NORGES HANDELSHØYSKOLE

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Shareholder Gains for Bidder Firms

An Event Study on the U.S. Petroleum Industry

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Abstract

The purpose of this paper is to examine the merger gains to the bidder firms' shareholders in the U.S. petroleum industry, through an event study, and through a cross-sectional regression on the event study results. This paper utilizes three different event windows of 3, 11 and 21 days, symmetric around the event date in the event study.

I find that the acquirers experience significantly positive abnormal returns around the announcement of the acquisition or merger. Further, I find that firms acquiring public targets experience significantly lower abnormal returns than firms acquiring private targets.

The above-mentioned results do not seem to be driven by extreme observations, they are robust to the specification of the beta coefficients and they seem to hold even for unclustered data.

Foreword

Writing this thesis has been an educational process in many respects. Academically, I learnt more and more about the limitations of the event study methodology as I moved further along with my work. Practically, I had to acquire new skills regarding the use of statistical tools and financial databases, which I am sure will be useful knowledge in the future.

Originally I was aiming at examining both the target and acquirer returns for acquirers from all over the world, but was surprised by how difficult it turned out to be to obtain the necessary data. The data collection process was also more time consuming than I had expected beforehand.

I would like to thank my supervisor, Einar Cathrinus Kjenstad, for being very helpful and accommodating, and giving me advice and critique which helped me along with my work with this paper.

Bergen, March 30th 2010

Silje Rognerud Haggerty

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Chapter 1

Introduction

The purpose of this paper is to investigate shareholder gains or losses for acquiring firms in the U.S. petroleum industry. The target firms can originate from any industry and country. The main goal is to examine the driving factors behind the gains or losses.

This thesis investigates the news effect from acquisitions on the acquiring firm's stock price, by means of an event study, and then analyzes the results from the event study by means of a cross-sectional regression. The events being studied are the announcements of acquisitions.

A firm's stock price should theoretically always reflect all the available information about the given firm and its future. When new information about the firm reaches the market, the stock price should immediately react and reflect this new information, given that the market players act rationally. An event study measures the impact from the new information on the stock price (MacKinlay, 1997). According to Gaughan (2007) this means that one assumes that any synergy effect will be immediately visible through the market reaction to the news.

Numerous previous studies have found that it is difficult to find economically and statistically significant results for shareholder gains for the bidding firm (ibid.). This paper aims at examining which factors in the deal or acquiring company, if any, significantly affect shareholder gains.

The study is organized as follows: The rest of chapter 1 presents a brief background on mergers and acquisitions and on the American oil industry, as well as the motivation for this study. Chapter 2 introduces previous research on event studies, whilst chapter 3 presents the hypotheses. The methodology applied in the analysis is outlined in chapter 4. Chapter 5 describes the data selection process. The results from the analyses are found in chapter 6, and chapter 7 presents the results from the robustness analyses. The conclusion and recommendations for future research are presented in chapter 8.

1.1. Mergers and Acquisitions

1.1.1. Definitions

Gaughan (2007) refers to an acquisition as something that occurs "when one company takes a controlling ownership interest in another firm, a legal subsidiary of another firm, or selected assets of another firm such as a manufacturing facility". A merger, on the other hand, occurs when two or more firms are combined, and only one of them continues to exist thereafter (ibid.).

Zephyr (2009) seems to call everything an acquisition, including what seem to be, and are often referred to as, mergers. This study will regard both mergers and acquisitions as defined by Gaughan (2007).

A merger or an acquisition can be vertical, horizontal or conglomerate. This depends on whether the firms are in the same industries and where they are in the value chain (ibid.).

1.1.2. Merger Waves

Historically there has been a tendency for restructuring activity to occur in waves.

Up until now there have been five merger waves, with the fifth wave ending in 2000 (Gaughan, 2007). The sixth merger wave started according to Gaughan (2007) in 2003, and it was still going on at the time when he wrote the book Mergers, Acquisitions and Corporate Resturucturings (2007).

Gaughan (2007) presents two theories as to why merger waves exist: response to shocks, or misevaluation. This is partly in line with Andrade, Mitchell and Stafford (2001) who argue that merger waves and restructuring activity in general are strongly influenced by industry-level shocks. They refer to a study by Mitchell and Muherin from 1996, where deregulation, oil price shocks, foreign competition and financial activities were found to explain a large part of the restructuring activity in the 1980's. This was a period when the oil and gas industry was one of the industries with the most restructuring activity (ibid.).

The most recent merger wave is different than earlier waves in that the mergers are larger in size, horizontal, cross-border and heavily concentrated in banking, telecommunications, health care, utilities and commodities such as oil, gas and metals (Gaughan, 2007).

1.2. The Petroleum Industry

Weston, Johnson and Siu (1999) claim that the international petroleum industry has some special characteristics causing it to be subject to an especially turbulent environment. For the petroleum industry, the instability in oil and natural gas prices, and the particularly global market, has had a large impact on the turbulent environment the firms are facing (ibid.). Based on this, it is not a far reach to claim that the petroleum industry is very much influenced by the business cycles in the global economy.

1.2.1. The US Petroleum Industry

Even though the petroleum industry is global, the focus of this thesis is mainly on acquiring firms in the U.S. The Government Accountability Office (GAO) reported in GOU-08-1082 (2008) that there had been more than 1000 domestic mergers in the U.S. petroleum industry between 2000 and 2007. Most of these were between companies in crude oil exploration and production.

1.3. Motivation for the Study

There is a practical motivation for this study, as well as a theoretical one. The practical aspect is linked to the importance of the oil industry and the presence of the sixth merger wave. The industry is, as mentioned in 1.2, global in scope, and is important to numerous other industries due to the use of petroleum in production. Also, there are certain nations that depend heavily on the oil industry. One example is my home country, Norway. This is the reason why I find it interesting to investigate this industry in particular. With an industry as global as this, I believe that the results will at least have some application to other countries' markets. The fact that there has been a sixth merger wave makes it interesting to examine the mergers taking place in the chosen period.

The theoretical motivation for this thesis is to use the event study methodology to examine the drivers of merger gains for the acquiring company. Mei and Sun (2008) performed an event study on mergers and acquisitions in the U.S. forest industry, as well as a cross-sectional regression on the results.

Chapter 2

Previous Studies

Extensive research has been performed on mergers and acquisitions, as well as event studies, in the past decades. In the following chapter, the findings in some of the studies that are relevant for this study are outlined. The findings from previous research on mergers and acquisitions are applied to my hypotheses in chapter 3. The theory on event studies is utilized in the methodology section in chapter 4.

2.1. Andrade, Mitchell and Stafford (2001)

Andrade, Mitchell and Stafford (2001) wrote a paper on mergers and acquisitions in the period 1973-1998, where they find significantly positive combined shareholder gains when using a relatively short event window of 3 days. For the acquiring firms, they find negative estimates for the abnormal return, but these results are not statistically significant. They conclude that the target firms' shareholders are the "winners".

They also claim that, generally, the acquiring firm's shareholders are subsidizing the gains for the target firm's shareholders, but that there are certain differences between companies. One of the main differences mentioned is the method of payment. When the company issues equity to finance the deal, a stock-financed deal, there are really two transactions happening at once: an equity issue and an acquisition. Equity issues are, according to the authors, associated with significantly negative abnormal returns. The reason is that if the acquiring firm's management issue equity, it is more likely that their equity is over- rather than undervalued. Otherwise, they would have chosen a different method of payment, for example cash through a debt issue.

Andrade, Mitchell and Stafford (2001) criticize the use of a short period of time surrounding the announcement date as the period from which to calculate the abnormal returns, and they suggest the calculation of long-term abnormal returns. The challenges

related to that would be to correctly calculate the long-run estimated returns, and to take into account the problem of clustering[1].

Andrade, Mitchell and Stafford (2001) also criticize the fact that the datasets used in the calculation of short-term abnormal returns in the past have been too coarse. They argue that the analysis ought to be taken to a next level, where deal-characteristics should be used to explain differences in the abnormal returns.

2.2. Becher (2000)

Becher (2000) studies wealth effects from U.S. bank mergers in the period from 1980 to 1997, and finds that it is the target company's shareholders that experience the main wealth effect from the deal. He also finds that the use of shares as payment results in a lower abnormal return for the acquiring firm's shareholders. These findings comply with the findings of Andrade, Mitchell and Stafford (2001).

2.3. Mei and Sun (2008)

Mei and Sun (2008) performed an event study on mergers and acquisitions in the U.S. forest industry. They did not find any significant results for the acquiring firms' shareholders. However, they claim that the lack of significant results could be a result of the fact that gains from the deal may already be reflected in the stock price if the acquiring firm already had a stake in the target company. Additionally, they suggest that their dataset consists of deals that are relatively small, so that the announcement might not have much effect on the overall value whatsoever. Hence, the stock price would not change much either.

Mei and Sun (2008) perform a cross-sectional regression, where they choose to use return on assets, status in the deal (target or acquirer), size of transaction and scale of the company as explanatory variables for the cumulative abnormal returns. They only find significant results for status in the deal.

[1] Clustering is defined in chapter 4.8.1

2.4. Shaheen (2006)

Shaheen (2006) tests the Synergy Trap Hypothesis by using the event study methodology. This hypothesis implies that shareholders of bidder firms will experience negative returns right before and after an acquisition or merger announcement. The target will experience positive returns.

Shaheen does not prove the Synergy Trap Hypothesis to be faulty, and finds that acquiring firms experience significant negative abnormal returns in the period surrounding the announcement date. Shaheen (2006) also finds a non-significant result for the method of payment.

2.5. Moeller and Schlingemann (2005)

Moeller and Schlingemann (2005) examined the difference between domestic and international deals for U.S. acquirers in the period from 1985 to 1995, using a 3-day event window. They find that the acquirers' gains for cross-border deals are lower than for domestic deals, on a statistically significant level.

They also check the influence from the target being in the same line of business as the acquirer, and find that there is a statistically significant positive link between relatedness and shareholder gains. Moeller and Schlingemann (2005) use the first two digits in the U.S. SIC-codes[2] to determine whether the companies are related or not.

2.6. Fuller, Netter and Stegemoller (2002)

Fuller, Netter and Stegemoller (2002) present results that indicate that the bidding firms' shareholders experience larger abnormal returns when the target is a private firm or a subsidiary of a public firm, than when the target is a publicly traded firm. Their findings are based on companies involved in several transactions. Fuller, Netter and Stegemoller (2002) explain their findings as a liquidity effect caused by regulation and the bidding process, but also find that tax considerations and a monitoring effect may influence the findings.

[2] The U.S. SIC is short for the United States Standard Industrial Classification

They also compared their findings to the relative size of the merger, and found that the relative size magnified the effect from the target being public or private.

2.7. Schlingemann (2004)

Schlingemann (2004) only looks at deals with cash payment, and examines the effect of the financing decision. He finds that the acquiring firms' financing funds are crucial to its shareholders' merger gains. The results from his study indicate that a history of previous equity financing leads to positive merger gains for the acquirer. The reason for this is that the choice to acquire resolves some of the uncertainty linked to the previous equity issues. That argument is based on the pecking-order hypothesis, which states that internal financing is preferred to external, and that debt issues are preferred to equity issues (Myers and Majluf, 1984).

Schlingemann includes several different factors in the cross-sectional regression, among others the following:

- Debt-to-equity, calculated as the book value of debt over book value of equity for the accounting year two years prior to the event. He includes this variable as a control variable.
- Relative size, calculated as the deal value relative to the acquirer's market value of assets the preceding accounting year
- Private-target dummy

Of these three, Schlingemann (2004) only finds the relative size-variable to be significant, and it is significantly positive.

2.8. Gaughan (2007)

Gaughan (2007) refers to a whole range of event studies on this subject published from the 1960's until 2007. He finds that from 1962 to 2001 average shareholder abnormal return for the target firm was 30%. The abnormal returns for the shareholders of the acquiring firm vary from "slightly negative to a moderate positive" (Gaughan, 2007). The

abnormal returns have declined over the years, as a result of the steady increase in premium paid for the targets. He also claims that the management of the acquirer will react to an immediate negative stock reaction. If so, the acquirer is more likely to either renegotiate or withdraw their bid, so that the bid will not end in an acquisition if the immediate reaction is negative.

Gaughan (2007) finds that it is insignificant whether the deal is domestic or cross-border on average. The exception is in emerging markets.

Regarding the method of payment, Gaughan (2007) argues that the use of shares is more risky to the target's shareholders, and they therefore demand a higher bid premium when paid in shares than if they were paid in cash.

Gaughan (2007) finds that over longer periods the acquirers seem to either destroy shareholder value or underperform compared to their competitors. If a takeover is unsuccessful, numerous studies cited by Gaughan (2007, p. 30) find that the immediate gain in target share prices following the announcement is gone one year after the announcement date. If one wants to get abnormal returns, one has to sell immediately after the announcement.

2.9. Maloney, McCormick and Mitchell (1993)

Maloney, McCormick and Mitchell (1993) use data from the period of 1962-82. They research managerial decisions, in an attempt to find evidence that "more debt leads to better decisions" (Maloney, McCormick and Mitchell, 1993, p. 191). The decisions examined are acquisitions, and their hypothesis is that higher leverage should lead to higher abnormal returns. The paper is based on the debt-monitoring hypothesis, arguing that more debt reduces the agency cost in the firm. Maloney, McCormick and Mitchell (1993) find that there is a positive link between leverage and abnormal returns, but that the coefficient is relatively small. What they argue is that this proves that agency costs are a real issue, and that debt has a way of monitoring or reducing these costs. The study does not, however, take into account the cost of debt.

Maloney, McCormick and Mitchell use two different 3-day event windows in their research, one ending with the announcement date (-2, 0), and one symmetrical around

the announcement date (-1, 1). The debt-to-equity ratio is measured as the book value of long-term debt to the market value of equity one year, two years or five years prior to the deal. They do not find significant differences between the different time frames.

In order to single out the effect from the debt-to-equity ratio they also include the deal financing, since the choice of financing can be a signal to the market as well.

Maloney, McCormick and Mitchell (1993) also present a few alternative explanations for the positive link between debt-to-equity and abnormal performance due to the acquisition announcement:

- *Managerial risk aversion*
- *Signaling*
- *Wealth transfers from*
- *Leveraged returns*
- *Capital asset pricing contradictions*
- *Tax shields*

Maloney, McCormick and Mitchell (1993) do not find proof for any of these explanations, and conclude that their findings were caused by the debt-monitoring hypothesis.

2.10. Myers (1977)

Myers (1977) argues that larger companies tend to have higher gearing, and that a higher ratio of fixed assets compared to intangible assets allows a higher gearing rate within the company (ibid.). Furthermore, he argues that larger firms might receive a more positive response to restructuring activity in the marketplace than smaller firms. That implies that the higher the gearing, the higher the abnormal returns.

Myers (1977) thus offers a different explanation as to why one can find a positive link between abnormal returns to the acquirer's shareholders and the level of gearing.

2.11. MacKinlay (1997)

MacKinlay (1997) summarizes different event study methods by researchers such as Ball and Brown (1968, as referred to in MacKinlay, 1997, p. 14), Fama et al. (1969, as referred to in MacKinlay, 1997, p. 14) and Brown and Warner (1980 and 1985, as referred to in MacKinlay, 1997, p. 14), among others. By doing this, MacKinlay (1997) is creating a common methodology for conducting an event study. In this manner, he utilizes the research done on the theoretical method, as well as the practical application of the methodology.

MacKinlay (1997) describes two categories of models for estimating normal returns – statistical and economic models. The first category is based strictly on statistical assumptions. Two examples of such models are the Market Model and the Constant Mean Return Model. The second category of models follows from arguments concerning investors' behavior, and is not based solely on statistical arguments. Examples are the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT).

The CAPM is a restricted economic version of the Market Model, but the validity of the restrictions imposed by the CAPM was questioned by Fama and French (1996, as referred to in MacKinlay, 1997, p. 19). MacKinlay (1997) therefore argues that the Market Model is the preferred choice for event studies.

MacKinlay (1997) also argues that the Market Model is just as good a model as more sophisticated statistical models, such as Fama and French's Factor Model, which accounts for more than one explanatory variable. The reason is that studies referred to by MacKinlay (1997) find no significant improvement in the predictability for the more advanced models.

Chapter 3

Hypotheses

In this chapter, the hypotheses that form the basis on which I perform the analysis in chapter 6 are described. In the first part of this chapter the hypotheses regarding the cumulative average abnormal returns (CAAR or $\overline{CAR}$)[3] are outlined, and in the second part the hypotheses about factors that affect the $\overline{CAR}$ are presented.

3.1. CAAR

One can assume that the news of an acquisition results in a market reaction. What is of interest here is the direction of that reaction and whether the reaction is statistically significant.

3.1.1. Full Sample

I perform a linear regression and from that expect to find that the news of an acquisition has an overall positive effect for the acquiring companies, based on the findings by Gaughan (2007) and Fuller, Netter and Stegemoller (2002) outlined in chapter 2, and the fact that a large portion of the targets in the dataset are private firms[4]. This means that my starting point is this:

H_0: $\overline{CAR} = 0$

H_1: $\overline{CAR} > 0$

[3] The term "cumulative average abnormal returns" is explained thoroughly in chapter 4.
[4] There are 29 deals with public targets and 168 deals with private targets. See appendix A.5.

3.1.2. Subgroups

To examine the dataset further, I perform separate event studies and two-sample tests between different subgroups. By doing this I can examine whether there are any significant differences between given groups. At this point in the analysis I cannot draw direct inferences about the causality between the factors and the $\overline{CAR}$, because there might be other variables affecting both the factor and the $\overline{CAR}$ when comparing the two samples in this manner. What I can do is to find if there is a significant difference in the $\overline{CAR}$ between the two subgroups, and whether I can reject a null hypothesis that they belong to the same population. In other words I can test if I can reject a null hypothesis that the groups have equal means for the $CAR(\tau_1, \tau_2)$. The true mean is unknown, but the estimate of the mean for the $CAR(\tau_1, \tau_2)$ is $\overline{CAR}(\tau_1, \tau_2)$.

3.1.2.1. Gearing

The gearing ratio, or D/E-ratio, can be defined in a few different ways, and is commonly known as the debt-to-equity ratio. It is a measure of the firm's leverage. I use the definition used by Maloney, McCormick and Mitchell (1993): book value of long-term debt over market value of equity. I use the debt and equity values stated at the end of the accounting year before the event date. I divide the dataset into two based on the gearing ratio, where the one group has a gearing ratio between 0 and 1 and the other a gearing ratio larger than 1. When a company has a gearing ratio larger than 1, it owes more to debt holders than is owned by its shareholders. My hypothesis here is based on the findings of Maloney, McCormick and Mitchell (1993) that a high gearing ratio implies low agency costs:

H_0: $\overline{CAR}_{hi} - \overline{CAR}_{lo} = 0$

H_1: $\overline{CAR}_{hi} - \overline{CAR}_{lo} > 0$

3.1.2.2. Public or Private Target

Most of the targets in the dataset are not listed on an exchange. I will compare the $\overline{CAR}$ of companies acquiring privately owned targets to the $\overline{CAR}$ of companies acquiring public targets.

I expect to find that the deals with private targets create larger $\overline{CAR}$ to the acquiring company. This is in accordance with Fuller, Netter and Stegemoller (2002) as outlined in chapter 2.

H_0: $\overline{CAR}_{pr} - \overline{CAR}_{pu} = 0$

H_1: $\overline{CAR}_{pr} - \overline{CAR}_{pu} > 0$

3.2. Analyzing Cumulative Average Abnormal Returns

There are numerous reasons why different events have varying $\overline{CAR}$. To analyze this I build a statistical model using a few different explanatory[5] variables, as well as extraneous[6] variables, and perform an ordinary least square (OLS) regression where the $\overline{CAR}$ for each event is the dependent variable. This is also called a cross-sectional regression. In the following I outline the explanatory and extraneous variables to be included in the regression.

3.2.1. Explanatory Variables

The explanatory variables should all be linearly independent, or else the problem of multicolinearity will occur. This is a result of not enough information or variation in the data material. However, multicolinearity between the explanatory variables does not automatically induce low precision in the estimated parameter. (Møen, 2007) The background for choosing variables consists of previous literature as well as factors which can be assumed to say something about the level of principal-agent issues and the riskiness of the transaction.

[5] By explanatory variable I mean a variable that directly influence the independent variable, which is CAAR.
[6] By extraneous variable I mean a variable which may influence the independent variable, but which I do not find interesting for the purpose of this paper, or have no opinion regarding its direction.

The regression will provide a range of coefficients, one per explanatory variable, each with a corresponding standard deviation and t-statistic. I name the coefficients $\beta_{variablename}$.

In the following I define the variables I choose to include in the regression, and explain my hypothesis about which direction I expect them to affect $CAR_i(\tau_1, \tau_2)$.

3.2.1.1. Gearing

My hypothesis regarding gearing is based on the debt-monitoring hypothesis (Maloney, McCormick and Mitchell, 1993); that a high level of debt reduces the agency costs of the firm, and that an acquisition therefore is more likely to be linked to high abnormal returns for an acquirer with high leverage.

H_0: $\beta_{DE} = 0$

H_1: $\beta_{DE} > 0$

3.2.1.2. Public Target

As outlined in chapter 2, Fuller, Netter and Stegemoller (2002) find that privately held targets resulted in higher abnormal returns for the acquirer's shareholders than if the target had been publicly owned. The main reason they find for that is that privately held targets are less liquid and that they are traded with a liquidity discount. My hypothesis here is therefore:

H_0: $\beta_{pub} = 0$

H_1: $\beta_{pub} < 0$

3.2.1.3. Relatedness

It should be important to the market reaction whether or not the acquiring and target companies are in the same line of business or not, or more generally, whether the acquisition is horizontal as opposed to vertical or diversifying. As a proxy for this, I use

the first two digits in the acquirers' and targets' SIC-numbers. The relatedness-variable is a dummy variable with the value of 1 if they have the same two-digit SIC and the value 0 if not. I assume that an acquisition within the same line of business is perceived as an investment with less risk, and thus creates larger CAR to the bidding firm's shareholders. This is in accordance with the definitions and findings by Moeller and Schlingemann (2005):

H_0: $\beta_{relat} = 0$

H_1: $\beta_{relat} > 0$

3.2.1.4. Form of Payment

The form of payment varies between several different forms, such as cash or shares, or a mix of the two. Previous studies mentioned in chapter 2 (Shaheen, 2006 and Andrade, Mitchell and Stafford, 2001) examine the perceived effects related to the different forms of payment and find that, between shares and cash, cash results in significantly higher abnormal returns. Becher (2000) divides the observations between the ones being financed with cash only, the ones being financed with a mix of cash and shares and the ones being financed with shares only.

I use a dummy-variable that takes the value 1 if the payment method is cash only and 0 otherwise.

Based on the findings mentioned in chapter 2 I expect to find the following:

H_0: $\beta_{cash} = 0$

H_1: $\beta_{cash} > 0$

3.2.1.5. Withdrawn

Some of the deals in the dataset are never completed, but have a status saying "Announced", "Pending", "Rumored" or even "Withdrawn". The latter have not been withdrawn within the time of the event window. This is information that was not available at the time of the event. My hypothesis regarding this is based on the point that

deals that were never finished may not have happened because of a negative market reaction to the rumor. The hypothesis is therefore:

H_0: $\beta_{wd} = 0$

H_1: $\beta_{wd} < 0$

3.2.2. Extraneous Variables

3.2.2.1. Domestic Deal

The sample includes targets both within the U.S. and abroad, and the market reaction might differ on the basis of this. A dummy variable for domestic versus international deal is therefore included in the regression.

3.2.2.2. Return on Assets

Return on assets (ROA) is defined as the net income over book value of total assets at the end of the preceding accounting year, in accordance with Mei and Sun (2008). ROA is a proxy for the profitability of the company.

3.2.2.3. Time

Time defined as dummy variables for each year is included in the regression as a proxy for the business cycle. Since the industry is subject to strong influence from the business cycles, as mentioned in chapter 1, the time variable may influence the market reaction considerably.

Chapter 4

Methodology

An event study identifies the impact from the new information on the stock price through measuring the abnormal stock return around the time of the news release (MacKinlay, 1997). To do this, one must identify the event of interest, the stock's normal return and use a normal return model to identify the abnormal return at the time of the event. MacKinlay's methodology for event studies is outlined in this chapter, and then applied in chapter 6. Concluding this chapter, the use of cross-sectional regression is outlined.

4.1. MacKinlay's Procedure for Event Studies

I use the methodology, formulas and notations that MacKinlay outlined in his paper from 1997[7]. Further I use the following procedure as the basis for my analysis:

1. Determine the event of interest
2. Choice of event and estimation windows
3. Determine which firms to include in the analysis
4. Choice of normal returns model
5. Determine and analyze abnormal returns
6. Determine the statistical significance
7. Present the empirical results
8. Further analyze the results

Step 1 is explained and outlined in the introduction of this paper, whilst step 3 is described in chapter 5. Steps 7 and 8 can be found in chapters 6 and 7.

In the following chapter I describe the event study methodology for step 2, 4, 5 and 6 and relate the procedure to my analysis. Conclusively, I present methods to perform

[7] See chapter 2.11.

significance tests on the data and introduce some statistical issues that should be taken into consideration.

4.2. Choice of Event and Estimation Windows

Some notation (MacKinlay, 1997):

τ: date

$\tau = 0$: event date

$\tau = T_0$: start of estimation window

$\tau = T_1$: end of estimation window

$\tau = T_1 + 1$: start of event window

$\tau = T_2$: end of event window

$\tau = T_2 + 1$: start of post-event window

$\tau = T_3$: end of post-event window

L_1 = length of estimation window = $T_1 - T_0$

L_2 = length of event window = $T_2 - T_1$

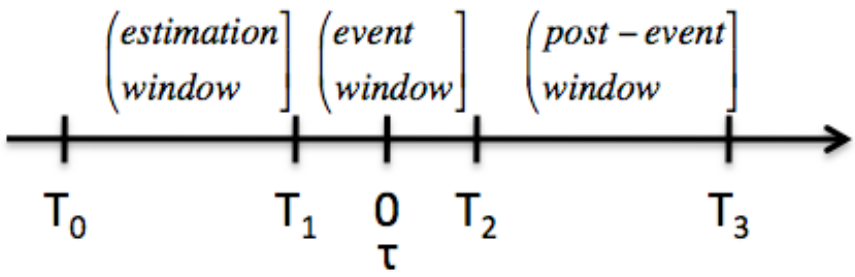

Figure 1: Timeline for an event study as described by MacKinlay (1997)

4.2.1. Identify the Event Time

When doing an event study, it is important to establish the time at which the event occurred.

It is sometimes possible to identify the exact time of the event, but this is rarely the case. Usually, one knows the news release date. Daily data is preferred to monthly stock data because the monthly data may be too rough and include other events than the one being analyzed. Knowing the news release date will therefore provide sufficient information to perform an event study.

In this analysis, it is therefore important to identify at what date the plan of an acquisition became publicly known. I use information given by Zephyr (2009) about which date the rumor of an acquisition reached the market.

4.2.2. Event Window

The event window is the period for which the researcher investigates the abnormal return. It is important to define how many days surrounding the event date the event window should be.

A possibly weak point is that even if one knows the time at which the news announcement was made public by the firm, one can never be sure if information has leaked out prior to the announcement. In addition to this concern, investors might not react to the news immediately, due to factors such as the opening hours of the stock exchange or non-trading days. The event window therefore usually covers several days, and is often, but not necessarily, symmetrically around the event date. This way, one can be more certain that the whole effect is being captured. The downside to increasing the number of days in the event window is that the analysis will become less revealing if unnecessary days are included.

Several papers have been written on the subject of event studies, and they all state different opinions about the length of the event window. Peterson (1989) claims that the typical event window is 21-121 days. Brown and Warner (1985) use 11 days in the event period in their analysis. MacKinlay (1997) states that the event window is usually larger than the exact event date. Andrade, Mitchell and Stafford (2001) claims that the

common event window choices are a 3 days event window, from one day before to one day after the announcement date, and an event window stretching from several days prior to the announcement until closing of the deal.

Becher (2000) claims that there are concerns regarding a longer event window for bidder firms. The number of days is up to the researcher, and the choice depends on how much leakage of information there may have been prior to the announcement and the delay of investor reactions after the announcement.

I choose to use three different event windows in my analysis. One is 21 days long and covers 10 days before and 10 days after the event date. The second is 11 days and covers 5 days before and after the event date. The last is 3 days long and covers 1 day before and after the event date.

4.2.3. Estimation Window

The estimation window is used to define the normal return model for the stock. MacKinlay (1997) defines normal return as ”the expected return without conditioning on the event taking place” (p. 15). It is most common to use the period prior to the event window to do this. The event window itself is not included, since the effect from the event might contaminate the definition of the normal return for the stock.

Brown and Warner (1985) use 239 days in the estimation window. Peterson (1989) states that the typical estimation window is 100 to 300 days. Choosing the number of days to include in the estimation window involves a trade-off between the power of the statistical model and the economic relevance of the estimated model when it is being used in the event window. MacKinlay (1997) uses a 250-day estimation window.

Sometimes a post-event window is included to estimate the normal return model. This is done in cases where there are gradual changes in the parameters, or when the risk of the firm changes because of the event.

I choose to include 300 days in my estimation window, all of which occur prior to the event window. The reason for using a relatively long estimation window is to ensure that the findings have high enough statistical power, but that the model is still economically relevant. The three different event windows call for three different

estimation windows. The (-10, 10) event window has a (-310,-11) estimation window, the (-5, 5) event window a (-305,-6) estimation window and the (-1, 1) event window a (-301,-2) estimation window.

4.3. Choice of Normal Return Model

The normal return can also be described as the stock's return in the event window if the event had not occurred. To find this normal return, the estimated parameters from the estimation period are applied to a model. In line with the findings by MacKinlay (1997)[8] I choose to use the Market Model with a single index as the independent factor.

To find the normal and abnormal return, one must estimate the parameters in the normal return model, here the chosen Market Model (MM). This can be done by performing a linear ordinary least squares (OLS) regression, given certain assumptions outlined in appendix D.2.

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

The OLS regression produces the parameters α_i, β_i and $\sigma(\varepsilon_i)$ from the data in the estimation window.

4.4. Determine and Analyze Abnormal Returns

4.4.1. Estimate Normal Returns

The abnormal return is the difference between the actual return and the estimated return under the market model in the event period. To find the abnormal return one must first estimate the normal return. This is done using observed data from the estimation period L_1.

$$\hat{\beta}_i = \frac{\sum_{\tau_0+1}^{T_1}(R_{i\tau} - \hat{\mu}_i)(R_{m\tau} - \hat{\mu}_m)}{\sum_{\tau_0+1}^{T_1}(R_{m\tau} - \hat{\mu}_m)^2}$$

[8] See chapter 2.11.

$$\hat{\alpha}_{\varepsilon_i} = \hat{\mu}_i - \hat{\beta}_i \hat{\mu}_m$$

$$\hat{\sigma}^2_{\varepsilon_i} = \frac{1}{L_1 - 2} \sum_{\tau=T_0+1}^{T_1} (R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau})^2$$

where

$$\hat{\mu}_i = \frac{1}{L_1} \sum_{\tau_0+1}^{T_1} R_{i\tau}$$

$$\hat{\mu}_m = \frac{1}{L_1} \sum_{\tau_0+1}^{T_1} R_{m\tau}$$

I use Scholes and William's (1977) method to adjust the model for missing values due to nonsynchronous trading. The basis of this model is to adjust the beta like this:

$$\hat{\beta}_i = \frac{\hat{\beta}_i^- + \hat{\beta}_i^+ + \hat{\beta}_i^0}{1 + 2\hat{\rho}_m}$$

The different betas are found through the regression:

$$R_{it} = \alpha_i + \beta_i^- R_{mt}^- + \beta_i^+ R_{mt}^+ + \beta_i^0 R_{mt} + \varepsilon_{it},$$

where R_{mt}^- and R_{mt}^+ refer to the market returns for the days before and after the day t. I have used $\hat{\alpha}_i$ and $\hat{\sigma}^2_{\varepsilon_i}$ estimated from this formula, and the $\hat{\beta}_i$ from the formula above.

The correlation coefficient, rho, is the estimated autocorrelation of the market return. It is estimated using:

$$\hat{\rho}_m = \frac{\hat{\sigma}_{r_{m,t}, r_{m,t-1}}}{\hat{\sigma}_{r_{m,t}} \hat{\sigma}_{r_{m,t-1}}}$$

4.4.2. Find Abnormal Returns

$$AR_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau}$$

$$\sigma^2(AR_{i\tau}) = \hat{\sigma}^2_{\varepsilon_i} + \frac{1}{L_1}\left[1 + \frac{(R_{m\tau} - \hat{\mu}_m)^2}{\hat{\sigma}^2_m}\right]$$

This conditional variance consists of two parts; the first part is the disturbance variance, and the second part is due to the sampling error in the estimated parameters. The latter can be ignored if the estimation window L_1 is sufficiently large, because the sampling error then approaches zero. The variance of the abnormal return is independent and constant over time when L_1 becomes sufficiently large.

$$\sigma^2(AR_{i\tau}) = \hat{\sigma}^2_{\varepsilon_i}$$

$$AR_{i\tau} \sim N(0, \sigma^2(AR_{i\tau}))$$

Under the null hypothesis that the event has no impact on the mean or variance of the firm's returns, the sample abnormal return has a normal distribution with zero mean and variance equal to $\sigma^2(AR_{i\tau}) = \hat{\sigma}^2_{\varepsilon_i}$.

In this study the null hypothesis is that the news announcement about an acquisition has no impact on the firm's returns. In other words, if the null hypothesis holds the announcement does not change the returns' mean or variance.

4.4.3. Aggregation of Abnormal Returns

To be able to draw general inferences about the event in question, the abnormal return observations must be aggregated. This is done in two ways; through time and across firms. The order of appearance should not matter, and I will in the following outline both methods.

a) Through time, then across securities

When aggregating through time, MacKinlay (1997) define $CAR_i(\tau_1, \tau_2)$ as a firm's cumulative abnormal return in L_2.

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

$$\sigma^2_i(\tau_1, \tau_2) = (\tau_2 - \tau_1 + 1)\sigma^2_{\varepsilon_i} = \text{var}(CAR_i(\tau_1, \tau_2))$$

Further, the $CAR_i(\tau_1, \tau_2)$ is aggregated across firms, and we get $\overline{CAR}(\tau_1, \tau_2)$.

$$\overline{CAR}(\tau_1, \tau_2) = \frac{1}{N}\sum_{i=1}^{N} CAR_i(\tau_1, \tau_2)$$

$$\sigma^2(\tau_1,\tau_2)=\frac{1}{N^2}\sum_i^N\sigma_i^2(\tau_1,\tau_2)=\text{var}(\overline{CAR}(\tau_1,\tau_2))$$

b) Across securities, then through time

To find the average abnormal return per day, one aggregates the abnormal return at each date across securities. This cumulated return is then divided by the number of securities, and provides a series of average abnormal returns across securities, $\overline{AR}(\tau)$.

$$\overline{AR}(\tau)=\frac{1}{N}\sum_{i=1}^N AR_{i\tau}$$

$$\sigma^2(\tau)=\frac{1}{N^2}\sum_i^N\sigma_i^2(\tau)=\text{var}(\overline{AR}(\tau))$$

Further, the time series is cumulated in the same way as before through time, and provides the cumulative average abnormal returns, $\overline{CAR}(\tau_1,\tau_2)$

$$\overline{CAR}(\tau_1,\tau_2)=\sum_{\tau=\tau_1}^{\tau_2}\overline{AR}(\tau)$$

$$\sigma^2(\tau_1,\tau_2)=\sum_{\tau=\tau_1}^{\tau_2}\sigma^2(\tau)=\text{var}(\overline{CAR}(\tau_1,\tau_2))$$

The covariance between events is set to zero as a result of the assumption that event windows do not overlap.

4.5. Determine the Statistical Significance

To test the null hypothesis H_0, which states that the cumulative average abnormal returns are zero, I use the distributional characteristics of the $\overline{CAR}(\tau_1,\tau_2)$:

$\overline{CAR}(\tau_1,\tau_2)\sim N(0,\text{var}(\overline{CAR}(\tau_1,\tau_2)))$,

using the estimated $\hat{\sigma}_{\varepsilon_i}^2$ from the Market Model and the Scholes and Williams (1977) adjustment as an estimate of the variance.

H_0 can be tested using a two-sided test:

$$\theta_1 = \frac{\overline{CAR}(\tau_1, \tau_2)}{\text{var}(\overline{CAR}(\tau_1, \tau_2))^{1/2}} \sim N(0,1)$$

One can also test the null hypothesis that each day's $\overline{AR}(\tau)$ is equal to zero. The distributional characteristics are:

$\overline{AR}(\tau) \sim N(0, \text{var}(\overline{AR}(\tau)))$, and the test statistic is:

$$\theta_1 = \frac{\overline{AR}(\tau)}{\text{var}(\overline{AR}(\tau))^{1/2}} \sim N(0,1)$$

When testing if two independent samples of observations, 1 and 2, have different $\overline{CAR}$, one must perform a two-sample t-test (Møen, 2007).

The null and alternative hypotheses are:

H_0: $\overline{CAR}_1$ - $\overline{CAR}_2$ = 0

H_A: $\overline{CAR}_1$ - $\overline{CAR}_2$ ≠ 0

The test statistic is:

$$\theta_1 = \frac{\overline{CAR}_1 - \overline{CAR}_2}{\sqrt{\frac{\hat{\sigma}_1^2}{n_1} + \frac{\hat{\sigma}_2^2}{n_2}}} \sim N(0,1) \text{ with } \nu = \frac{(\hat{\sigma}_1^2/n_1 + \hat{\sigma}_2^2/n_2)^2}{\frac{(\hat{\sigma}_1^2/n_1)^2}{n_1 - 1} + \frac{(\hat{\sigma}_2^2/n_2)^2}{n_2 - 1}}$$ degrees of freedom (Møen, 2007).

The null hypotheses can be tested on different confidence levels, the most common being 90%, 95% or 99%. The p-values resulting from the t-tests reflect the probability of finding an abnormal return with the value found in the analysis, or even further away from 0, assuming the null hypothesis is true. The level of confidence then allows insight as to whether or not one can reject the null hypothesis. If the chosen confidence level is 95% and one finds a p-value of 5% or less, the null hypothesis is rejected (ibid.).

4.6. Cross-sectional Regression

Cross-sectional regressions are used to find how company- and deal-specific characteristics affect the abnormal returns. This is done through an Ordinary Least Squares (OLS) regression with the cumulative abnormal return as the dependent variable. The assumptions for OLS are given in appendix D.1.

4.7. Statistical versus Practical Significance

Even if the hypothesis is rejected on a statistical level of significance, the results might still be practically significant in the meaning that the size and the sign of the coefficient provide valuable information even if the findings are statistically insignificant (Wooldridge, 2003).

4.8. Statistical Considerations

This section will introduce some of the key statistical issues for event study methods.

4.8.1. Clustering

When aggregating across observations, it is assumed that there is no clustering in the dataset, meaning that there is no overlap of event windows. If there is clustering, one cannot assume that the abnormal returns are independent across securities. There will be covariances different from zero between the securities, which causes the distributional results implied when using OLS to no longer hold (MacKinlay, 1997). One then risks making wrong inferences in the cross-sectional regression. According to Kothari and Warner (2006) cross-correlation biases the estimated standard deviation downward, and the test statistic upward. That means that one is more likely to make Type I errors[9].

4.8.2. Endogeneity

Endogeneity exists when there is correlation between an explanatory variable and the error term (Møen, 2007) in a regression. According to Wooldridge (2003) the most

[9] Type I error: To falsely reject the null hypothesis (Kothari and Warner, 2006)

common sources of endogeneity are omitted variables, measurement error and simultaneity.

The announcement of an acquisition is an endogenous event, and the managers of the announcing firm can usually control how, when and how much information is announced. Eckbo, Maksimovic and Williams (1990) find that both standard OLS and GLS estimators are inconsistent when it comes to such endogenous events. They also argue that because managers tend to act rationally, outsider investors will assume that the managers have insider information indicating that the investment decision has a positive net present value. Eckbo, Maksimovic and Williams (1990) infer that the abnormal returns in event windows can only exist if the manager has valuable private information.

Wooldridge (2003) recommends solving the issue by using instrumental variables. Eckbo, Maksimovic and Williams (1990) recommend solving it by using nonlinear estimators. These methods are both beyond the scope of this paper.

4.8.3. Heteroscedastic[10] Error Terms

The OLS cross-sectional regression assumes cross-sectionally uncorrelated and homoscedastic error terms[11]. In other words it assumes that the error terms are independent and identically distributed (i.i.d):

$$E(\varepsilon_{it}) = 0 \;\; \text{var}(\varepsilon_{it}) = \sigma^2_{\varepsilon_i}$$

MacKinlay (1997) recommends the use of robust standard errors instead of OLS standard errors to resolve the issue of heteroscedasticity. The method to calculate robust standard errors in this paper is the method suggested by Davidson and MacKinnon (1993, referred in Stata (2010)). The use of robust standard deviations will allow for less biased inferences when there is heteroscedasticity in the data.

[10] Heteroscedasticity means that the variance of the error term is not constant over time (Møen, 2007)
[11] The assumptions for OLS in the cross-sectional regression can be found in appendix D.1

Chapter 5

Data Collection

Throughout this chapter I present how and why I collected the data used in the analysis. First I comment briefly on the choice of market index, then my means for identifying the events used, and finally how the dataset was narrowed down due to statistical challenges. There are a total of 197 events, which are listed in appendix A.3. A summarizing list of restrictions can be found in Table 1 in the very beginning of this chapter.

Table 1: **Restrictions on dataset**

	Restrictions
1	Merger or acquisition
2	Acquirer quoted on AMEX, NYSE or NASDAQ
3	Acquirer's stock traded on a daily basis, and historical data available in CRSP
4	Rumored acquisition between January 1st 2002 and December 31st 2006
5	U.S. acquirer
6	Acquirer's SIC either 13 or 291
7	Acquirer must have a post-deal majority in target
8	Withdrawal of bid must not happen in event window
9	Only one acquiring company per deal
10	Acquirer's fundamentals available in Compustat
11	No intrafirm event-time clustering

5.1. Choice of Market index

MacKinlay (1997) refers to the S&P 500, the CRSP Value Weighted Index and the CRSP Equal Weighted Index as popular choices in event studies. I choose to use the CRSP Value Weighted Index.

5.2. Finding Events in Zephyr

When performing the event study it is important to pointedly define which firms should be included in the sample. Important selection criteria include type of industry, stock exchange, geographical area, and time frame of interest. These are often given through the hypothesis.

Further, it is important that the firms' stocks are frequently traded and that the event windows of the events are not overlapping. (MacKinlay, 1997)

The events needed to conduct this analysis are found using the online database Zephyr from Bureau van Dijk. This is an online, daily-updated database containing extensive information on M&A's, venture capital deals and Initial Public Offerings (IPO) (Zephyr, 2009). When using the database, a search strategy is chosen to narrow down the sample in accordance to the type of mergers and acquisitions the researcher is interested in. I outline the selection process in the following sections.

5.2.1. Quoted Acquirers

To enable an event study, the acquirers must be listed on a stock exchange. This study requires that they were listed at the time of the event on at least one of the main U.S. equity exchanges, NYSE, AMEX or NASDAQ. The stocks had to be traded on a daily basis. This paper does not require the targets to be quoted on an exchange.

5.2.2. Time Period

When deciding which time period to include in the analysis, there were three main factors which had to be evaluated. Firstly, if the data are recent, the results from the analysis become more relevant and interesting. It is also less likely that similar research has been performed before.

In addition to this, the time period should stretch out over approximately five years, to make any findings significant and thus the study more relevant.

The sixth merger wave started in the beginning of the 2000's, as mentioned in chapter 1. The oil industry is one of the industries that Gaughan (2007) mentions to be heavily

involved in the merger wave. I choose to follow Gaughan, and use the years from 2002-2006.

Based on the above-mentioned considerations, the time period chosen is from January 1st, 2002 to December 31st, 2006. The events in the analysis were rumored within this period. This means that news about an acquisition became generally known at the given date. Acquisitions with status ”withdrawn” are included unless the withdrawal date is within the event window.

5.2.3. Industry Classification

This study examines the effect of acquisitions for firms in the petroleum and natural gas industry, with targets in any industry.

When choosing how to define this in Zephyr, it is important that the industry is classified correctly. In this paper, the acquirers' activity is classified according to the US SIC code. This code was replaced by NAICS in 1997, but it is still possible to use the old system for classification.

The acquirers' activity is either classified as ”13 - Oil and gas extraction” or as ”291 - Petroleum refining” in the US SIC code.

5.2.4. Geographical Area

This thesis focuses on U.S. acquiring firms and targets being from all over the world. This makes it possible to examine the effect of geographical location of the target on the abnormal returns found in the event study.

5.2.5. Stake

In regards to the percentage of the target acquired, this paper requires that the part has to be known, and higher than 50 %. Events that do not fulfill the requirements have been excluded from the sample.

5.2.6. Type of Deal

The deal types included are ”Acquisition” and ”Merger”.

5.2.7. Deal Status

The deal status can be any, even ”Withdrawn” or ”Pending – Awaiting Approval”, as long as the withdrawal or rejection of the bid happened after the end of the longest event window. All the events where the withdrawal or rejection happened in the event window of +/- 10 days are removed from the sample.

5.2.8. Only One Acquiring Company in the Deal

A few of the deals involve several companies acquiring a target together. The deals examined contain only one acquiring company, because it would be hard to distinguish the effect on each acquiring company if the deals with several acquirers were to be included in the sample.

Zephyr provides a total of 329 deals, which can be found in appendix A.1.

5.3. Collecting Data from Compustat

To measure the impact from fundamental factors on the acquirers’ abnormal return, information from the companies’ balance sheets and income statements is necessary.

Compustat North America is a database providing such information for publicly traded companies in North America (Compustat Data Sets, 2009). The publisher is Standard & Poor’s.

The data collected from Compustat provides the information needed to compute some of the factors used in the cross-sectional regression.

A few of the companies do not have data available in Compustat, and are therefore removed from the sample entirely. These deals can be found in appendix A.2.

5.4. Clustering

Event-time clustering is an issue within the event study framework, which is discussed both in chapters 4 and 6.

Events where the same company has overlapping event windows[12] are removed from the dataset because of difficulty with measuring the impact on the company from each event.

All in all, I end up with a total of 197 events, which are listed in appendix A.3. Table 2 shows how the events are spread out in time. Table 17 in appendix A.3 shows the geographical spread.

Table 2: Summary of number of events per year

Year	*No of events*
2002	36
2003	35
2004	41
2005	40
2006	45
Total	197

[12] For the 21-day event window

Chapter 6

Analysis

In this chapter I present my findings based on the methodology and data in the previous chapters. I also analyze the findings in the light of previous studies and the hypotheses presented in chapters 2 and 3. I first perform an event study, before I analyze the abnormal returns based on deal- and firm-specific characteristics in a cross-sectional regression. Notation will follow that of MacKinlay[13] (1997). P-values are given for two-sided tests.

6.1. Event Study Analysis

In this section I first perform an event study on the whole sample of 197 events for the three different event windows[14]. Further, I perform separate event studies and two-sample tests on high versus low gearing and public versus private targets. The results will be printed in tables, and significant p-values will be marked with *c* for significance on a 90%-level, *b* for 95%-level and *a* for a 99% confidence level. Tables of the daily average abnormal returns, cumulative average abnormal returns, and the corresponding standard deviations and p-values can be found in appendix B.1.

6.1.1. The Entire Dataset

Table 3 summarizes the findings for the full dataset.

[13] See chapter 4.

[14] The event windows are from day -1 to day 1 (-1, 1), from day -5 to day 5 (-5, 5) and from day -10 to day 10 (-10, 10).

Table 3: Event study results - the whole dataset

(τ_1, τ_2)	*-1,1*	*-5,5*	*-10,10*
$\overline{CAR}(\tau_1, \tau_2)$	0.75%	1.71%	0.29%
St. dev. $\overline{CAR}(\tau_1, \tau_2)$	0.32%	0.61%	0.85%
Test statistic θ	2.3873	2.8207	0.3434
P-value	0.02[b]	0.01[a]	0.73
No of observations	197	197	197

6.1.1.1. 3–day Event Window

$\overline{CAR}$ for the entire sample is significantly positive on a 95% confidence level for the 3-day event window from -1 to 1. This implies that the bidder firms' shareholders experience positive abnormal returns on average over the period, which suggests that the market reaction is overall positive to the acquisition announcement. The daily average abnormal returns are all positive, and the day 0 and day 1 abnormal returns are statistically significant. This can be seen in appendix B.1.1. They are both significantly positive, which indicates that the market has a relatively immediate positive reaction to the acquisition. The fact that $\overline{AR}$ for day -1 is insignificant indicates that the event dates are well specified.

6.1.1.2. 11–day Event Window

$\overline{CAR}$ is significantly positive on a 99% confidence level for the 11-day event window. The market reaction is hence still positive, but on a higher level of confidence for the longer event window. Figure 2 shows the development in $\overline{CAR}$ over time. It is interesting to note that the two days with the highest average abnormal returns, days -5 and 4, are the only two days which are statistically significant on a 99% confidence level[15]. The returns on these two days are hence driving the results, and this might explain why the 11-day event window has a positive $\overline{CAR}$ on a higher level of confidence

[15] AAR and CAAR with corresponding p-values can be found in appendix B.1.1.

than the 3-day event window. The fact that these two days are the main drivers for the 11-day event window results cannot be explained by the event study theory.

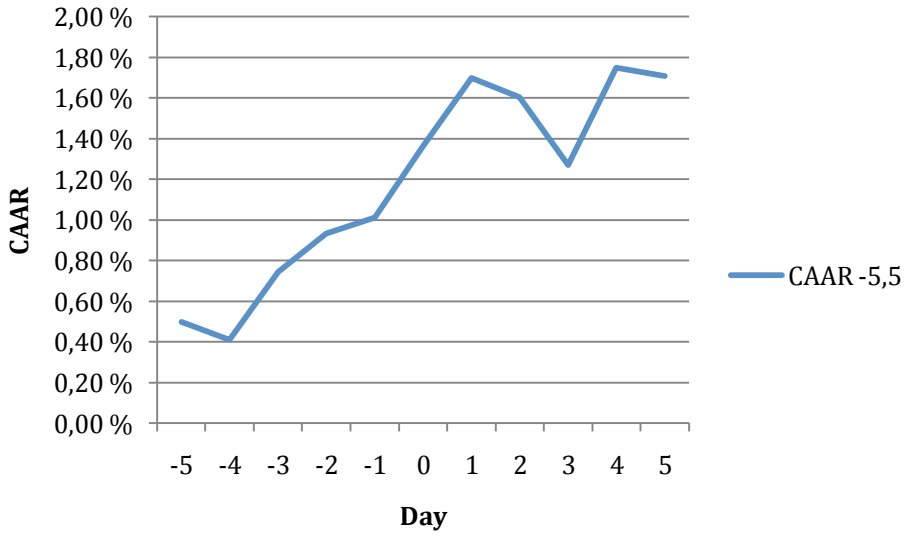

Figure 2: Daily development in CAAR (-5, 5)

6.1.1.3. 21-day event window

$\overline{CAR}$ for the 21-day event window is also positive, but it is not significant on any relevant[16] confidence level. This implies that I have no statistical support for making inferences regarding the market reaction for the 21-day event window. Figure 3 depicts the development in $\overline{CAR}(-10,10)$ over time. The figure shows how the greatest increase in $\overline{CAR}$ happens on the days closest to the event date. The days furthest from the event date seem to have a negative sign, and days -6, 3 and 10 are significantly so. Days -5 and 4 still have positive $\overline{AR}$[17] on a 99% confidence level, and they are also the two days with the highest absolute values. The fact that I cannot find that the longer event window has significant $\overline{CAR}$, indicates that the shorter event windows register the full effect from

[16] Relevant confidence levels are 90%, 95% or 99%.

[17] AAR and CAAR with corresponding p-values can be found in appendix B.1.1

the news announcement. This indicates that it is unnecessary to use such a long event window, because it in this case only reduces the statistical significance.

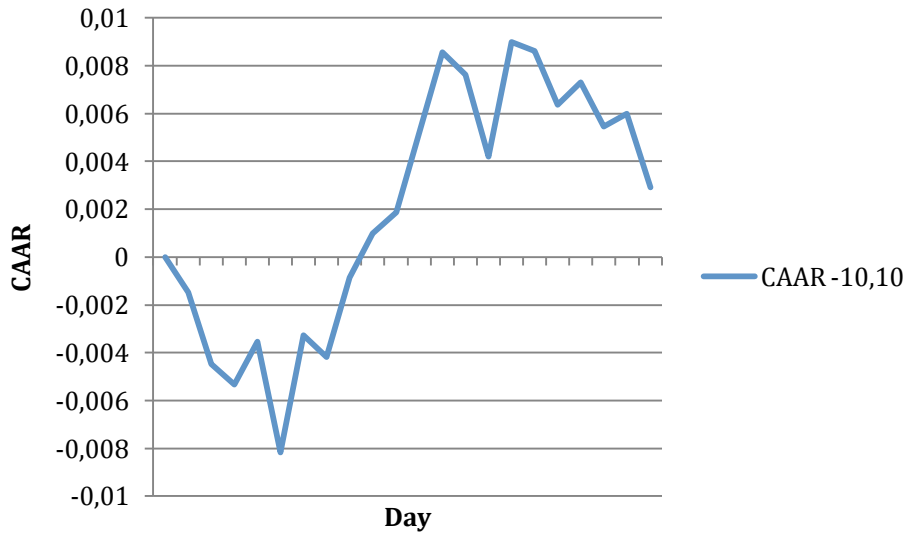

Figure 3: Daily development in CAAR (-10, 10)

To summarize the findings for the full sample, it seems as if $\overline{CAR}$ to the shareholders of the acquirer is larger than zero. My argument for this is that both of the two shorter event windows provide statistically significant and positive $\overline{CAR}$, and the (-10, 10) event window also provides a positive coefficient. As argued by Becher (2000), the shorter event windows may in fact register the full effect from the announcement. Additionally, there is a higher probability of other events contaminating the results for a longer event window.

Days 0 and 1 are significantly positive for all three event windows, on a 90% confidence level. The fact that both of these two days are significant and positive suggests that the stock market reaction is not strictly immediate, but that the delay is relatively limited.

6.1.2. High versus Low Gearing

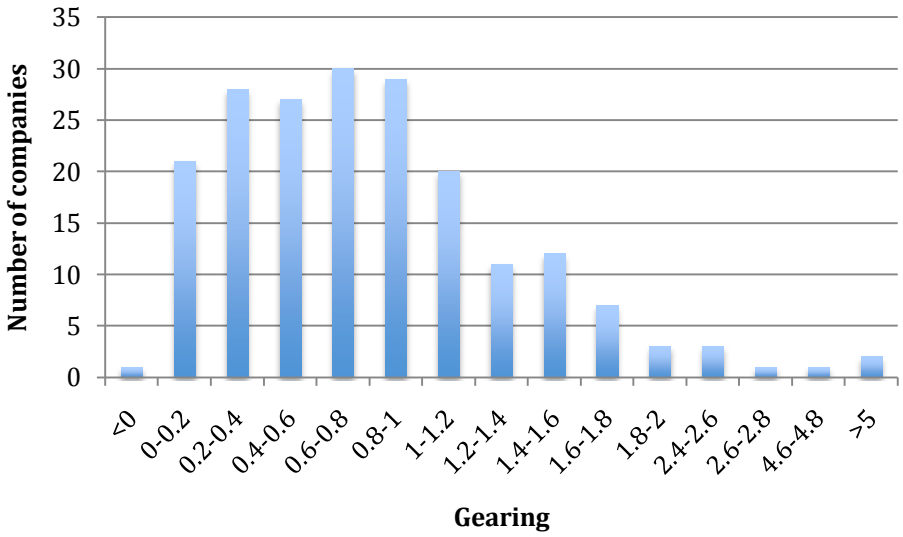

Figure 4: Histogram of the acquirers' level of gearing

This figure shows the variation in gearing level for the acquiring companies. The gearing is calculated as long-term debt over equity to shareholders. The list of deals and their characteristics can be found in appendix A.4.

In the further analysis I have divided the deals into two groups based on the bidder's level of gearing[18]. The daily levels of average abnormal returns and cumulative abnormal returns can be found in their entirety in appendix B.1.2, and Table 4 summarizes the findings.

[18] The groups are identified based on a gearing rate lower than - and higher than – 1, as outlined in chapter 3.

Table 4: Event study results – High versus low gearing

τ_1, τ_2	*-1,1*			*-5,5*			*-10,10*		
Gearing	*High*	*Low*	*Hi-Lo*	*High*	*Low*	*Hi-Lo*	*High*	*Low*	*Hi-Lo*
$\overline{CAR}(\tau_1, \tau_2)$	2.41%	0.03%	2.39%	3.86%	0.77%	3.10%	1.77%	-0.36%	2.13%
St. dev $\overline{CAR}(\tau_1, \tau_2)$	0.57%	0.38%		1.10%	0.73%		1.53%	1.01%	
Test statistic	4.2228	0.0698	2.2846	3.5108	1.0549	1.9036	1.1597	-0.3547	1.1532
P-value	0.00[a]	0.94	0.03[b]	0.00[a]	0.29	0.06[c]	0.25	0.72	0.25
No of observations	60	137		60	137		60	137	

6.1.2.1. 3-day Event Window

For the 3-day event window I find that the sample with high gearing has a statistically significant positive $\overline{CAR}$ on a 95% significance level. The findings for the subgroup with lower gearing are not statistically significant on any relevant level[19]. The two-sample t-test with unequal variances proves that the two samples have different mean $\overline{CAR}$ on a 95% confidence level. This is all summarized in Table 4. The results indicate that the group of companies with a gearing ratio higher than 1 has a statistically significant higher $\overline{CAR}$ than the group of companies with gearing ratio lower than 1. This further implies that the market reaction is more positive for the bidders with a higher level of gearing.

6.1.2.2. 11-day Event Window

The findings for the 11-day event window show the same results as for the 3-day event window.

6.1.2.3. 21-day Event Window

The 21-day event window dataset does not provide significant findings for either of the subgroups, as shown in Table 4. For a longer event window I cannot say that there is a

[19] Relevant confidence levels are 90%, 95% or 99%.

significant difference between the two groups' abnormal return, and thus cannot make inferences regarding differences in market reactions for the two groups.

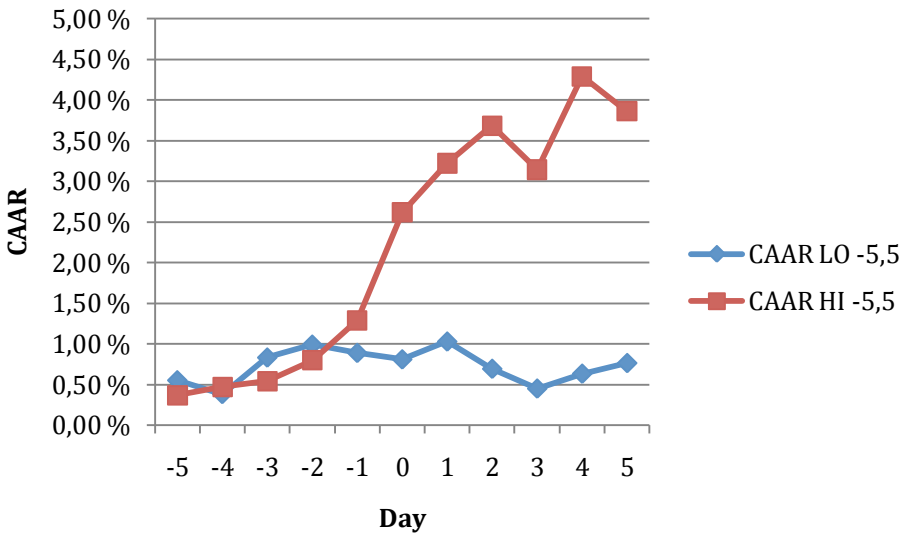

Figure 5: Daily development in CAAR (-5, 5) for high versus low gearing

Figure 5 shows how $\overline{CAR}$ develops over time for the two subgroups. The $\overline{AR}$ in day -5 is significant for the group of acquirers with lower gearing, and the $\overline{AR}$ in days 0, 1 and 4 are significant for the group with higher gearing[20]. All of those are significantly positive. This figure makes the difference between the two groups obvious, and it is interesting to see how the group with high gearing experiences a strong and positive reaction to the acquisition announcement.

My findings suggest that I can reject the null hypothesis suggesting that acquirers with high and low gearing have the same $\overline{CAR}$. The subgroup with the higher gearing has a higher $\overline{CAR}$ than the dataset as a whole (see Table 3) for all three event windows. This indicates that there is a factor in the higher gearing subgroup causing the $\overline{CAR}$ to be higher than average.

It is tempting to conclude that a higher gearing leads to higher abnormal returns after seeing the results from the two-sample t-tests. However, as mentioned before, there might be one or more other underlying factors driving these results.

[20] AAR and CAAR with corresponding p-values can be found in appendix B.1.2

One possible explanation, besides the agency cost hypothesis (Maloney, McCormick and Mitchell, 1993), is offered by Myers (1977), as presented in chapter 2. Myers argues that the size of the firm could be the underlying factor affecting both abnormal returns and level of gearing.

The issue of gearing driving abnormal returns is examined further in the cross-sectional regression later in this chapter.

6.1.3. Public versus Private Target

There are 29 deals with targets that were publicly listed and 168 deals with privately owned targets at the time of the acquisition announcement[21]. I have examined the difference in $\overline{CAR}$ between the two groups of deals through separate event analyses and a two-sample t-test, for all of the three event windows.

Table 5: Event study results – Public versus private target

τ_1, τ_2	*-1,1*			*-5,5*			*-10,10*		
	Private	*Public*	*Priv-Pub*	*Private*	*Public*	*Priv-Pub*	*Private*	*Public*	*Priv-Pub*
$\overline{CAR}(\tau_1, \tau_2)$	1.32%	-2.53%	3.85%	2.26%	-1.47%	3.73%	1.08%	-4.26%	5.34%
St. dev $\overline{CAR}(\tau_1, \tau_2)$	0.34%	0.79%		0.66%	1.52%		0.92%	2.10%	
Test statistic	3.8456	-3.1925	3.9026	3.4183	-0.9644	2.7118	1.1656	-2.0273	2.6852
P-value	0.00[a]	0.00[a]	0.00[a]	0.00[a]	0.34	0.01[a]	0.25	0.05[c]	0.01[b]
No of observations	168	29		168	29		168	29	

6.1.3.1. 3-day Event Window

As can be seen in Table 5, the group of bidders acquiring public targets has a significantly negative $\overline{CAR}$, on a 99% confidence level, whilst the group acquiring privately owned targets has a significantly positive $\overline{CAR}$ on the same level of confidence.

[21] A full list of the deals with public or private targets can be found in appendix A.5.

All the daily $\overline{AR}$'s have the same sign[22]. It is mainly the event-day average abnormal return that drives these results for both groups in the 3-day event window. The two-sample t-test also concludes that there is a significant difference between the two groups' means, indicating that the group of companies acquiring privately owned targets receives a more positive market reaction than the companies acquiring publicly held targets.

6.1.3.2. 11-day Event Window

The findings for the 11-day event window show a slightly different picture than what I could find for the 3-day event window. The directions of the $\overline{CAR}$'s are still the same, but now only the group acquiring private firms have a significant coefficient. However, the average abnormal return on day 0 is still significant for both groups, with the same sign as for the 3-day event window. The two-sample t-test also here allows for the null hypothesis of equal means to be rejected, on a 99% confidence level.

Figure 6 shows the daily development in $\overline{CAR}$ for the 11-day event window. It is interesting to note that there is a relatively large change from day -1 to day 0 for both groups, in opposite directions. This is clear also from looking at the daily $\overline{AR}$ in appendix B.1.3.

6.1.3.3. 21-day Event Window

For the 21-day event window I find that only the group acquiring public targets has a statistically significant coefficient for $\overline{CAR}$. The sign is still the same for both coefficients, and the two-sample t-test produces the same conclusion as before.

The findings for the three different event windows all signal that I can reject the null hypothesis that the $\overline{CAR}$ of the two groups are equal. The data seems to support the notion that firms which acquired private targets experienced a more positive market reaction and higher $\overline{CAR}$. Whether acquiring a private target, rather than a public one,

[22] AAR and CAAR with corresponding p-values can be found in appendix B.1.3.

leads to higher $\overline{CAR}$, will be further examined in the cross-sectional regression later in this chapter.

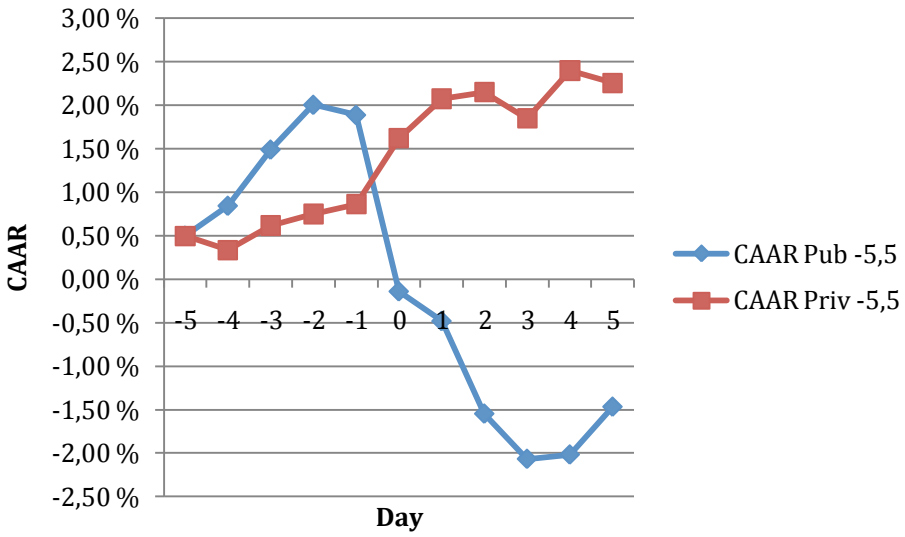

Figure 6: Daily development in CAAR (-5, 5) for public versus private target

6.2. Cross-sectional Regression Analysis

In this section I use deal- or company-specific factors to try and explain differences in $CAR_i(\tau_1, \tau_2)$ for different deals. To do this I perform an Ordinary Least Squares regression (OLS regression), with $CAR_i(\tau_1, \tau_2)$ as the dependent variable. I do this for all three of the event windows.

I use the variables defined in chapter 3, and these variables provide the following basis for the regression:

$$\overline{CAR}(\tau_1, \tau_2) = DE_i*\beta_{DE} + pub_i*\beta_{pub} + relat_i*\beta_{relat} + cash_i*\beta_{cash} + wd_i*\beta_{wd} + dom_i*\beta_{dom} + ROA_i*\beta_{ROA} + d02_i*\beta_{02} + d04_i*\beta_{04} + d05_i*\beta_{d05} + d06_i*\beta_{d06} + \varepsilon_i ,$$

where

- "DE" is the percentage gearing rate for the acquiring firm
- "pub" is a dummy variable for public target

- "relat" is a dummy variable for relatedness
- "cash" is a dummy variable for cash as the form of payment
- "wd" is a dummy variable for withdrawn bid
- "dom" is a dummy variable for domestic deal
- "ROA" is return on asset for acquiring firm
- "d02"-"d06" are dummy variables for year of event[23]
- ε_i is the error term.

Aside from this I follow the notation given by MacKinlay as outlined in chapter 3.

I perform four different cross-sectional regressions on each event window. The first regression (1) includes all the independent variables listed above. The second (2) excludes the time dummies. The third (3) excludes the ROA-variable and the domestic deal dummy variable as well. The fourth regression (4) includes only the gearing variable and the public target dummy.

In the following I present and analyze the results from the different versions of the regression analysis on the CAR (-5, 5)[24], comment on any significant variables in the regressions, and finally comment on overall results from the cross-sectional regression analysis.

[23] The dummy variable for 2003 is left out of the analysis because only (N-1) of the years need to be included as dummy variables.

[24] The summarizing tables from the 3-day and 21-day event windows can be found in appendix C.1.

6.2.1. Results

Table 6: Results from the cross-sectional regression for the 11-day event window

	1			*2*			*3*			*4*		
	Coef.	*Std. error*	*P-value*	*Coef.*	*Std. error*	*P-value*	*Coef.*	*Std. error*	*P-value*	*Coef.*	*Std. error*	*P-value*
DE	-0.0001	0.09%	0.89	-0.0002	0.08%	0.8	0.0002	0.08%	0.79	0.0002	0.06%	0.72
pub	-0.0343	1.45%	0.02[b]	-0.0333	1.42%	0.02[b]	-0.0322	1.45%	0.03[b]	-0.037	1.39%	0.01[a]
relat	-0.0028	1.61%	0.86	-0.0035	1.54%	0.82	-0.0044	1.62%	0.79			
cash	0.0175	1.29%	0.18	0.0187	1.25%	0.14	0.0154	1.26%	0.22			
wd	-0.0375	4.42%	0.4	-0.0407	3.98%	0.31	-0.0197	3.21%	0.54			
dom	0.0091	1.50%	0.55	0.0098	1.45%	0.5						
ROA	-0.4105	30.91%	0.19	-0.3889	30.34%	0.2						
d02	0.0236	1.76%	0.18									
d04	0.0179	1.36%	0.19									
d05	0.0096	2.64%	0.72									
d06	0.0186	1.55%	0.23									
cons	0.0173	2.20%	0.43	0.0302	2.55%	0.24	0.0207	1.56%	0.19	0.0222	0.70%	0.00[a]
R^2		9.18%			8.38%			2.96%			2.30%	

6.2.1.1. Explanatory Variables

As can be seen in Table 6, only one of the explanatory variables is statistically significant on any relevant level, and that is the dummy variable for public targets. Whether or not the target is publicly owned has a statistically significant impact on the acquirer's cumulative abnormal return. All four regressions find it to be a negative impact on the bidding firm's CAR if the target is publically owned, and not private. The variable is significantly negative, which implies that the wealth effect for acquirer shareholders is lower when the target is public than when it is privately owned, all other equal. This is as expected, and in line with my hypothesis in chapter 3.2. The reason could be, as argued by Fuller, Netter and Stegemoller (2002), a liquidity discount caused by the fact that privately owned firms are less liquid than publicly traded companies. That also means that publicly traded targets are more likely to be targeted by several firms, and are thus more likely to experience a bidding war.

The gearing variable, DE, has shifting, and small, negative and positive values in the different regressions for the 11-day event window, and none of the coefficients are significant. The variation in sign of the gearing variable implies that there is some sort of correlation between the company's gearing and one or several of the other variables. I fail to reject the null hypothesis that the acquirer's gearing level has no impact on its CAR. Given the size of the coefficient and the shifting sign, however, it might seem as if the gearing variable is economically insignificant either way. It is interesting to see that the very significant difference between the shareholder gains to the groups of bidders with high and low gearing was not caused directly by the level of gearing. The cross-sectional regression shows that there must be another underlying factor causing the results in section 6.1.2.

The dummy variable for withdrawn bid is negative in the three regressions where it is included. The findings are the same for the 3-day and 21-day event windows[25]. The sign is in line with my hypothesis, and implies that if a bid is later withdrawn, the CAR surrounding the event date is smaller, everything else held equal. The findings are however statistically insignificant, except for the longest event window. The coefficient is based on information that was not available to the market at the time of the announcement, and the inferences are thus not clear. The results for the other coefficients still hold if the wd-coefficient is excluded from the regressions entirely.

The dummy variable for relatedness is negative, but statistically insignificant in all of the different regressions for the 11-day event window. I cannot reject the null hypothesis that whether or not the companies are in the same line of business prior to the deal has no effect on CAR. The reason for coefficients having opposite sign of what I had hypothesized may be incorrect specifications given by Zephyr about the firms. The SIC-codes they provide are possibly not from the exact time when the deal happened. The coefficients from the regressions for the two other event windows are positive.[26]

Form of payment is included here as a dummy variable for cash only and it is positive for all of the regressions in which it is included. The variable is insignificant in all the regressions, and therefore I cannot reject the null hypothesis that it does not have an effect. The coefficients do have the sign I predicted based on previous studies. The

[25] See appendix C.1.
[26] See appendix C.1

reason for why I find only insignificant results may be that the variable is incorrectly specified. In previous studies, upon which I built my hypothesis, the form of payment is cash, stock, or a mix of the two. In my dataset the forms of payment were more complex, and this might have led to difficulty finding significant results.

6.2.1.2. Extraneous Variables

The dummy variable for domestic deals is positive, but statistically insignificant. This is in line with the arguments made by Gaughan (2007) based on numerous previous studies; that the globalized business environment leads to smaller differences between acquiring domestic or international targets.

The time dummy variables are all positive, but insignificantly so. A joint F-test on the dummy variables provides a P-value of 0.4455, which support that time is insignificant for the level of CAR.

Return on assets seems to affect CAR negatively. The effect is statistically insignificant in all the regressions.

6.2.1.3. Endogeneity

According to Myers (1977), the size of the acquirer can be driving both the gearing ratio, as well as abnormal returns. This means that size might be an omitted variable in my analysis, causing endogeneity in the results. Fuller, Netter and Stegemoller (2002) find that the relative size of the deal magnifies the effect from the target being either public or private. The relative transaction size may also be affecting the abnormal returns, as Schlingemann (2004) finds in his analysis. This might mean that the relative transaction size should have been included in the regression. Because it is not, there might be endogeneity in the results.

Additionally, there should probably have been a variable reflecting the relationship between private information and external expectations. I base this on the argument by Eckbo, Maksimovic and Williams (1990), mentioned in chapter 4.8. One solution to solve the problem with endogeneity can be to use ML estimators as described by Eckbo,

Maksimovic and Williams (1990) and Wooldridge (2003), but this is, as mentioned, beyond the scope of this paper.

Chapter 7

Robustness Analysis

This chapter consists of four different sections, each with the goal of analyzing the robustness of the results in the previous chapter. In the first section I test to what extent extreme observations of CAR are driving the results. In the second I test for regular betas instead of Scholes and William's (1977) beta. In the third part I see how the results might change if I use the default OLS standard errors instead of robust standard errors. Finally, in the fourth section, I perform an event study including only events with no overlapping event windows to examine how clustering is affecting my results.

7.1. Extreme Observations

It is interesting to examine the most extreme observations in order to see how much they affect the results and more specifically if there are any changes from the significance found in chapter 6. Extreme values may be caused by multiple kinds of errors, but they may also very well be real in the sense that they are a true effect from the event.

7.1.1. Extreme Values of CAR(-5,5) versus Beta Estimates

In order to see if potentially erroneously estimated beta values are driving the results found in chapter 6 I compare the observations with a cumulative abnormal return[27] higher than 20% or lower than -20%, with their corresponding beta values[28]. An overview can be found in Table 7. Two of the extreme CAR's have beta estimates larger than 2, but one has a low beta estimate of 0.20. I cannot see that there is any clear connection between the beta estimates and the extreme values of CAR for these

[27] For the (-5,5) event window

[28] The beta estimates are the Scholes and Williams' (1977) estimates for the 11-day event window used in the previous chapters.

observations. I therefore conclude that there must be either be a different error causing the extreme values, or they are just a true effect from the events in question.

Table 7: Extreme observations - CAR versus Beta

Deal no.	*CAR(-5,5)*	*Beta*
288	-22.51%	1.25
324	20.88%	2.41
69	24.03%	1.22
166	25.73%	0.20
229	27.17%	2.90
286	*27.98%*	*1.84*
228	70.70%	1.27

7.1.2. Analysis Without Extreme Values of CAR(-5,5)

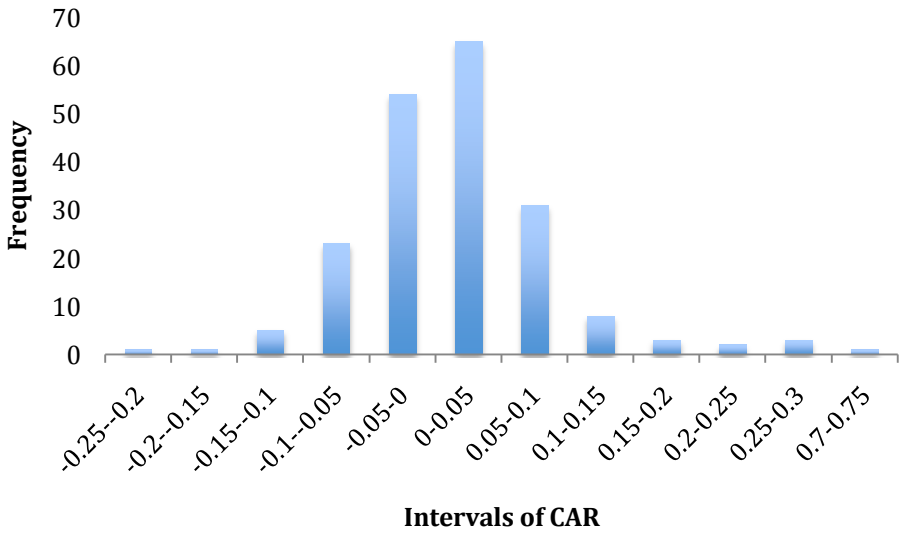

Figure 7: Histogram of CAR (-5, 5)

I remove the 2%, 5% and 10% of the highest and lowest observations of CAR (-5, 5). This means that I remove 1%, 2.5% and 5% of the highest and equal portions of the lowest observations of CAR[29].

It is important to note that of the observations that are removed, the positive ones have a larger absolute value of CAR than the negative ones, which can be seen in the histogram in Figure 7. This leads to the findings in Table 8, where the coefficients of $\overline{CAR}(-5,5)$ are lower after removing the extreme values. The positive result is however still significantly positive, though on a lower level when the most extreme values are removed. When looking at the daily $\overline{AR}$[30], one can see that $\overline{AR}$ from days -5 and 4 are still significant, but on a lower level of confidence than in chapter 6. Day 1 $\overline{AR}$ is only significant for the two datasets with the fewest removed observations. The day 0 $\overline{AR}$, which was significantly positive on a 90% confidence level[31], is now statistically insignificant for all the versions without extreme values. This implies that the events with the 2% most extreme values of CAR are driving the findings for the event day.

Table 8: Event study results without extreme observations

	2%	*5%*	*10%*	*Original*
$\overline{CAR}(-5,5)$	1.45%	1.30%	1.16%	1.71%
St. dev. $\overline{CAR}(-5,5)$	0.60%	0.60%	0.60%	0.61%
Test statistic θ	2.4186	2.1718	1.9188	2.8207
P-value	0.02[c]	0.03[b]	0.06[c]	0.01[a]
No of observations	193	187	177	197

Since the results from the event study are fairly consistent for the three different datasets, I test only one of them in a cross-sectional regression. I use the dataset where 5% of the extreme values are removed. I continue to use robust standard errors, and the

[29] The removed observations are listed in appendix A.6

[30] AAR and CAAR with corresponding p-values can be found in appendix B.1.4

[31] AAR and CAAR with corresponding p-values can be found in appendix B.1.1

regressions are equivalent to the ones in chapter 6. The results are summarized in Table 9, and can be compared to the original results in Table 6 on page 45.

Table 9: Results from the cross-sectional regression without extreme observations

	1			*2*			*3*			*4*		
	Coef.	*Std. error*	*P-value*	*Coef.*	*Std. error*	*P-value*	*Coef.*	*Std. error*	*P-value*	*Coef.*	*Std. error*	*P-value*
DE	-0.0002	0.09%	0.86	-0.0001	0.07%	0.84	0.0001	0.07%	0.88	0.0002	0.05%	0.75
pub	-0.0202	1.21%	0.10[c]	-0.0196	1.16%	0.09[c]	-0.0172	1.21%	0.16	-0.0202	1.12%	0.07[c]
relat	0.0057	0.94%	0.54	0.0059	0.94%	0.53	0.0064	0.98%	0.51			
cash	0.0132	1.01%	0.19	0.0143	0.97%	0.14	0.0131	0.97%	0.18			
wd	-0.0321	3.61%	0.38	-0.0376	3.37%	0.27	-0.0274	3.06%	0.37			
dom	0.0131	1.02%	0.2	0.0116	0.99%	0.25						
ROA	-0.214	10.25%	0.04[b]	-0.2178	9.89%	0.03[b]						
d02	0.0065	1.36%	0.64									
d04	0.0176	1.33%	0.19									
d05	0.0061	1.27%	0.63									
d06	0.0062	1.21%	0.61									
cons	0.0009	1.51%	0.95	0.0094	1.29%	0.47	0.0076	0.79%	0.33	0.0156	0.47%	0.00[a]
R^2		8.2%			7.21%			3.32%			1.59%	

The dummy variable for public target is still significantly negative, but it is significant on a lower level of confidence. For regression 3 it is even insignificant on any relevant level. The negative coefficient is smaller after removing the 5% most extreme values. This can be explained by looking at the 10 observations that were excluded: two out of the five observations with the lowest CAR are publicly listed, whilst five out five of the observations with highest CAR are privately owned. Additionally, these highest 5 CARs were considerably larger in absolute value than the five lowest CARs.

Interestingly, I also find that the variable for return on assets becomes significantly negative when removing the 10 most extreme observations of CAR. This means that a larger return on assets, which is a proxy for profitability, leads to lower abnormal returns to the bidder's shareholders, all other equal.

My conclusion is that the previous findings where bidders experience an overall significant positive $\overline{CAR}$ and that privately owned targets leads to higher CAR still hold after removing the most extreme observations. Additionally, I find that ROA affects CAR negatively on a statistically significant level after removing the most extreme observations. However, the findings of positive average abnormal return on the event day no longer hold.

7.2. Regular Beta Estimates

As described in chapter 4, I originally used Scholes and Williams' (1977) method to adjust the model to deal with nonsynchronous trading. In this section I examine what effect that adjustment has had on my results, if any.

The results when using a regular beta, calculated as outlined in chapter 4.4.1, p. 22, are summarized in Table 10, and they are approximately the same as the original results in Table 3, page 34. The daily $\overline{AR}$s[32] do not differ much from the daily $\overline{AR}$s[33] with adjusted betas.

Table 10: Event study results with regular beta estimates

τ_1, τ_2	*-1,1*	*-5,5*	*-10,10*
$\overline{CAR}(\tau_1, \tau_2)$	0.70%	1.70%	0.25%
St.dev. $\overline{CAR}(\tau_1, \tau_2)$	0.32%	0.61%	0.85%
Test statistic θ	2.2127	2.7878	0.2975
P-value	0.03[b]	0.01[a]	0.77
No of observations	197	197	197

I conclude that the use of adjusted beta estimates did not significantly affect my findings, and that might imply that nonsynchronous data is not an issue in this dataset.

[32] AAR and CAAR with corresponding p-values can be found in appendix B.1.1.

[33] AAR and CAAR with corresponding p-values can be found in appendix B.1.5.

7.3. OLS Standard Errors

As outlined in chapter 4, I use robust standard errors when performing the cross-sectional regression in chapter 6. To examine the effect this has on my results I perform a cross-sectional regression using ordinary least squares standard errors, which are assuming homoscedasticity[34]. I perform the regressions on the 11-day event window, and the results are summarized in Table 11. The results can be compared to the original results in Table 6 on page 45.

Table 11: Results from the cross-sectional regression with OLS standard errors

	1			*2*			*3*			*4*		
	Coef.	*Std. error*	*P-value*	*Coef.*	*Std. error*	*P-value*	*Coef.*	*Std. error*	*P-value*	*Coef.*	*Std. error*	*P-value*
DE	-0.0001	0.09%	0.88	-0.0002	0.09%	0.82	0.0002	0.09%	0.82	0.0002	0.09%	0.8
pub	-0.0343	1.84%	0.07[c]	-0.0333	1.83%	0.07[c]	-0.0322	1.86%	0.09[c]	-0.037	1.76%	0.04[b]
relat	-0.0028	1.43%	0.84	-0.0035	1.41%	0.8	-0.0044	1.44%	0.76			
cash	0.0175	1.44%	0.23	0.0187	1.40%	0.18	0.0154	1.42%	0.28			
wd	-0.0375	4.64%	0.42	-0.0407	4.54%	0.37	-0.0197	4.59%	0.67			
dom	0.0091	1.66%	0.58	0.0098	1.63%	0.55						
ROA	-0.4105	12.15%	0.00[a]	-0.3889	11.83%	0.00[a]						
d02	0.0236	2.08%	0.26									
d04	0.0179	2.01%	0.38									
d05	0.0096	2.04%	0.64									
d06	0.0186	1.99%	0.35									
cons	0.0173	2.26%	0.44	0.0302	1.81%	0.10[c]	0.0207	1.21%	0.09[c]	0.0222	0.69%	0.00[a]
Adj. R^2		3.78%			4.99%			0.42%			1.30%	
R^2		9.18%			8.38%			2.96%			2.30%	

I find that with OLS standard errors, ROA is a significant independent variable. Its coefficient is significantly negative. However, since this is a method that wrongfully assumes that the stock returns are homoscedastic, I cannot draw any inferences solely on the basis of this result.

[34] See appendix D

My conclusion regarding public versus private target still holds with the use of OLS standard errors, though the statistical significance is somewhat lower.

7.4. Clustering

To test how big an issue the clustering is in the dataset, I perform an event study on only events without overlapping event windows. I use the 3-day event window, so that as many of the observations as possible can still be included in the sample. By performing this test I can examine a purer effect from the acquisition announcements.

The sample consists of 102 observations[35], and Table 12 summarizes the event study on the sample, and compares the result with those from the original dataset. The coefficient for the bidders' $\overline{CAR}$ is larger and significant on a higher level of confidence than for the whole dataset, and one can perhaps argue that the removed observations blurred the results when testing the whole dataset. However, there might be other underlying factors which are causing the $\overline{CAR}$ to change, so I cannot generally state that the impact from other events causes a lower $\overline{CAR}$.

Table 12: Event study results without overlapping event windows

	Without overlap	*Original dataset*
$\overline{CAR}(-1,1)$	1.75%	0.75%
St.dev. $\overline{CAR}(-1,1)$	0.47%	0.32%
Test statistic θ	3.7419	2.3873
P-value	0.00[a]	0.02[b]
No of observations	102	197

Furthermore, the results from the cross-sectional regression are summarized in Table 13. None of the rumored acquisitions in this data sample were withdrawn, and the wd-

[35] The observations can be found in appendix A.7.

variable is therefore excluded from the cross-sectional regression. The results in Table 13 can be compared to the findings for the whole dataset in appendix C.1, Table 29.

Table 13: Results from the cross-sectional regression without overlapping event windows

	1			*2*			*3*			*4*		
	Coef.	*Std. error*	*P-value*	*Coef.*	*Std. error*	*P-value*	*Coef.*	*Std. error*	*P-value*	*Coef.*	*Std. error*	*P-value*
DE	0.0013	3.66%	0.97	0.0009	3.57%	0.98	0.0012	3.90%	0.98	0.0012	3.86%	0.98
pub	-0.0464	2.44%	0.06[c]	-0.045	2.43%	0.07[c]	-0.0453	2.32%	0.05[c]	-0.0448	2.12%	0.04[b]
relat	-0.0021	2.06%	0.92	0.0022	1.95%	0.91	-0.0012	2.15%	0.96			
cash	-0.0001	1.39%	0.99	0.0039	1.32%	0.77	0.0018	1.25%	0.89			
dom	0.0042	1.85%	0.82	0.0047	1.87%	0.8	0.0067	1.89%	0.73			
ROA	-0.2809	33.44%	0.4	-0.2748	31.82%	0.39						
d02	0.0454	2.22%	0.04[b]									
d04	0.0334	1.73%	0.06[c]									
d05	0.03	2.96%	0.31									
d06	0.0129	2.06%	0.53									
cons	0.0051	4.63%	0.91	0.0262	4.33%	0.55	0.0148	3.48%	0.67	0.0201	3.50%	0.57
R^2	15.16%			10.59%			5.33%			5.21%		

I do not find great differences in the significance between the two regressions. The greatest difference between the two regressions is that two of the years are now significant. As long as they are not all significant there is probably not a systematic change in CAR (-1, 1) over time. Another difference between the regressions is that the dummy variable for public or private target now becomes less significant, but it is still significant on a 90% and 95% confidence level.

When choosing to remove 95 observations from the dataset without any economic argument to do so, I risk drawing inferences that are not true. Hence, I cannot say that these results prove my previous findings right. I can however say that they do not prove my previous findings to be wrong, which means that I am not making a Type I error, which is mentioned as one of the risks by Kothari and Warner (2006).

After having performed these four tests on my data, I can conclude that my main findings from chapter 6 are not driven by extreme observations and they do not rely heavily on the specification of beta or the standard deviation. Additionally, it might seem as if my results would hold even for unclustered data. This last point would have to be investigated further.

Chapter 8

Conclusion

First and foremost, my study provides evidence that acquiring firms in the U.S. petroleum industry experience positive and statistically significant $\overline{CAR}$[36], and thus positive shareholder gains. These results do not seem to be driven by extreme observations, they are robust to the specification of the beta coefficients and they seem to hold even for unclustered data.

Through separating the dataset into two groups based on the bidding firms' gearing ratios[37], I find that the two groups have significantly different cumulative average abnormal returns. Further, I find that the group with the higher level of gearing has higher $\overline{CAR}$, which indicates that the group of bidders with a higher level of gearing experiences a more positive market reaction. This result is consistent with the debt-monitoring hypothesis. However, when testing this result in a cross-sectional regression I do not find that the level of gearing has any significant effect on the acquirers' $\overline{CAR}$. This implies that one or more of the other included variables picks up the effect. There may also be another unknown factor present that is linked to both the acquirers' level of gearing and the $\overline{CAR}$.

I also separate the dataset into two, based on whether the target was publicly traded or privately owned. What I find here is that the group with privately owned targets has a significantly higher $\overline{CAR}$ than the group with public targets. This is in line with the liquidity discount theory as presented by Fuller, Netter and Stegemoller (2002). I find the same result when performing the cross-sectional regressions, and the findings are consistent in all of them. The significant positive findings here may also explain the fact that I find significantly positive abnormal returns for the full dataset, since I have 168 private targets and only 29 public ones. This result also seem robust to the three factors mentioned above.

[36] The results are only significant for the 3-day and 11-day event window. The result is statistically insignificant for the 21-day window.

[37] Gearing ratio lower than 1 versus higher than 1

The petroleum industry is said to be an especially global industry. My results are consistent with this, through the fact that I find that it is statistically insignificant whether the target is a domestic or an international firm in the cross-sectional regression. My findings are also consistent with the findings in other studies described in chapter 2. Those findings are based on other industries or a combination across industries. This implies that the U.S. petroleum industry has some features in common with other U.S. industries, and that the general findings from the U.S. on merger gains for acquirers can be applied for the petroleum industry as well.

8.1. Future Research

It could be interesting to apply some more refined techniques, such as nonlinear models as suggested by Eckbo, Maksimovic and Williams (1990), on this dataset to see if the inferences still hold. Additionally, including size as an explanatory variable in the cross-sectional regression to see if that variable might explain some of the variation in CAR might be rewarding.

Further, it could be interesting to examine long-term effects from the acquisitions by examining the companies' financial statements.

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Appendix A

Lists of Events

A.1. List of Events

Table 14: Original list of events from Zephyr

This list shows all the events in the original dataset from Zephyr (2009), with targets, acquirers, nationalities and event dates.

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
1	Air Products and Chemicals Inc.	US	Ashland Inc's electronic chemicals business	US	30.06.03
2	Allis-Chalmers Energy Inc.	US	Capcoil Tubing Services Inc.	US	03.05.05
3	Allis-Chalmers Energy Inc.	US	Specialty Rental Tools Inc.	US	22.12.05
4	Allis-Chalmers Energy Inc.	US	Rogers Oil Tool Services Inc.	US	04.04.06
5	Allis-Chalmers Energy Inc.	US	DLS Drilling Logistics and Services Corporation	BO	28.04.06
6	Allis-Chalmers Energy Inc.	US	Petro Rentals Inc.	US	18.10.06
7	Allis-Chalmers Energy Inc.	US	Oil & Gas Rental Services Inc.	US	26.10.06
8	Alon USA Energy Inc.	US	Paramount Petroleum Corporation	US	01.05.06
9	Alon USA Energy Inc.	US	Edgington Oil Company's assets	US	01.05.06
10	Amerada Hess Corporation	US	21 DB stores	US	07.09.04
11	Amerada Hess Corporation	US	Dana Petroleum plc's Indonesian subsidiary	ID	27.11.04
12	Amerada Hess Corporation	US	FirstEnergy Solutions	US	18.03.05
13	Amerada Hess Corporation	US	Trabant Holdings International	RU	23.03.05
14	Amerada Hess Corporation	US	EnLine Energy Solutions' natural gas marketing business	US	01.08.05
15	Amerada Hess Corporation	US	Select Energy Inc.'s retail energy marketing business	US	02.05.06
16	American Oil and Gas Inc.	US	Tower Colombia Corporation	US	24.03.05
17	American Real Estate Partners LP	US	Flamingo Laughlin hotel-casino	US	29.11.05
18	American Real Estate Partners LP	US	Reckson Associates Realty Corporation	US	03.08.06
19	Anadarko Petroleum Corporation	US	Howell Corporation	US	30.09.02
20	Anadarko Petroleum Corporation	US	Access Northeast Energy Inc.	CA	12.08.04
21	Anadarko Petroleum Corporation	US	Kerr-McGee Corporation	US	23.06.06
22	Anadarko Petroleum Corporation	US	Western Gas Resources Inc.	US	23.06.06

Table 14 continued

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
23	Apache Corporation	US	Pioneer Natural Resources Company's Argentinian operations	AR	17.01.06
24	Apache Corporation	US	Pan American Fueguina SRL	AR	08.11.06
25	Ashland Inc.	US	Degussa AG's water treatment unit		04.11.04
26	Ashland Inc.	US	Nanjing Clear Environment Protection Co., Ltd	CN	09.03.06
27	Ashland Inc.	US	Northwest Coatings LLC	US	27.10.06
28	Baker Hughes Inc.	US	Cornerstone Pipeline Inspection Group	US	27.05.03
29	Baker Hughes Inc.	US	Zeroth Technology Ltd	GB	02.12.05
30	Baker Hughes Inc.	US	Baseline Technologies Inc.	CA	06.12.05
31	Baker Hughes Inc.	US	Nova Technology Corporation	US	31.01.06
32	Basic Energy Services Inc.	US	G & L Tool Ltd	US	03.01.06
33	Basic Energy Services Inc.	US	LeBus Oil Field Service Company	US	01.02.06
34	Basic Energy Services Inc.	US	Arkla Cementing Inc.	US	27.03.06
35	Basic Energy Services Inc.	US	Globe Well Service Inc.	US	26.04.06
36	Basic Energy Services Inc.	US	Hennessey Rental Tools Inc.	US	01.08.06
37	Basic Energy Services Inc.	US	Davis Tool Company Inc.	US	20.12.06
38	Bill Barrett Corporation	US	CH4 Corporation	RO	13.04.06
39	BJ Services Company	US	OSCA Inc.	US	20.02.02
40	Boots & Coots International Well Control Inc.	US	Oil States International Inc's hydraulic well control business	US	21.11.05
41	Brink's Company, The	US	ASA	FR	03.03.05
42	Brink's Company, The	US	Securitas AB's cash handling and processing operations in Hungary, Poland and the Czech Republic		29.04.05
43	Bronco Drilling Company Inc.	US	Thomas Drilling Company	US	05.09.05
44	Bronco Drilling Company Inc.	US	Eagle Drilling LLC	US	19.09.05
45	Bronco Drilling Company Inc.	US	Big A Drilling Company	US	16.12.05
46	Burlington Resources Inc.	US	Integra Resources Ltd	CA	31.03.03
47	Cal Dive International Inc.	US	Stolt Offshore SA's diving and shallow water pipelay assets in the Gulf of Mexico and Trinidad	US	12.04.05
48	Cano Petroleum Inc.	US	Ladder Energy Company	US	06.07.04
49	Cano Petroleum Inc.	US	Square One Energy	US	07.02.05
50	Cano Petroleum Inc.	US	WO Energy	US	30.11.05
51	Cano Petroleum Inc.	US	Myriad Resources Corporation	US	30.04.06
52	Chesapeake Energy Corporation	US	ONEOK Inc's Mid-Continent gas assets	US	04.12.02
53	Chesapeake Energy Corporation	US	Concho Resources Inc.	US	23.12.03
54	Chesapeake Energy Corporation	US	Greystone Petroleum LLC	US	11.05.04

Table 14 continued

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
55	Chesapeake Energy Corporation	US	BRG Petroleum Corporation	US	27.12.04
56	Chesapeake Energy Corporation	US	Pecos Production Company	US	12.04.05
57	Chesapeake Energy Corporation	US	Columbia Natural Resources LLC	US	03.10.05
58	Chesapeake Energy Corporation	US	Axio Natural Resources Inc.	US	31.01.06
59	Chesapeake Energy Corporation	US	Rising Star Holdings Corporation	US	31.07.06
60	Chevron Corporation	US	Royal Dutch Shell Plc's retail and commercial fuel and lubricants marketing businesses in Cameroon	CM	30.11.05
61	Chevron Corporation	US	USA Petroleum Corporation's 122 retail stations across California	US	14.07.06
62	ChevronTexaco Corporation	US	Singapore Syngas Pte Ltd	SG	31.10.02
63	ChevronTexaco Corporation	US	Muanda International Oil Company Ltd	CD	01.07.04
64	ChevronTexaco Corporation	US	Unocal Corporation	US	03.03.05
65	ChevronTexaco Corporation	US	Unocal Corporation	US	03.03.05
66	China Natural Gas Inc.	US	2 compressed natural gas filling stations	CN	12.07.06
67	Cimarex Energy Company	US	Key Production Company Inc	US	25.02.02
68	Cimarex Energy Company	US	Magnum Hunter Resources Inc.	US	26.01.05
69	Clayton Williams Energy Inc.	US	Romere Pass Unit	US	22.07.02
70	Clayton Williams Energy Inc.	US	Southwest Royalties Inc.	US	04.02.04
71	Complete Production Services Inc.	US	Pumpco Services Inc.	US	08.11.06
72	Comstock Resources Inc.	US	Ovation Energy LP	US	25.08.04
73	Comstock Resources Inc.	US	EnSight Energy Partners LP's certain oil and gas producing assets	US	12.05.05
74	ConocoPhillips Company	US	Premcor Inc. 's certain processing units and ancillary assets	US	22.04.03
75	ConocoPhillips Company	US	Louis Dreyfus Refining and Marketing Ltd	GB	25.11.05
76	ConocoPhillips Company	US	Wilhelmshavener Raffineriegesellschaft mbH	DE	25.11.05
77	ConocoPhillips Company	US	Burlington Resources Inc.	US	12.12.05
78	DCP Midstream Partners LP	US	Gas Supply Resources Inc.	US	10.10.06
79	Delek US Holdings Inc.	US	Williamson Oil Co Inc.'s 100 filling stations and convenience stores company	US	28.03.04
80	Delek US Holdings Inc.	US	BP plc's 25 gas stations and convenience stores in Nashville, Tennessee	US	15.11.05
81	Delek US Holdings Inc.	US	Pride Companies LP's refining business	US	21.06.06
82	Delta Petroleum Corporation	US	Castle Energy Corporation's US oil and gas properties	US	16.01.02
83	Delta Petroleum Corporation	US	DHS Drilling Company	US	06.04.05
84	Delta Petroleum Corporation	US	Castle Energy Corporation	US	08.11.05
85	Denbury Resources Inc.	US	Genesis Energy Inc.	US	06.05.02

Table 14 continued

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
86	Denbury Resources Inc.	US	Coho Energy Inc.'s Mississippi and Navarro County oil and gas properties	US	07.08.02
87	Denbury Resources Inc.	US	Natural Gas Systems Inc's Delhi Holt-Bryant unit	US	09.05.06
88	Devon Energy Corporation	US	Ocean Energy Inc.	US	24.02.03
89	Devon Energy Corporation	US	Chief Holdings LLC's oil and gas assets	US	03.05.06
90	Dominion Resources Inc.	US	Mirant State Line Ventures Inc.	US	26.02.02
91	Dominion Resources Inc.	US	Cove Point LNG Ltd Partnership	US	01.08.02
92	Dominion Resources Inc.	US	United American Energy Holdings Corp.'s power generating facility in Mecklenburg, Virginia	US	02.10.03
93	Dominion Resources Inc.	US	Kewaunee Power Plant	US	07.11.03
94	Dominion Resources Inc.	US	USGen New England Inc's three electric power generation facilities	US	07.09.04
95	Duke Energy Corporation	US	Catamount Energy Corporation	US	23.03.06
96	Duke Energy Corporation	US	Dynegy Inc.'s Rockingham County-based power plant	US	22.05.06
97	Duke Energy Corporation	US	Catawba Nuclear Station	US	27.12.06
98	Duke Energy Corporation (Old)	US	Cinergy Corporation	US	09.05.05
99	Edge Petroleum Corporation	US	Miller Exploration Company	US	28.05.03
100	Encore Acquisition Company	US	Cortez Oil & Gas Inc.	US	02.03.04
101	Encore Acquisition Company	US	Crusader Energy Corporation	US	23.08.05
102	Endeavour International Corporation	US	OER Oil AS	NO	13.10.04
103	Energy Partners Ltd	US	Stone Energy Corporation	US	24.04.06
104	Energy Partners Ltd	US	Stone Energy Corporation	US	24.04.06
105	Energy Transfer Partners LP	US	TXU Fuel Company	US	26.04.04
106	Energy Transfer Partners LP	US	Unnamed owner of a Houston Pipeline system and related storage facilities	US	26.01.05
107	Energy Transfer Partners LP	US	Unnamed propane company in California	US	14.03.05
108	Energy Transfer Partners LP	US	Unnamed propane company in Missouri	US	14.03.05
109	Energy Transfer Partners LP	US	Unnamed propane company in Texas	US	14.03.05
110	Energy Transfer Partners LP	US	Unnamed propane company in Maine	US	14.03.05
111	Energy Transfer Partners LP	US	3 unnamed propane retail companies	US	28.06.05
112	Energy Transfer Partners LP	US	Transwestern Pipeline Company LLC	US	15.09.06
113	Ensco International Inc.	US	Chiles Offshore Inc.	US	15.05.02
114	Ensco International Inc.	US	Ensco Enterprises Ltd	SG	29.01.04
115	Enterprise Products Partners LP	US	Diamond-Koch's liquid storage business	US	17.01.02
116	Enterprise Products Partners LP	US	Western Gas Resources Inc.'s Toca natural gas processing plant natural gas liquids fractionator	US	10.07.02

Table 14 continued

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
117	Enterprise Products Partners LP	US	El Paso Corporation's 9 natural gas processing plants in South Texas	US	15.12.03
118	Enterprise Products Partners LP	US	GulfTerra Energy Partners LP	US	15.12.03
119	Enterprise Products Partners LP	US	El Paso Corporation's 2 natural gas gathering systems and a cryogenic processing plant operating subsidiaries	US	24.01.05
120	Enterprise Products Partners LP	US	Dixie Pipeline Company	US	28.02.05
121	Enterprise Products Partners LP	US	Ferrellgas Partners LP's certain non- strategic storage and terminal assets	US	23.06.05
122	Enterprise Products Partners LP	US	TEPPCO Partners LP's silica gel natural gas processing plant	US	26.01.06
123	Enterprise Products Partners LP	US	Jonah Gas Gathering Company's Pioneer silica gel natural gas processing plant	US	03.04.06
124	Enterprise Products Partners LP	US	Cerrito Gathering Company Ltd's natural gas gathering assets	US	13.07.06
125	Evergreen Resources Inc.	US	Carbon Energy Corporation	US	31.03.03
126	EXCO Resources Inc.	US	Pittsburgh-based oil and gas extraction company	US	28.04.06
127	EXCO Resources Inc.	US	Anadarko Petroleum Corporation`s oil and gas properties, acreage and other assets in the Vernon and Ansley Fields	US	26.12.06
128	EXCO Resources Inc. (old)	US	North Coast Energy Inc.	US	22.05.03
129	Flotek Industries Inc.	US	International BioSystems 2000	US	13.03.02
130	Flotek Industries Inc.	US	3 unnamed non-magnetic drill collar and stabilizer rental tool and sales business	US	18.09.03
131	Flotek Industries Inc.	US	Spidle Sales & Services Inc.	US	21.12.04
132	Flotek Industries Inc.	US	Phoenix E&P Technology LLC's shaker screen business	US	28.01.05
133	Flotek Industries Inc.	US	Harmon's Machine Works Inc.	US	09.08.05
134	Flotek Industries Inc.	US	Precision-LOR Ltd	GB	25.08.05
135	Flotek Industries Inc.	US	Total Well Solutions LLC	US	16.02.06
136	Flotek Industries Inc.	US	LifTech LLC	US	07.06.06
137	Flotek Industries Inc.	US	Triumph Drilling Tools Inc.	US	06.12.06
138	Forest Oil Corporation	US	Wiser Oil Company	US	23.05.04
139	Forest Oil Corporation	US	Houston Exploration Company, The	US	17.04.06
140	Frontier Oil Corporation	US	Holly Corporation	US	31.03.03
141	Geokinetics Inc.	US	Trace Energy Services Ltd	CA	01.08.05
142	Geokinetics Inc.	US	Grant Geophysical Inc.	US	11.09.06
143	Giant Industries Inc.	US	BP's Yorktown, Virginia, refinery	US	12.02.02

Table 14 continued

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
144	Giant Industries Inc.	US	Crude oil pipeline system	US	23.06.05
145	Giant Industries Inc.	US	Dial Oil Company	US	13.07.05
146	Gran Tierra Energy Inc.	US	Compania General de Combustibles SA's certain production and exploration assets in Argentina	AR	22.02.06
147	Gran Tierra Energy Inc.	US	Argosy Energy International	CO	03.04.06
148	Grey Wolf Inc.	US	New Patriot Drilling Corporation	US	08.03.04
149	Halliburton Company	US	Pruett Industries Inc's assets	US	15.08.02
150	Halliburton Company	US	A2D Technologies Inc.'s SmartSECTION geologic software business	US	23.02.05
151	Heritage Propane Partners LP	US	Tri-Cities Gas Company Inc.	US	03.10.02
152	Heritage Propane Partners LP	US	Stegall Petroleum Inc.	US	20.03.03
153	Heritage Propane Partners LP	US	Love Propane Gas LLC's assets	US	24.06.03
154	Heritage Propane Partners LP	US	Big Sky Petroleum	US	02.10.03
155	Heritage Propane Partners LP	US	Archibald Propane's assets	US	08.10.03
156	Heritage Propane Partners LP	US	Moore-LP Gas Inc.'s assets	US	15.10.03
157	Heritage Propane Partners LP	US	Sunbeam LP Gas Inc.'assets	US	16.10.03
158	Heritage Propane Partners LP	US	Energy Transfer Company Ltd	US	07.11.03
159	Heritage Propane Partners LP	US	Metro Lift Propane Inc.'s assets	US	08.12.03
160	Holly Corporation	US	ConocoPhillips' Woods Cross refinery	US	12.01.03
161	Holly Corporation	US	Rio Grande Pipeline Company	BR	30.06.03
162	Houston Exploration Company, The	US	Transworld Exploration and Production Inc.'s assets	MX	15.09.03
163	ICO Inc.	US	Analysis Petroleum Inspection Pte Ltd	SG	05.03.02
164	Kaneb Pipe Line Partners LP	US	Burns Philp & Company Ltd's eight bulk liquid storage terminals	AU	18.09.02
165	Kaneb Pipe Line Partners LP	US	Koch Pipelines Company LP's anhydrous ammonia pipeline system	US	18.09.02
166	Kaneb Pipe Line Partners LP	US	Tesoro Petroleum Corporation's Northern Great Plains Products System	US	22.11.02
167	Kaneb Pipe Line Partners LP	US	Exxon Mobil Corporation's Philadelphia terminal	US	06.05.04
168	Kaneb Pipe Line Partners LP	US	Exxon Mobil Corporation's Linden, New Jersey terminal	US	09.09.04
169	Kaneb Pipe Line Partners LP	US	Ross Chemical & Storage Company Ltd.	GB	30.09.04
170	Kaneb Pipe Line Partners LP	US	Amsterdam petroleum terminal	NL	02.05.05
171	Kerr-McGee Corporation	US	Westport Resources Corporation	US	07.04.04
172	Key Energy Services Inc.	US	Q Services Inc.	US	14.05.02
173	Key Energy Services Inc.	US	Fleet Cementers Inc.	US	16.02.04
174	KeySpan Corporation	US	Algonquin LNG Inc.	US	13.12.02

Table 14 continued

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
175	KeySpan Corporation	US	Seneca-Upshur Petroleum Inc	US	24.05.04
176	Kinder Morgan Energy Partners LP	US	Mid-Tex Gas Storage Company	US	01.12.03
177	Layne Christensen Company	US	Beylik Drilling	US	04.10.04
178	Layne Christensen Company	US	Reynolds Inc.	US	29.06.05
179	Layne Christensen Company	US	Collector Wells International Inc.	US	13.07.06
180	Linn Energy LLC	US	Kaiser-Francis Oil Company's certain Oklahoma assets	US	24.07.06
181	Linn Energy LLC	US	Blacksand Energy LLC's certain Los Angeles Basin assets	US	24.07.06
182	Linn Energy LLC	US	Unnamed private oil and gas company with operations in the Texas Panhandle	US	13.12.06
183	Marathon Oil Corporation	US	GLOBEX Energy Inc.	US	18.06.02
184	Mariner Energy Inc.	US	Forest Energy Resources Inc.	US	12.09.05
185	MarkWest Energy Partners LP	US	Pinnacle Natural Gas Company	US	26.03.03
186	MarkWest Energy Partners LP	US	American Central East Texas Gas Company LP's Carthage gathering system and gas processing assets	US	08.07.04
187	MarkWest Energy Partners LP	US	Starfish Pipeline Co LLC	US	25.01.05
188	MarkWest Energy Partners LP	US	Javelina gas processing and fractionation facility in Corpus Christi, Texas	US	19.09.05
189	MDU Resources Group Inc.	US	Granite City Ready-Mix Companies	US	19.04.02
190	MDU Resources Group Inc.	US	Buffalo Bituminous Inc.	US	06.06.02
191	MDU Resources Group Inc.	US	ESI Inc.	US	01.10.02
192	MDU Resources Group Inc.	US	PG&E Corporation's wind-power plant	US	28.01.03
193	MDU Resources Group Inc.	US	Young Brothers Contractors Inc.	US	11.07.03
194	MDU Resources Group Inc.	US	Masco Inc.	US	03.05.04
195	MDU Resources Group Inc.	US	Norm's Utility Contractor Inc.	US	01.06.05
196	MDU Resources Group Inc.	US	Jefferson State Redi-Mix Inc.	US	09.06.05
197	MDU Resources Group Inc.	US	Concrete Products Industries Inc.	US	09.06.05
198	MDU Resources Group Inc.	US	Jefferson State Asphalt Inc.	US	09.06.05
199	MDU Resources Group Inc.	US	Cherry Creek Aggregate Inc.	US	09.06.05
200	MDU Resources Group Inc.	US	Allied Concrete Pumping Inc.	US	09.06.05
201	MDU Resources Group Inc.	US	Keith Hamilton Trucking Inc.	US	09.06.05
202	MDU Resources Group Inc.	US	HDP Leasing Inc.	US	09.06.05
203	MDU Resources Group Inc.	US	Bombard Electric	US	10.06.05
204	MDU Resources Group Inc.	US	Bombard Mechanical LLC	US	17.06.05
205	MDU Resources Group Inc.	US	Jebro Inc.	US	03.10.05

Table 14 continued

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
206	MDU Resources Group Inc.	US	Irving F Jensen Company Inc's assets	US	03.10.05
207	MDU Resources Group Inc.	US	Brower Construction Company	US	03.10.05
208	MDU Resources Group Inc.	US	Desert Fire Holdings Inc	US	03.04.06
209	MDU Resources Group Inc.	US	Cascade Natural Gas Corporation	US	09.07.06
210	MDU Resources Group Inc.	US	Kent's Oil Service	US	05.09.06
211	National Fuel Gas Company	US	Empire State Pipeline	US	03.10.02
212	Natural Gas Services Group Inc.	US	Screw Compression Systems Inc.	US	04.01.05
213	Newfield Exploration Company	US	EEX Corporation	US	29.05.02
214	Newfield Exploration Company	US	Primary Natural Resources	US	09.09.03
215	Newfield Exploration Company	US	Denbury Offshore Inc.	US	20.07.04
216	Newfield Exploration Company	US	Inland Resources Inc.	US	06.08.04
217	Newpark Resources Inc.	US	Ava SpA	IT	29.05.02
218	Newpark Resources Inc.	US	OLS Consulting Services Inc.	US	30.03.05
219	Noble Energy Inc.	US	Patina Oil & Gas Corporation	US	16.12.04
220	Noble Energy Inc.	US	United States Exploration Inc.	US	09.02.06
221	Occidental Petroleum Corporation	US	Vintage Petroleum Inc.	US	13.10.05
222	Oceaneering International Inc.	US	Rotator AS	NO	02.09.03
223	Oceaneering International Inc.	US	Subsea 7 Ltd's drill support ROV business	US	30.11.03
224	Oceaneering International Inc.	US	Stolt Offshore SA's ROV drill support business		03.12.03
225	Oceaneering International Inc.	US	Fugro NV's ROV US businesses		01.10.04
226	Oceaneering International Inc.	US	Grayloc Products LLC	US	30.06.05
227	OMNI Energy Services Corporation	US	Trussco Inc.	US	27.05.04
228	OMNI Energy Services Corporation	US	Preheat Inc.	US	22.09.05
229	OMNI Energy Services Corporation	US	Rig Tools Inc.	US	27.06.06
230	OMNI Energy Services Corporation	US	Charles Holston Inc.	US	28.11.06
231	OSCA Inc.	US	Ancor Services Inc.	US	22.01.02
232	Parker Drilling Company	US	Australian Oil & Gas Corporation Ltd	AU	06.06.02
233	Patina Oil & Gas Corporation	US	Bravo Natural Resources Inc.	US	06.11.02
234	Patina Oil & Gas Corporation	US	Le Norman Partners LLC	US	20.02.03
235	Patina Oil & Gas Corporation	US	Cordillera Energy Partners LLC's assets	US	25.08.03
236	Patterson-UTI Energy Inc.	US	Odin Drilling Inc.	US	12.03.02

Table 14 continued

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
237	Patterson-UTI Energy Inc.	US	TMBR/Sharp Drilling Inc.	US	27.05.03
238	Patterson-UTI Energy Inc.	US	Key Energy Services Inc's US land drilling business	US	08.12.04
239	Penn Virginia Corporation	US	Crow Creek Holding Corporation	US	10.05.06
240	Petrohawk Energy Corporation	US	Mission Resources Corporation	US	20.07.04
241	Petrohawk Energy Corporation	US	Wynn-Crosby Energy Inc.	US	14.10.04
242	Petrohawk Energy Corporation	US	Unnamed private company	CA	07.02.05
243	Petrohawk Energy Corporation	US	KCS Energy Inc.	US	21.04.06
244	Petroleum Development Corporation	US	Unioil Inc.	US	20.10.06
245	PetroQuest Energy Inc.	US	Unnamed oil and gas exploration and production company	US	13.04.05
246	Pioneer Natural Resources Company	US	Evergreen Resources Inc.	US	04.05.04
247	Pioneer Natural Resources Company	US	Evergreen Resources Inc.	US	08.05.04
248	Plains Exploration & Production Company LP	US	3TEC Energy Corporation	US	03.02.03
249	Plains Exploration & Production Company LP	US	Nuevo Energy Company	US	12.02.04
237	Patterson-UTI Energy Inc.	US	TMBR/Sharp Drilling Inc.	US	27.05.03
238	Patterson-UTI Energy Inc.	US	Key Energy Services Inc's US land drilling business	US	08.12.04
239	Penn Virginia Corporation	US	Crow Creek Holding Corporation	US	10.05.06
240	Petrohawk Energy Corporation	US	Mission Resources Corporation	US	20.07.04
241	Petrohawk Energy Corporation	US	Wynn-Crosby Energy Inc.	US	14.10.04
242	Petrohawk Energy Corporation	US	Unnamed private company	CA	07.02.05
243	Petrohawk Energy Corporation	US	KCS Energy Inc.	US	21.04.06
244	Petroleum Development Corporation	US	Unioil Inc.	US	20.10.06
245	PetroQuest Energy Inc.	US	Unnamed oil and gas exploration and production company	US	13.04.05
246	Pioneer Natural Resources Company	US	Evergreen Resources Inc.	US	04.05.04
247	Pioneer Natural Resources Company	US	Evergreen Resources Inc.	US	08.05.04
248	Plains Exploration & Production Company LP	US	3TEC Energy Corporation	US	03.02.03
249	Plains Exploration & Production Company LP	US	Nuevo Energy Company	US	12.02.04
250	Plains Exploration & Production Company LP	US	Stone Energy Corporation	US	24.04.06
251	Plains Exploration & Production Company LP	US	Pogo Producing Company	US	01.12.06
252	Pogo Producing Company	US	Northrock Resources Ltd	CA	10.05.05
253	Pogo Producing Company	US	Latigo Petroleum Inc.	US	17.04.06

Table 14 continued

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
254	Premcor Inc.	US	Williams Companies Inc's Memphis refinery and related supply and distribution assets	US	26.11.02
255	Premcor Inc.	US	Delaware City Refining Complex	US	14.01.04
256	Pride International Inc.	US	Unnamed joint venture company that owns two deepwater submersibles	US	10.11.06
257	PYR Energy Corporation	US	Venus Exploration Inc.	US	05.04.04
258	Quest Resource Corporation	US	Devon Energy Corporation's Cherokee coalbed methane project	US	16.12.03
259	Quest Resource Corporation	US	Consolidated Oil Well Services Inc's Chanute yard	US	24.08.04
260	Range Resources Corporation	US	Great Lakes Energy Partners LLC	US	02.06.04
261	Range Resources Corporation	US	Unnamed private coal company	CA	23.11.04
262	Range Resources Corporation	US	Plantation Petroleum Holdings II LLC	US	06.06.05
263	Range Resources Corporation	US	Stroud Energy Inc.	US	11.05.06
264	Regency Energy Partners LP	US	TexStar Field Services LP	US	13.07.06
265	Royale Energy Inc.	US	Royale Petroleum Corporation	US	23.06.04
266	Sunoco Inc.	US	El Paso Corporation's Eagle Point facility	US	06.02.03
267	Sunoco Inc.	US	Speedway SuperAmerica's 193 Gas stations	US	07.02.03
268	Sunoco Inc.	US	Marathon Ashland Petroleum LLC's 193 gas stations	US	08.02.03
269	Sunoco Inc.	US	El Paso CGP Company's 473 petrol stations	US	15.03.03
270	Sunoco Inc.	US	Equistar Chemicals LP's Texas polypropylene facility	US	27.03.03
271	Sunoco Inc.	US	Lyondell Chemical Company's polypropylene plant in Bayport, TX	US	27.03.03
272	Sunoco Inc.	US	ConocoPhillips Company's 340 gas stations in Delaware, Maryland, Washington, DC and Virginia.	US	27.01.04
273	Superior Energy Services Inc.	US	Premier Oilfield Services Ltd	GB	18.08.03
274	Superior Energy Services Inc.	US	Warrior Energy Services Corporation	US	25.09.06
275	Superior Well Services Inc.	US	Dynamic Wireline	US	01.03.02
276	Superior Well Services Inc.	US	Osage Wireline Company	US	15.08.03
277	Superior Well Services Inc.	US	Patterson Wireline LLC	US	06.10.06
278	Tesoro Petroleum Corporation	US	Golden Eagle Refinery	US	05.02.02
279	Tesoro Petroleum Corporation	US	Kauai Petroleum Co. Ltd	US	05.05.06
280	TETRA Technologies Inc.	US	Kemira Oyj's calcium chloride business	NL	04.06.04
281	TETRA Technologies Inc.	US	Compressco Inc.	US	23.06.04
282	TETRA Technologies Inc.	US	Beacon Resources LLC	US	03.03.06
283	TETRA Technologies Inc.	US	Epic Divers Inc.	US	09.03.06

Table 14 continued

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
284	TGC Industries Inc.	US	Highland Industry Inc.	US	22.05.06
285	Tom Brown Inc.	US	Matador Petroleum Corporation	US	07.05.03
286	Toreador Resources Corporation	US	Pogo Magyarorszag Olaj, Es Gazkutato, Termelo Kft	HU	07.06.05
287	Transmeridian Exploration Inc.	US	Bramex Management Inc.		20.10.05
288	Tri-Valley Corporation	US	Pleasant Valley Energy Corporation	US	28.03.05
289	Union Drilling Inc.	US	Thornton Drilling Company	US	06.04.05
290	Union Drilling Inc.	US	SPA Drilling LP's drilling and support services assets	US	06.04.05
291	Unit Corporation	US	Twenty drilling rigs and related equipment	US	19.08.02
292	Unit Corporation	US	PetroCorp Inc.	US	01.07.03
293	Unit Corporation	US	Serdrilco Inc.	US	21.11.03
294	Unit Corporation	US	Superior Pipeline Company LLC	US	02.08.04
295	United Heritage Corporation	US	Imperial Petroleum Inc.	US	14.07.04
296	Unocal Corporation	US	Spirit Energy 76 Development LP	US	27.06.03
297	Valero Energy Corporation	US	Aruba refinery	NL	20.11.03
298	Valero Energy Corporation	US	Link Energy LLC's NGL storage facilities	US	31.12.03
299	Valero Energy Corporation	US	El Paso Corporation's Aruba refinery and related assets	NL	04.02.04
284	TGC Industries Inc.	US	Highland Industry Inc.	US	22.05.06
285	Tom Brown Inc.	US	Matador Petroleum Corporation	US	07.05.03
286	Toreador Resources Corporation	US	Pogo Magyarorszag Olaj, Es Gazkutato, Termelo Kft	HU	07.06.05
287	Transmeridian Exploration Inc.	US	Bramex Management Inc.		20.10.05
288	Tri-Valley Corporation	US	Pleasant Valley Energy Corporation	US	28.03.05
289	Union Drilling Inc.	US	Thornton Drilling Company	US	06.04.05
290	Union Drilling Inc.	US	SPA Drilling LP's drilling and support services assets	US	06.04.05
291	Unit Corporation	US	Twenty drilling rigs and related equipment	US	19.08.02
292	Unit Corporation	US	PetroCorp Inc.	US	01.07.03
293	Unit Corporation	US	Serdrilco Inc.	US	21.11.03
294	Unit Corporation	US	Superior Pipeline Company LLC	US	02.08.04
295	United Heritage Corporation	US	Imperial Petroleum Inc.	US	14.07.04
296	Unocal Corporation	US	Spirit Energy 76 Development LP	US	27.06.03
297	Valero Energy Corporation	US	Aruba refinery	NL	20.11.03

Table 14 continued

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
298	Valero Energy Corporation	US	Link Energy LLC's NGL storage facilities	US	31.12.03
299	Valero Energy Corporation	US	El Paso Corporation's Aruba refinery and related assets	NL	04.02.04
300	Valero Energy Corporation	US	Premcor Inc.	US	25.04.05
301	Varco International Inc.	US	ICO Inc.'s oilfield services business	US	03.07.02
302	Venoco Inc.	US	Marquez Energy LLC	US	28.01.05
303	Venoco Inc.	US	TexCal Energy (LP) LLC	US	31.03.06
304	Veritas DGC Inc.	US	Hampson-Russell Software Services Ltd	GB	21.08.02
305	Vintage Petroleum Inc.	US	Petrolera RÌo Alto SA	AR	28.05.04
306	W-H Energy Services Inc.	US	Boyd's Rental Tools	US	17.06.02
307	W-H Energy Services Inc.	US	EM Hobbs Inc.	US	04.11.02
308	Western Gas Resources Inc.	US	El Paso Corp's 18 gathering systems in Wyoming	US	04.02.03
309	Western Gas Resources Inc.	US	Oil and gas assets in the San Juan Basin		01.10.04
310	Western Refining Inc.	US	Giant Industries Inc.	US	28.08.06
311	Western Refining Inc.	US	Giant Industries Inc.	US	28.08.06
312	Westlake Chemical Corporation	US	Bristolpipe Corporation	US	01.07.04
313	Westlake Chemical Corporation	US	Eastman Chemical Company's polyethylene business	US	10.10.06
314	Westport Resources Corporation	US	United Resources Inc.'s South Texas oil and gas assets	US	06.11.03
315	Whiting Petroleum Corporation	US	Equity Oil Company	US	02.02.04
316	Whiting Petroleum Corporation	US	Celero Energy LP	US	26.07.05
317	Whiting Petroleum Corporation	US	Oklahoma oil pipeline and gathering system	US	05.06.06
318	Williams Partners LP	US	Four Corners LLC	US	16.11.06
319	WPS Resources Corporation	US	Michigan Gas Utilities Corporation	US	14.03.05
320	WPS Resources Corporation	US	Minnesota Gas	US	14.03.05
321	WPS Resources Corporation	US	Peoples Energy Corporation	US	06.07.06
322	WR Grace & Company	US	Addiment Inc.'s business and assets	US	26.03.02
323	WR Grace & Company	US	Argonaut Technologies Inc.'s performance liquid chromatography business	US	26.08.03
324	WR Grace & Company	US	Alltech International Holdings Inc.	US	15.06.04
325	WR Grace & Company	US	Midland Dexter Venezuela SA's certain assets	VE	03.03.05
326	WR Grace & Company	US	Single-Site Catalysts LLC's assets	US	08.11.05
327	WR Grace & Company	US	Flexit Laboratories Pvt Ltd	IN	11.11.05

Table 14 continued

Deal ID	*Acquirer name*	*Country*	*Target name*	*Country*	*Event date*
328	XTO Energy Inc.	US	Antero Resources Corporation	US	11.01.05
329	XTO Energy Inc.	US	Peak Energy Resources Inc.	US	01.06.06

A.2. Excluded Events

Table 15: Excluded events

These are the events that were excluded from the original list of deals provided by Zephyr (2009). The deals are listed based on the reason for exclusion.

Lacking data in Compustat	*Listed twice*	*More than 3 days without trading*	*Multiple events in event window(-10,10)*	*Lacking data in CRSP*
99	65	3	6	2
104	103	227	7	8
	247	257	12	9
		295	13	16
			21	32
			22	33
			29	34
			30	35
			75	36
			76	37
			77	43
			107	44
			108	45
			109	47
			110	48
			117	49
			118	50
			144	51
			145	66
			154	67
			155	71
			156	78
			157	79
			164	80
			165	81
			180	102
			181	126
			195	127
			196	128
			197	129
			198	130
			199	131
			200	132
			201	133
			202	134
			203	135
			204	136
			205	141
			206	142
			207	146
			215	147
			216	182
			223	184
			224	185
			266	248

Table 15 continued

Lacking data in Compustat	*Listed twice*	*More than 3 days without trading*	*Multiple events in event window(-10,10)*	*Lacking data in CRSP*
			267	249
			268	254
			269	264
			270	275
			271	276
			280	277
			281	284
			282	285
			283	287
			319	289
			320	290
			326	302
			327	303
			97	306
				307
				310
				311
				312
				315

A.3. Final List of Deals

Table 16: The final list of deals

Deal ID	*Deal ID*	*Deal ID*	*Deal ID*	*Deal ID*
1	87	171	241	324
4	88	170	242	325
5	89	172	243	328
10	90	173	244	329
11	91	174	245	
14	92	175	246	
15	93	176	250	
17	94	177	251	
18	95	178	252	
19	96	179	253	
20	98	183	255	
23	100	186	256	
24	101	187	258	
25	105	188	259	
26	106	189	260	
27	111	190	261	
28	112	191	262	
31	113	192	263	
38	114	193	265	
39	115	194	272	
40	116	208	273	
41	119	209	274	
42	120	210	278	
46	121	211	279	
52	122	212	286	
53	123	213	288	
54	124	214	291	
55	125	217	292	
56	137	218	293	
57	138	219	294	
58	139	220	296	
59	140	221	297	
60	143	222	298	
61	148	225	299	
62	149	226	300	
63	150	228	301	
64	151	229	304	
68	152	230	305	
69	153	231	308	
70	158	232	309	
72	159	233	313	
73	160	234	314	
74	161	235	316	
82	162	236	317	
83	163	237	318	
84	166	238	321	
85	167	239	322	
86	168	240	323	

Table 17: Geographical spread of events

Target country	*No of events*
US	162
Other	31
Unknown	4
Total	197

A.4. Events with High and Low Gearing

Table 18: List of deals with gearing <1

Deal ID	*Gearing*	*Deal ID*	*Gearing*	*Deal ID*	*Gearing*
325	0.00	192	0.36	219	0.72
236	0.00	193	0.36	10	0.72
322	0.00	222	0.36	11	0.72
68	0.00	83	0.37	19	0.73
237	0.00	301	0.38	299	0.74
238	0.00	89	0.40	308	0.74
318	0.00	25	0.41	115	0.75
323	0.00	274	0.41	116	0.75
324	0.00	28	0.42	179	0.75
294	0.00	162	0.43	69	0.75
288	0.00	252	0.44	125	0.75
26	0.02	177	0.45	273	0.76
27	0.02	240	0.45	253	0.76
39	0.06	241	0.45	138	0.78
292	0.07	212	0.47	328	0.78
293	0.07	100	0.50	101	0.79
291	0.11	300	0.50	119	0.80
160	0.11	87	0.52	120	0.80
161	0.11	139	0.53	121	0.80
244	0.13	256	0.53	213	0.80
38	0.14	70	0.53	214	0.81
286	0.14	316	0.53	122	0.85
61	0.19	279	0.55	123	0.85
23	0.21	17	0.56	124	0.85
24	0.21	178	0.57	272	0.85
31	0.23	218	0.58	317	0.87
60	0.23	208	0.58	246	0.88
64	0.23	209	0.58	263	0.88
114	0.26	210	0.58	95	0.88
62	0.26	20	0.59	96	0.88
304	0.27	1	0.59	58	0.88
313	0.27	15	0.60	59	0.89
41	0.27	217	0.60	4	0.89
42	0.27	309	0.60	5	0.90
233	0.29	321	0.64	150	0.90
265	0.29	194	0.65	187	0.91
149	0.30	74	0.65	188	0.93
63	0.30	220	0.66	243	0.93
226	0.31	234	0.67	85	0.94
245	0.32	235	0.67	86	0.96
221	0.32	14	0.68	242	0.96
113	0.32	183	0.69	56	0.97
137	0.34	189	0.70	57	0.97
225	0.34	190	0.70	84	0.97
231	0.35	191	0.70		
82	0.35	314	0.71		

Table 19: List of deals with gearing >1

Deal ID	*Gearing*	*Deal ID*	*Gearing*
172	1.02	158	1.62
166	1.20	159	1.62
232	1.42	88	1.63
278	1.47	305	1.66
90	1.51	52	1.73
91	1.51	53	1.82
174	1.58	186	1.94
163	1.73	152	2.45
143	1.88	153	2.45
151	2.45	228	2.64
46	1.01	40	4.70
173	1.01	258	71.23
18	1.02	259	71.23
98	1.02	159	1.62
239	1.05	88	1.63
55	1.06	305	1.66
72	1.06	52	1.73
296	1.07	53	1.82
262	1.10	186	1.94
250	1.11	152	2.45
251	1.11	153	2.45
176	1.12	228	2.64
297	1.13	40	4.70
298	1.13	258	71.23
73	1.13	259	71.23
211	1.14		
171	1.17		
54	1.19		
148	1.20		
140	1.24		
255	1.25		
167	1.25		
168	1.25		
169	1.25		
92	1.29		
93	1.29		
260	1.31		
261	1.31		
170	1.40		
229	1.42		
230	1.42		
106	1.43		
111	1.43		
94	1.46		
112	1.49		
175	1.50		
105	1.62		

A.5. Events with Public and Private Targets

Table 20: List of deals with private and public targets

Private				***Public***
Deal ID	*Deal ID*	*Deal ID*	*Deal ID*	*Deal ID*
1	91	176	261	18
4	92	177	262	19
5	93	178	263	39
10	94	179	265	64
11	95	183	272	68
14	96	186	273	84
15	100	187	278	88
17	101	188	279	98
20	105	189	286	113
23	106	190	288	138
24	111	191	291	139
25	112	192	293	140
26	114	193	294	171
27	115	194	296	209
28	116	208	297	213
31	119	210	298	219
38	120	211	299	221
40	121	212	301	232
41	122	214	304	237
42	123	217	305	240
46	124	218	308	243
52	125	220	309	246
53	137	222	313	250
54	143	225	314	251
55	148	226	316	252
56	149	228	317	274
57	150	229	318	292
58	151	230	322	300
59	152	231	323	321
60	153	233	324	
61	158	234	325	
62	159	235	328	
63	160	236	329	
69	161	238		
70	162	239		
72	163	241		
73	166	242		
74	167	244		
82	168	245		
83	169	253		
85	170	255		
86	172	256		
87	173	258		
89	174	259		
90	175	260		

A.6. Extreme Observations

Table 21: Removed extreme observations

This table shows which observations were removed from the sample for the three different percentages. Above the line are the most extreme negative values, and beneath the line are the most extreme positive values of CAR(-5,5).

10%

Deal no	*CAR(-5,5)*	*Beta*
288	-22.51%	1.25
84	-19.24%	3.01
73	-14.73%	1.24
83	-13.83%	1.63
221	*-11.34%*	*1.15*
189	-10.68%	0.27
56	-10.09%	1.22
68	-9.86%	1.17
55	-9.46%	1.15
70	-8.91%	1.08
261	*14.60%*	*1.25*
4	15.85%	3.48
40	16.97%	0.78
173	18.17%	0.80
324	20.88%	2.41
69	24.03%	1.22
166	25.73%	0.20
229	27.17%	2.90
286	*27.98%*	*1.84*
228	70.70%	1.27

5%

Deal no	*CAR(-5,5)*	*Beta*
288	-22.51%	1.25
84	-19.24%	3.01
73	-14.73%	1.24
83	-13.83%	1.63
221	*-11.34%*	*1.15*
69	24.03%	1.22
166	25.73%	0.20
229	27.17%	2.90
286	*27.98%*	*1.84*
228	70.70%	1.27

2%

Deal no	*CAR(-5,5)*	*Beta*
288	-22.51%	1.25
84	-19.24%	3.01
286	*27.98%*	*1.84*
228	70.70%	1.27

A.7. List of Deals Without Clustering

Table 22: list of deals without clustering

This is a synopsis of the deals that do not have overlapping event windows when the event window is 3 days long.

Deal ID	*Deal ID*	*Deal ID*	*Deal ID*
5	95	189	296
11	96	192	298
14	100	210	300
18	101	212	301
20	105	214	305
23	112	219	308
25	116	220	313
26	120	221	316
27	121	222	318
38	122	228	322
39	137	229	324
40	143	230	328
52	148	231	
53	149	233	
54	150	236	
55	152	238	
56	153	240	
57	159	241	
59	160	242	
62	162	244	
63	163	245	
69	166	251	
74	171	255	
83	173	258	
84	174	260	
85	176	261	
86	177	265	
90	183	274	
91	186	278	
92	188	294	

Appendix B

Tables of AAR and CAAR

In this section I will present a full overview of AAR and CAAR for the different event studies performed in chapter 6 and 7. Significant p-values will be marked with *c* for significance on a 90%-level, *b* for 95%-level and *a* for a 99% confidence level.

B.1. Event study

B.1.1. Full dataset

Table 23: AAR and CAAR for the event study on the whole dataset

Day	*-10*	*-9*	*-8*	*-7*	*-6*	*-5*	*-4*	*-3*	*-2*	*-1*	*0*
AAR-10,10	-0.15%	-0.30%	-0.09%	0.18%	-0.46%	0.49%	-0.09%	0.33%	0.19%	0.09%	0.33%
CAAR-10,10	-0.15%	-0.45%	-0.53%	-0.35%	-0.82%	-0.33%	-0.42%	-0.09%	0.10%	0.19%	0.52%
St dev -10,10	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%
P-value	0.43	0.11	0.64	0.33	0.01[a]	0.01[a]	0.62	0.07[c]	0.31	0.64	0.07[c]
AAR-5,5						0.50%	-0.09%	0.34%	0.19%	0.08%	0.35%
CAAR-5,5						0.50%	0.41%	0.75%	0.93%	1.01%	1.36%
St dev -5,5						0.18%	0.18%	0.18%	0.18%	0.18%	0.18%
P-value						0.01[a]	0.64	0.07[c]	0.30	0.67	0.06[c]
AAR-1,1										0.08%	0.35%
CAAR-1,1										0.08%	0.42%
St dev -1,1										0.18%	0.18%
P-value										0.68	0.06[c]

Table 23 continued

Day	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
AAR-10,10	0.33%	0.33%	-0.09%	-0.34%	0.48%	-0.04%	-0.22%	0.09%	-0.19%	0.06%	-0.31%
CAAR-10,10	0.52%	0.85%	0.76%	0.42%	0.90%	0.86%	0.64%	0.73%	0.54%	0.60%	0.29%
St dev -10,10	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%
P-value	0.07[c]	0.07[c]	0.61	0.07[c]	0.01[a]	0.83	0.23	0.61	0.31	0.76	0.09[c]
AAR-5,5	0.35%	0.34%	-0.09%	-0.33%	0.48%	-0.04%					
CAAR-5,5	1.36%	1.70%	1.61%	1.27%	1.75%	1.71%					
St dev -5,5	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%					
P-value	0.06[c]	0.07[c]	0.61	0.07[c]	0.01[a]	0.83					
AAR-1,1	0.35%	0.33%									
CAAR-1,1	0.42%	0.75%									
St dev -1,1	0.18%	0.18%									
P-value	0.06[c]	0.07[c]									

B.1.2. High versus Low Gearing

Table 24: AAR and CAAR – High versus low gearing

Day	*-10*	*-9*	*-8*	*-7*	*-6*	*-5*	*-4*	*-3*	*-2*	*-1*	*0*
AAR LO -10,10	-0.03%	-0.36%	-0.12%	0.19%	-0.40%	0.54%	-0.18%	0.44%	0.15%	-0.09%	-0.09%
CAAR LO -10,10	-0.03%	-0.39%	-0.51%	-0.32%	-0.71%	-0.17%	-0.35%	0.09%	0.25%	0.16%	0.06%
St dev LO -10,10	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%
P-value	0.89	0.11	0.59	0.39	0.08	0.02[b]	0.43	0.05[b]	0.49	0.68	0.67
AAR HI -10,10	-0.41%	-0.16%	-0.01%	0.16%	-0.62%	0.37%	0.10%	0.08%	0.27%	0.50%	1.31%
CAAR HI -10,10	-0.41%	-0.57%	-0.59%	-0.43%	-1.05%	-0.68%	-0.58%	-0.50%	-0.24%	0.26%	1.57%
St dev HI -10,10	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%
P-value	0.22	0.63	0.97	0.64	0.07[c]	0.27	0.76	0.82	0.43	0.14	0.00[a]
AAR LO -5,5						0.55%	-0.17%	0.45%	0.16%	-0.10%	-0.08%
CAAR LO -5,5						0.55%	0.38%	0.83%	0.99%	0.89%	0.81%
St dev LO -5,5						0.22%	0.22%	0.22%	0.22%	0.22%	0.22%
P-value						0.01[a]	0.44	0.04[b]	0.47	0.64	0.72
AAR HI -5,5						0.37%	0.10%	0.07%	0.26%	0.49%	1.33%
CAAR HI -5,5						0.37%	0.47%	0.54%	0.80%	1.29%	2.62%
St dev HI -5,5						0.33%	0.33%	0.33%	0.33%	0.33%	0.33%
P-value						0.27	0.76	0.83	0.44	0.14	0.00[a]
AAR LO -1,1										-0.11%	-0.08%
CAAR LO -1,1										-0.11%	-0.19%
St dev LO -1,1										0.22%	0.22%
P-value										0.63	0.70
AAR HI -1,1										0.49%	1.32%
CAAR HI -1,1										0.49%	1.81%
St dev HI -1,1										0.33%	0.33%
P-value										0.14	0.00[a]

Table 24 continued

Day	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
AAR LO -10,10	-0.09%	0.22%	-0.33%	-0.25%	0.19%	0.14%	-0.06%	-0.03%	-0.09%	0.07%	-0.28%
CAAR LO -10,10	0.06%	0.28%	-0.05%	-0.30%	-0.11%	0.03%	-0.04%	-0.06%	-0.15%	-0.08%	-0.36%
St dev LO -10,10	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%
P-value	0.67	0.32	0.14	0.25	0.39	0.54	0.78	0.90	0.69	0.76	0.22
AAR HI -10,10	1.31%	0.59%	0.44%	-0.54%	1.15%	-0.44%	-0.59%	0.37%	-0.41%	0.03%	-0.39%
CAAR HI -10,10	1.57%	2.17%	2.61%	2.07%	3.21%	2.77%	2.17%	2.54%	2.13%	2.16%	1.77%
St dev HI -10,10	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%
P-value	0.00[a]	0.08[c]	0.19	0.11	0.00[a]	0.19	0.08	0.27	0.23	0.93	0.25
AAR LO -5,5	-0.08%	0.22%	-0.34%	-0.24%	0.18%	0.13%					
CAAR LO -5,5	0.81%	1.03%	0.69%	0.45%	0.63%	0.77%					
St dev LO -5,5	0.22%	0.22%	0.22%	0.22%	0.22%	0.22%					
P-value	0.72	0.32	0.13	0.27	0.40	0.55					
AAR HI -5,5	1.33%	0.60%	0.46%	-0.54%	1.15%	-0.43%					
CAAR HI -5,5	2.62%	3.22%	3.68%	3.14%	4.29%	3.86%					
St dev HI -5,5	0.33%	0.33%	0.33%	0.33%	0.33%	0.33%					
P-value	0.00[a]	0.07[c]	0.17	0.11	0.00[a]	0.20					
AAR LO -1,1	-0.08%	0.22%									
CAAR LO -1,1	-0.19%	0.03%									
St dev LO -1,1	0.22%	0.22%									
P-value	0.70	0.33									
AAR HI -1,1	1.32%	0.60%									
CAAR HI -1,1	1.81%	2.41%									
St dev HI -1,1	0.33%	0.33%									
P-value	0.00[a]	0.07[c]									

B.1.3. Public versus Private Target

Table 25: AAR and CAAR – Public versus private target

Day	*-10*	*-9*	*-8*	*-7*	*-6*	*-5*	*-4*	*-3*	*-2*	*-1*	*0*
AAR PUB -10,10	-0.18%	-0.58%	0.18%	-0.69%	-0.35%	0.50%	0.33%	0.63%	0.52%	-0.12%	-2.04%
CAAR PUB -10,10	-0.18%	-0.76%	-0.58%	-1.27%	-1.61%	-1.11%	-0.78%	-0.15%	0.37%	0.25%	-1.80%
St dev PUB -10,10	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%
P-value	0.70	0.22	0.70	0.14	0.45	0.29	0.47	0.18	0.26	0.79	0.00[a]
AAR PRIV -10,10	-0.14%	-0.25%	-0.13%	0.33%	-0.48%	0.49%	-0.16%	0.28%	0.13%	0.12%	0.74%
CAAR PRIV -10,10	-0.14%	-0.39%	-0.53%	-0.20%	-0.68%	-0.19%	-0.36%	-0.08%	0.05%	0.18%	0.92%
St dev PRIV -10,10	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%
P-value	0.48	0.21	0.51	0.10[c]	0.02[b]	0.02[b]	0.42	0.17	0.52	0.54	0.00[a]
AAR PUB -5,5						0.50%	0.34%	0.65%	0.52%	-0.12%	-2.03%
CAAR PUB -5,5						0.50%	0.84%	1.49%	2.01%	1.89%	-0.14%
St dev PUB -5,5						0.46%	0.46%	0.46%	0.46%	0.46%	0.46%
P-value						0.28	0.46	0.17	0.27	0.80	0.00[a]
AAR PRIV -5,5						0.50%	-0.16%	0.28%	0.13%	0.11%	0.76%
CAAR PRIV -5,5						0.50%	0.34%	0.62%	0.75%	0.86%	1.62%
St dev PRIV -5,5						0.20%	0.20%	0.20%	0.20%	0.20%	0.20%
P-value						0.01[a]	0.42	0.16	0.51	0.57	0.00[a]
AAR PUB -1,1										-0.13%	-2.04%
CAAR PUB -1,1										-0.13%	-2.17%
St dev PUB -1,1										0.46%	0.46%
P-value										0.78	0.00[a]
AAR PRIV -1,1										0.11%	0.76%
CAAR PRIV -1,1										0.11%	0.87%
St dev PRIV -1,1										0.20%	0.20%
P-value										0.58	0.00[a]

Table 25 continued

Day	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
AAR PUB -10,10	-2.04%	-0.36%	-1.07%	-0.55%	0.04%	0.54%	-0.40%	-0.31%	-0.15%	-0.04%	-0.17%
CAAR PUB -10,10	-1.80%	-2.15%	-3.23%	-3.77%	-3.73%	-3.19%	-3.58%	-3.89%	-4.04%	-4.09%	-4.26%
St dev PUB -10,10	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%
P-value	0.00[a]	0.44	0.03[b]	0.24	0.93	0.25	0.39	0.51	0.74	0.92	0.71
AAR PRIV -10,10	0.74%	0.45%	0.08%	-0.31%	0.56%	-0.14%	-0.19%	0.16%	-0.19%	0.07%	-0.33%
CAAR PRIV -10,10	0.92%	1.37%	1.45%	1.14%	1.70%	1.56%	1.37%	1.53%	1.34%	1.41%	1.08%
St dev PRIV -10,10	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%
P-value	0.00[a]	0.03[b]	0.71	0.13	0.01[a]	0.49	0.34	0.42	0.34	0.72	0.10[c]
AAR PUB -5,5	-2.03%	-0.34%	-1.07%	-0.52%	0.05%	0.55%					
CAAR PUB -5,5	-0.14%	-0.48%	-1.55%	-2.07%	-2.02%	-1.47%					
St dev PUB -5,5	0.46%	0.46%	0.46%	0.46%	0.46%	0.46%					
P-value	0.00[a]	0.46	0.03[b]	0.27	0.91	0.24					
AAR PRIV -5,5	0.76%	0.45%	0.07%	-0.30%	0.55%	-0.14%					
CAAR PRIV -5,5	1.62%	2.08%	2.15%	1.85%	2.40%	2.26%					
St dev PRIV -5,5	0.20%	0.20%	0.20%	0.20%	0.20%	0.20%					
P-value	0.00[a]	0.02[b]	0.71	0.13	0.01[a]	0.48					
AAR PUB -1,1	-2.04%	-0.37%									
CAAR PUB -1,1	-2.17%	-2.53%									
St dev PUB -1,1	0.46%	0.46%									
P-value	0.00[a]	0.43									
AAR PRIV -1,1	0.76%	0.45%									
CAAR PRIV -1,1	0.87%	1.32%									
St dev PRIV -1,1	0.20%	0.20%									
P-value	0.00[a]	0.00[a]									

B.2. Robustness Analysis

B.1.4. Without Extreme Observations

Table 26: AAR and CAAR without extreme observations

This table shows the development in AAR and CAAR for the 11-day event window after removing 10%, 5% and 2% of the most extreme observations of CAR. When removing a percentage I have removed equal amounts of extreme negative and extreme positive observations. That means that I have removed 5%, 2.5% and 1% of both tails for the three versions.

Day	*-5*	*-4*	*-3*	*-2*	*-1*	*0*	*1*	*2*	*3*	*4*	*5*
AAR 10% -5,5	0.38%	0.02%	0.33%	0.10%	0.13%	0.11%	0.25%	-0.19%	-0.34%	0.32%	0.05%
CAAR 10% -5,5	0.38%	0.40%	0.73%	0.83%	0.96%	1.07%	1.32%	1.13%	0.79%	1.11%	1.16%
St dev 10% -5,5	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%
P-value	0.04[b]	0.90	0.07	0.60	0.46	0.54	0.17	0.29	0.06[c]	0.08[c]	0.78
AAR 5% -5,5	0.40%	-0.02%	0.29%	0.19%	0.06%	0.19%	0.34%	-0.19%	-0.29%	0.35%	-0.02%
CAAR 5% -5,5	0.40%	0.37%	0.66%	0.84%	0.91%	1.10%	1.44%	1.25%	0.97%	1.32%	1.30%
St dev 5% -5,5	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%
P-value	0.03[b]	0.89	0.11	0.30	0.73	0.29	0.06[c]	0.30	0.11	0.05[c]	0.92
AAR 2% -5,5	0.40%	0.05%	0.25%	0.22%	0.07%	0.28%	0.38%	-0.25%	-0.22%	0.30%	-0.03%

CAAR 2% -5,5	0.40%	0.45%	0.70%	0.92%	0.99%	1.28%	1.65%	1.40%	1.18%	1.48%	1.45%
St dev 2% -5,5	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%
P-value	0.03[b]	0.78	0.17	0.21	0.70	0.12	0.04[b]	0.17	0.23	0.10[c]	0.86

B.1.5. Regular Beta

Table 27: AAR and CAAR with regular beta

Day	*-10*	*-9*	*-8*	*-7*	*-6*	*-5*	*-4*	*-3*	*-2*	*-1*	*0*
AAR-10,10	-0.18%	-0.30%	-0.07%	0.18%	-0.47%	0.49%	-0.07%	0.35%	0.17%	0.08%	0.32%
CAAR-10,10	-0.18%	-0.48%	-0.56%	-0.38%	-0.85%	-0.36%	-0.42%	-0.08%	0.09%	0.17%	0.50%
St dev -10,10	0.19%	0.19%	0.19%	0.19%	0.19%	0.19%	0.19%	0.19%	0.19%	0.19%	0.19%
P-value	0.33	0.10[c]	0.70	0.33	0.01[a]	0.01[a]	0.72	0.06[c]	0.36	0.67	0.08[c]
AAR-5,5						0.49%	-0.06%	0.35%	0.17%	0.08%	0.33%
CAAR-5,5						0.49%	0.43%	0.78%	0.95%	1.03%	1.36%
St dev -5,5						0.18%	0.18%	0.18%	0.18%	0.18%	0.18%
P-value						0.01[a]	0.73	0.06[c]	0.35	0.68	0.07[c]
AAR-1,1										0.08%	0.33%
CAAR-1,1										0.08%	0.40%
St dev -1,1										0.18%	0.18%
P-value										0.68	0.08[c]

Table 27 continued

Day	*0*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
AAR-10,10	0.32%	0.30%	-0.03%	-0.35%	0.48%	-0.05%	-0.22%	0.08%	-0.18%	0.05%	-0.31%
CAAR-10,10	0.50%	0.80%	0.76%	0.41%	0.89%	0.84%	0.61%	0.70%	0.51%	0.57%	0.25%
St dev -10,10	0.19%	0.19%	0.19%	0.19%	0.19%	0.19%	0.19%	0.19%	0.19%	0.19%	0.19%
P-value	0.08[c]	0.10[c]	0.85	0.06[c]	0.01[a]	0.78	0.23	0.65	0.32	0.78	0.09[c]
AAR-5,5	0.33%	0.30%	-0.03%	-0.35%	0.48%	-0.05%					
CAAR-5,5	1.36%	1.66%	1.63%	1.28%	1.75%	1.70%					
St dev -5,5	0.18%	0.18%	0.18%	0.18%	0.18%	0.18%					
P-value	0.07[c]	0.10[c]	0.85	0.06[c]	0.01[a]	0.77					
AAR-1,1	0.33%	0.30%									
CAAR-1,1	0.40%	0.70%									
St dev -1,1	0.18%	0.18%									
P-value	0.08[c]	0.10[c]									

B.1.6. Without Clustering

Table 28: AAR and CAAR without clustering

Day	*-1*	*0*	*1*
AAR-1,1	0.04%	1.13%	0.57%
CAAR-1,1	0.04%	1.18%	1.75%
St dev -1,1	0.27%	0.27%	0.27%
P-value	0.87	0.00[a]	0.04[b]

Appendix C

Cross-sectional Regression Outputs

In this section I have included the regression outputs from my analyses that are not printed in chapter 6 or 7. Significant p-values will be marked with *c* for significance on a 90%-level, *b* for 95%-level and *a* for a 99% confidence level.

C.1. Original Cross-sectional Regression Analysis

Table 29: Cross-sectional regression for the (-1, 1) event window

	1			*2*			*3*			*4*		
	Coef.	*Std. dev.*	*P-value*	*Coef.*	*Std. dev.*	*P-value*	*Coef.*	*Std. dev.*	*P-value*	*Coef.*	*Std. dev.*	*P-value*
DE	0.0006	0.05%	0.26	0.0006	0.05%	0.24	0.0008	0.05%	0.13	0.0008	0.06%	0.16
pub	-0.038	1.15%	0.00[a]	-0.0384	1.13%	0.00[a]	-0.0377	1.10%	0.00[a]	-0.0377	1.00%	0.00[a]
relat	0.0023	1.10%	0.83	0.0008	1.04%	0.94	0.0005	1.07%	0.96			
cash	-0.0072	0.82%	0.38	-0.0041	0.81%	0.61	-0.0059	0.82%	0.48			
wd	-0.0215	2.51%	0.39	-0.0185	2.37%	0.44	-0.0088	2.09%	0.67			
dom	0.0053	0.87%	0.54	0.0063	0.85%	0.46						
ROA	-0.1947	19.34%	0.32	-0.1842	18.52%	0.32						
d02	0.0125	1.38%	0.37									
d04	0.0028	0.97%	0.77									
d05	-0.01	1.62%	0.54									
d06	-0.0029	1.05%	0.78									
cons	0.0174	1.38%	0.21	0.0166	1.58%	0.3	0.0133	0.99%	0.18	0.0119	0.47%	0.01[a]
R^2	10.44%			9.05%			6.38%			6.13%		

Table 30: Cross-sectional regression for the (-10, 10) event window

	1			*2*			*3*			*4*		
	Coef.	*Std. dev.*	*P-value*	*Coef.*	*Std. dev.*	*P-value*	*Coef.*	*Std. dev.*	*P-value*	*Coef.*	*Std. dev.*	*P-value*
DE	-0.0011	0.11%	0.32	-0.0009	0.08%	0.27	-0.0006	0.08%	0.45	-0.0005	0.05%	0.35
pub	-0.0469	2.17%	0.03[b]	-0.0473	2.14%	0.03[b]	-0.0451	2.13%	0.04[b]	-0.0538	2.02%	0.01[a]
relat	0.0054	1.89%	0.78	0.004	1.82%	0.83	0.0044	1.90%	0.82			
cash	0.0205	1.85%	0.27	0.0261	1.72%	0.13	0.0222	1.70%	0.19			
wd	-0.0825	3.63%	0.02[b]	-0.0847	3.49%	0.02[b]	-0.0699	3.72%	0.06[c]			
dom	0.0219	2.45%	0.37	0.0202	2.36%	0.39						
ROA	-0.306	26.46%	0.25	-0.308	25.81%	0.23						
d02	0.0073	2.21%	0.74									
d04	0.0269	2.63%	0.31									
d05	-0.0183	2.84%	0.52									
d06	-0.0003	1.77%	0.99									
cons	-0.0037	3.02%	0.9	0.0003	3.13%	0.99	0.0024	1.63%	0.89	0.0116	0.92%	0.21
R^2		8.20%			6.59%			4.22%			2.84%	

Appendix D

Ordinary Least Squares

OLS, or Ordinary Least Squares, is a method for estimating parameters of a linear regression model. The method minimizes the sum of squared residuals (Wooldridge, 2003). I will in the following use notation and terminology from Wooldridge (2003).

The OLS-method is said to be BLUE (Best Linear Unbiased Estimator) under the following assumptions:

D.1. Cross-sectional Data

- The model must be linear in the parameters

  This implies that the model can be written as follows:

  $$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k + \varepsilon$$

- Random sampling

  The sample was randomly drawn from the population.

- Zero conditional mean

  The error term has expected value equal to zero, given any values of the independent variables.

- No perfect collinearity

  None of the independent variables are constant and there is no linear relationship among the independent variables.

- Homoscedasticity

  Constant variance in the error term:

  $$Var(\varepsilon | x_1, \ldots, x_k) = \sigma^2$$

D.2. Time Series Data

- The model must be linear in the parameters

  This implies that the model can be written as follows:

  $$y_t = \beta_0 + \beta_1 x_{1t} + \beta_2 x_{2t} + \ldots + \beta_k x_{kt} + \varepsilon_t$$

- Zero conditional mean

  For each t, the error term has expected value equal to zero, given any values of the independent variables.

- No perfect collinearity

  None of the independent variables are constant and there is no linear relationship among the independent variables.

- Homoscedasticity

  Constant variance in the error term over time:

  $$Var(\varepsilon_t | X) = Var(\varepsilon_t) = \sigma^2$$

- No serial correlation

  The errors in two different time periods are uncorrelated.