7 shows that the results of the subsample of equity-financed deals result in highly negative underperformance. Cash-financed deals do not produce significant abnormal returns. This is also in line with the findings of André, Kooli and L'Her (2004), Huang and Walkling (1987) and others.



Equity-financing is an indication of being overvalued, because managers would not pay with equity as they believe it is undervalued. Therefore, the market sees it as a negative signal when a takeover is paid with equity. When the market noticed that management believes the equity is overvalued, it will correct this overvaluation in time. This leads to higher underperformance in the long-run.

**The hypothesis can not be rejected:** *Stock-financed deals lead to more shareholder value destruction.*

#### *Hypothesis 4*

In previous literature there is a general consensus that tender offers lead to more shareholder value creation than mergers. The reason for this is an unresolved issue, explained in Section 2.5.2. The hypothesis is that tender offers create more shareholder value than mergers.

In the univariate cross-section analysis in Table 5 it appears that tender offers produce a 1.46% higher abnormal announcement return, which is in line with the results of Moeller, Schlingemann and Stulz (2004). However, after adding more variables the coefficient becomes insignificant. This suggests the difference between tender offers and mergers is due to the method of payment hypothesis as Travlos (1987) explained, which is also displayed in Section 4.1. In the long-run the results are in line with the findings of Loughran and Vijh (1997), Rau and Vermaelen (1998) and others. Table 7 shows a significant underperformance for mergers, while tender offers do not lead to significant results.

**The hypothesis can not be rejected:** *Tender offers create more shareholder wealth than mergers*

#### *Hypothesis 5*

The performance extrapolation hypothesis of Rau and Vermaelen (1998) indicates the market over-extrapolates the past performance of the bidder when assessing the value of an acquisition. Managers from overvalued firms are overconfident and that is why they also select takeover-targets which will not be value enhancing. Kohers and Kohers (2001) found a positive relation for the book-to-market ratio and the three-year abnormal return. This fifth hypothesis stated that undervalued companies create more shareholder wealth by acquiring than overvalued companies.

The two proxies for over- and undervaluation show different results. The book-to-market ratio appears not to have explanatory power for the short term announcement returns, but the Q-ratio coefficient is significant in both the univariate and the multivariate analysis. A higher Q-ratio, which is an indication for overvaluation, leads to a lower announcement return. In the long-term analysis in Table 7 the results are unexpected, as undervalued firms produce significant underperformance after a takeover while overvalued firms do not significantly underperform. These results are in contrast with the mainstream findings, and cannot be explained.

**The hypothesis can thus be rejected:** *Especially in the long-term, undervalued firms do not create more shareholder wealth than overvalued firms by acquiring.*

#### *Hypothesis 6*

Relative size is often incorporated to control for the change in equity of the bidder after acquiring a target. The results in previous literature are mixed, with positive and negative relationships found. The hypothesis in this analysis stated that there is a positive relation between relative size and abnormal returns, because big acquisitions have a bigger impact on the bidders' equity and large targets have more potential synergies.

With respect to the announcement return there is no relation with the relative size variable, neither the bidders' market capitalization variable. When looking at the long-term post-performance it appears that the subsample with a relative size above median value is significantly underperforming in the 12 (24, 36) months after the takeover. This is in line with the findings of Fuller, Nette and Stegemoller (2002), suggesting that it is more difficult to integrate large targets. Also, the negotiation position of large targets might lead to a higher premium paid. It is not necessary to acquire large targets to exploit growth opportunities, which is plausible for the high-technology sector. Because innovative value-creating technology may also be developed by small entities.

**The hypothesis can thus be rejected:** *Acquiring a relatively large target does lead to more value destruction.*

#### *Hypothesis 7*

Theory indicates that takeovers in a crisis period are more value creating, because managers only pick the best projects in case of uncertainty. Chidambaran et al. (2010) found that a cold merger market produces higher announcement returns. During a crisis there is less takeover activity, what leads to the hypothesis that acquiring during a crisis-period leads to more shareholder value creation.

The abnormal announcement return is significantly higher when the takeover is announced during a crisis. Also after including other variables, the effect remains the same. In the long-run it appears that takeovers completed during the crisis do not underperform, in contrast to the periods before and after the crisis. This indicates managers are more fastidious during a crisis, which leads to better decisions.

**The hypothesis can not be rejected:** *Acquiring during a crisis period does lead to more shareholder value creation.*

### *Hypothesis 8 and 9*

The eighth and ninth hypothesis are related to the integration of the target. First it is stated that when a takeover is focus-increasing, that means bidder and target are in the same industry, there is more value creation. Moeller, Schlingemann and Stulz (2004) found a positive relation between the relatedness of the industries and the announcement return. Another deal characteristic which influences the post-acquisition performance is whether the deal is a cross-border deal or not (Campa & Hernando, 2004).

When analysing the announcement return it shows unexpected results. The CAR for focus-increasing deals does not differ from the CAR for diversifying deals, which is in line with André, Kooli and L'Her (2004). Also the cross-border deals lead to higher announcement returns than domestic deals, which can not be explained by the theory.

In the long-term the results are in line with the theory, as diversifying deals result in significant underperformance while focus-increasing takeovers have no significant under- or overperformance. The subsample with cross-border deals experiences significant underperformance for all the three years after the takeover, while domestic deals do not deviate from the benchmark. These long-term results indicate that when it is more difficult to integrate the target, the more the bidder underperforms. Especially in the case of a high-technology target, the industry-related knowledge is important to exploit the potential synergies. The same applies to cross-border deals, as cultural differences may make it more difficult to incorporate the target.

**Both hypotheses can not be rejected:** *Despite questionable findings for the announcement return, it follows that the shareholder value creation is bigger for focus-increasing domestic deals.*

### *Hypothesis 10*

A more innovative target offers more potential synergies. Bena and Li (2014) found a positive relation between a measure of innovativeness and the long-term buy-and-hold return. The hypothesis therefore stated that acquiring more innovative targets leads to more value creation.

However, there are no statistically significant variables which proxy the innovativeness of the target. Also the subsamples used for the long-term analysis do not offer a clear pattern. The number of patents and/or trademarks does not matter for the post-performance.

**The hypothesis can thus be rejected:** *Acquiring a more innovative target does not lead to more shareholder value creation.*

## 6. Conclusions and recommendations

Section 6.1 answers the main research question and summarizes the most important findings, Section 6.2 gives some implications and recommendations, and Section 6.3 concludes with limitations and suggestions for further research.

### 6.1 Conclusions

The main research question was:

***Do mergers and acquisitions in the high-technology sector create shareholder value, and which factors could drive these effects?***

As appeared in the analysis in Section 5.1 there is a negative abnormal return following the announcement of the takeover. Also after completing the takeover there is a long-term underperformance up to three years. But the best way to decide whether an acquisition of a high-technology target creates shareholder value is to look at the whole interval, starting two days before the announcement until three years after the completion of the takeover, which is done in Section 5.3. Despite a positive abnormal return after the announcement until the date when the takeover is effective, overall there is a negative abnormal return after three years of -13.89%. So the conclusion is there is no shareholder value creation, but there is even value destruction.

The analysis confirms that the method of payment hypothesis is an important factor in the post-acquisition performance. It shows that equity-financing leads to more value destruction than cash-financing, which was predicted by the hypothesis.

Another factor with explanatory power is whether it is a tender offer or a merger. Tender offers do not result in value destruction, while mergers do. Usually management is replaced after a tender offer, which is in the interest of the acquirer. Another possible explanation is that tender offers are more often cash-financed, while mergers are more often equity-financed.

The bigger the target is relatively to the bidder, the more value destruction there is. This suggests it is more difficult to integrate large targets. Another explanation is that large targets have a better negotiation position, and the premium paid by the acquirer is therefore higher.

The next factor influencing the performance after a takeover is whether the takeover is in a crisis period. When this is the case, there is less value destruction. The reason for this is that managers in a time of uncertainty are more careful in selecting their projects.

Two other factors which reduce the value destruction are when the deal is focus-increasing and domestic. When the acquirer and the target are in the same industry, there is more industry-specific knowledge to exploit the potential synergies. This is especially important in a technical sector like the high-technology sector. It is also more difficult to exploit the synergies when the deal is a cross-border takeover, because of cultural differences.

## **6.2 Implications and recommendations**

Shareholders of acquirers should be sceptical towards the managers' acquisition plans, because on average there is shareholder value destruction. Of course it is on average, so when the right conditions are set the deal could be advantageous. The analysis displayed that in a crisis-period the takeovers are more beneficial to the bidders' shareholders than in a non-crisis period. This is also an indication that when only the best takeover plans are executed, it may not be value destructing.

It is recommended to finance a takeover with cash instead of equity, as was predicted by the existing theory. A tender offer, acquiring a relatively small domestic target company during a crisis-period, which is focus-increasing can be considered as the most favourable takeover in the long-run.

## **6.3 Limitations and future research**

Lyon, Barber and Tsai (1999) argue that long-term event studies are treacherous, because misspecifications are likely to occur. Therefore, the conclusions are drawn carefully, as some results are contrary to some well-respected papers.

A limitation is the sample size, with only 615 observations. It is preferred to have a bigger sample, because this makes the coefficients become more reliable. This is especially a problem in the long-term analysis. The subsamples based on certain variables lead to small subsamples. Also for the cross-section analysis a bigger sample would be preferable, as an increase in sample size makes the distribution of the dependent variable more normally distributed.

To increase the number of observations it might be an idea to include the mergers and acquisitions of privately held target companies. This thesis focussed on publicly traded companies because of time limitations with regard to data obtaining.

For future research it is recommended to add more factors to the analysis. For example, the degree of institutional ownership in the acquirer. These more experienced investors might assess the potential targets more effectively, and are less likely to engage in speculative takeovers.

In future research it could be interesting to incorporate the managers' motivation for the takeover. As it appears from the analysis a takeover is a value destroying project for the acquirers' shareholders. You wonder why managers still engage in taking over a high-technology target. A reason could be the managerial self-interest explained in Section 2.3.2. However, an analysis is needed to draw a conclusion on this.

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## Appendix

### Appendix 1: Overview of sample selection.

Request	Operator	Description	Hits
Database	Include	All Mergers & Acquisitions	n/a
Date Effective/Unconditional	Between	01/01/2001 to 12/31/2015	472.971
Date Announced	Between	01/01/2001 to 12/31/2015	469.996
Deal Type (Code)	Include	Disclosed Value M&A Undisclosed Value M&A	371.147
Target Mid Industry (Code)	Include	Biotechnology Pharmaceuticals Healthcare Providers & Services (HMOs) Healthcare Equipment & Supplies Computers & Peripherals Electronics E-commerce / B2B Internet Infrastructure Internet Software & Services IT Consulting & Services Other High Technology Semiconductors Software Aerospace & Defense Chemicals Space and Satellites Telecommunications Equipment	68.052
Acquiror Nation Region (Code)	Include	North America	33.895
Acquiror Public Status (Code)	Include	Public	16.589
Target Public Status (Code)	Include	Public	1.208
Deal Value (\$ Mil)	Between	50 to HI	804
Percent of Shares Owned after Transaction	Between	50 to HI	800
Deal Status (Code)	Include	Completed	800
Data adding CRSP/Compustat		Due to missing data	615

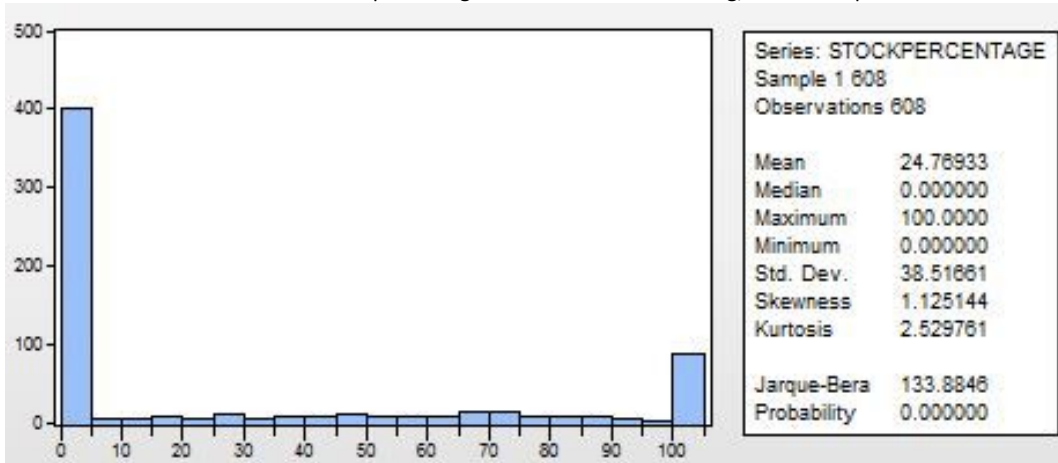
## Appendix 2: Distribution of acquiring firms over industries

Acquiring firms divided by industry. Companies are classified following their first two digits of the SIC code.  
Industry classification is obtained from the SICcode.com website.

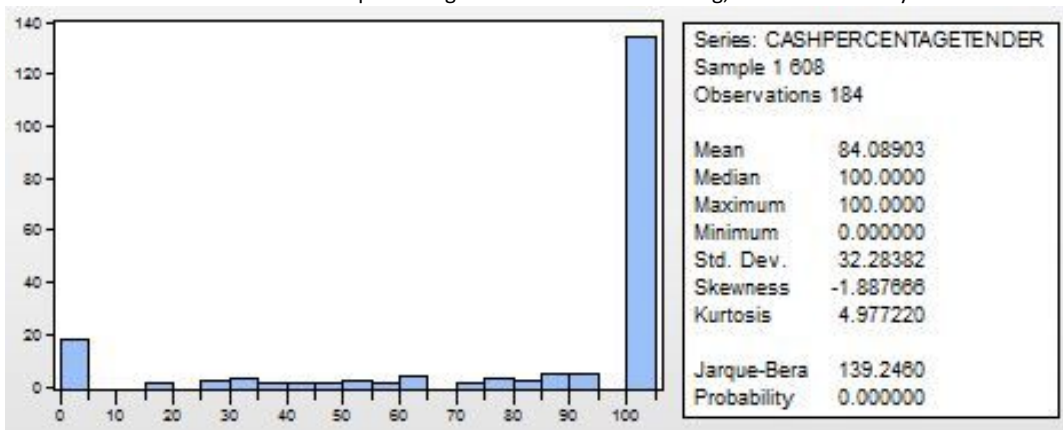
SIC code	Industry	Freq.	Percent
01-09	Agriculture, Forestry and Fishing	0	0.00
10-14	Mining	1	0.00
15-17	Construction	0	0.00
20-39	Manufacturing	392	63.73
40-49	Transportation, Communications, Electric, Gas and Sanitary service	19	3.09
50-51	Wholesale Trade	13	2.11
52-59	Retail Trade	6	0.97
60-67	Finance, Insurance and Real Estate	11	1.79
70-89	Services	173	28.13
91-99	Public Administration	0	0.00
Total		615	

## Appendix 3: Histograms Cash-percentage used

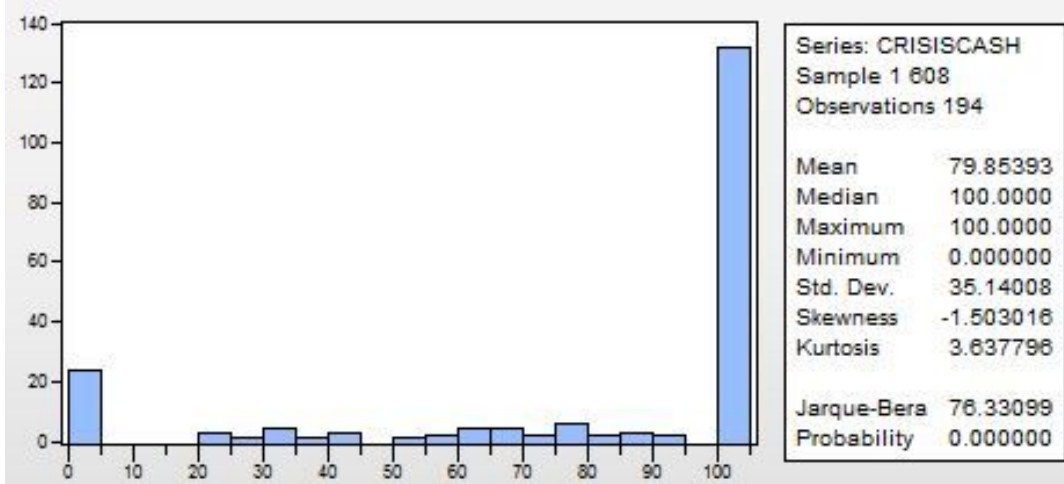
Distribution of the percentage of cash used for financing, whole sample



Distribution of the percentage of cash used for financing, tender offers only

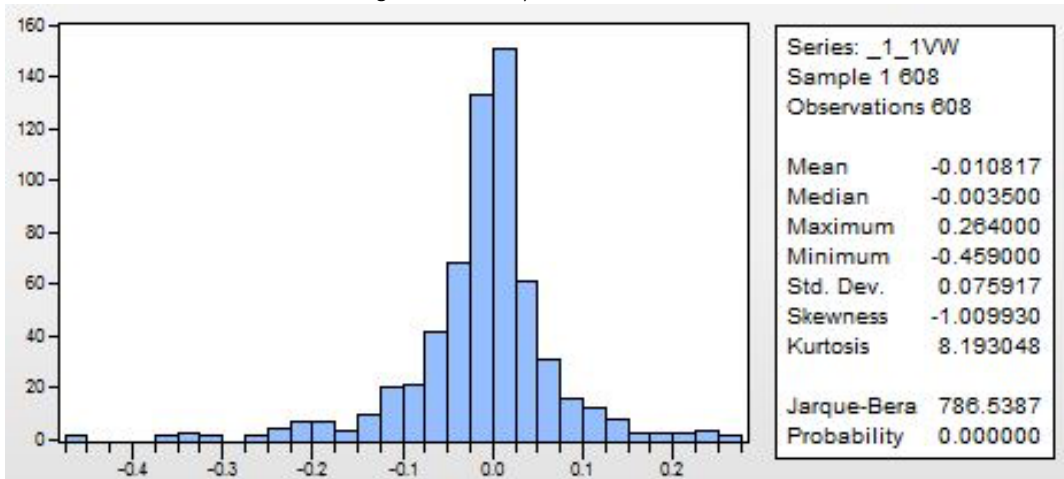


Distribution of the percentage of cash used for financing, crisis period only

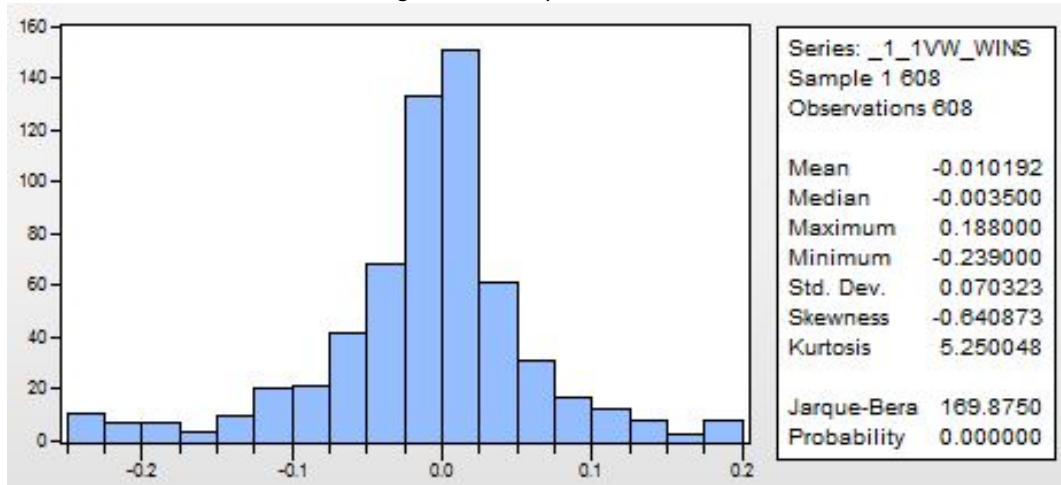


#### Appendix 4: Initial- and winsorized distribution

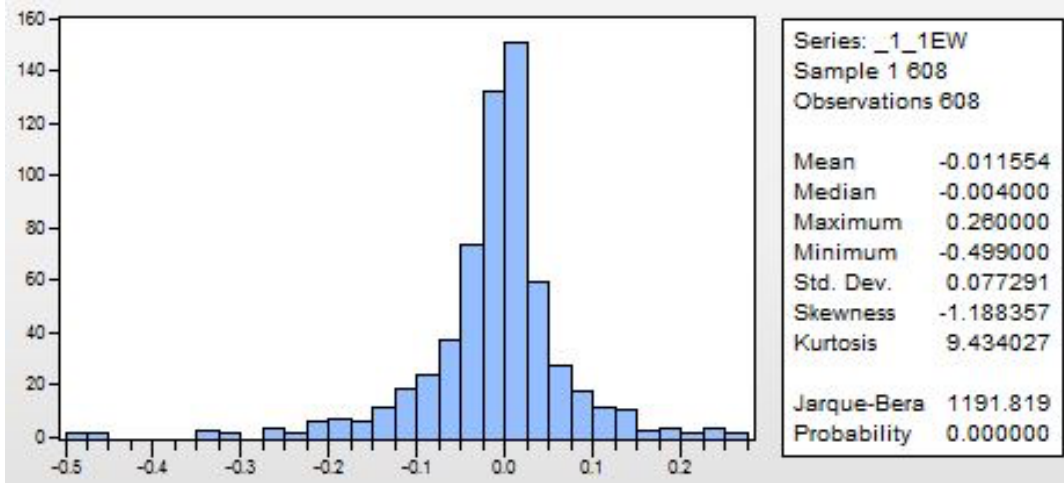
Distribution of the initial value-weighted three-day abnormal return interval around the announcement



Distribution of the winsorized value-weighted three-day abnormal return interval around the announcement



Distribution of the initial equally-weighted three-day abnormal return interval around the announcement



Distribution of the winsorized equally-weighted three-day abnormal return interval around the announcement

