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Stockholm School of Economics
Department of Finance

Takeover Offers and Intra-Industry Effects

An Empirical Analysis of Rival Firms' Stock Price Reactions to Takeover Offers

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Abstract

Using a data set containing 162 takeover offers in the Swedish stock market, we conduct an event study to investigate industry rivals' stock price reactions to takeover offers within the same industry. Our findings indicate that the abnormal returns of industry rivals are not significantly affected by the takeover offers. By applying interquantile regressions we are able to show that there is no statistically significant increase in variance for rival firms around the event date either, which is unexpected. Testing for differences in-between industries, it appears that industry rivals' cumulative abnormal returns are centered around zero regardless of industry type. Additionally there seems to be no correlation between abnormal return of target firms and the abnormal return of rival firms around the takeover announcement.

Keywords: Event Study, Takeover Offers, Acquisitions, Industry Rivals, Industry Comovements

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1. Introduction

Few investors are today ignorant to the impact that earning announcements and takeover offers may have on their holdings. Previous studies have suggested that stock prices also are dependent upon significant events impacting companies within the same industry. It has for example been stated that earnings announcements from companies may impact the stock prices of industry rivals, creating short term abnormal returns (AR) (Foster 1981). Further, Lang & Stulz (Lang, Stulz 1992) conclude that stock prices are impacted by industry rivals' bankruptcy announcements. Building on previous research, this study will investigate the impact of takeover announcements on the short term stock prices of industry rivals.

Some studies have been conducted on this topic (e.g. Eckbo 1983). However they have focused mainly on horizontal and challenged mergers for US, Canadian or European firms. The previous studies have reported varying results, consequently it is of interest to analyse if there is an effect in the Swedish market.

This thesis investigates three areas concerning the reaction of industry rivals to takeover offers. Firstly we analyse whether the takeover offer on a target firm is a strong enough signal to create abnormal returns or abnormal variance for industry rivals. Our findings show that target firms enjoy abnormal returns of almost 25% on average in the event window, while industry rivals are not impacted at all. The cumulative abnormal return (CAR) for industry rivals between day -1 to day +1 is normally distributed around zero. Additionally, interquantile regressions of abnormal returns show that the variances of cumulative abnormal returns for industry rivals is unaffected by the takeover announcement. The findings are not consistent with expectations and stresses the fact that takeover announcements most likely have no significant impact on the stock prices of rival firms.

Secondly, we investigate how different industry categories react to takeover offers on rival firms. Graphing the CAR:s based on industry type yields small differences, however our findings indicate that no industry shows any CAR:s significantly different from zero or significantly different from other categories.

Thirdly, this paper investigates to what degree the abnormal returns of the target firm and industry rivals are correlated by conducting a regression analysis and by calculating correlation coefficients. The results indicate that the returns of target and rival firms are not significantly correlated at all.

We propose the following three hypotheses in order to explain our findings:

Hypothesis 1: Takeover offers create short term abnormal returns and abnormal variances for other stocks within the same industry

Hypothesis 1 tests whether the market perceives takeover offers as a positive or negative signal for industry rivals. The hypothesis also enables us to test if there are abnormal variances in industry rivals stock prices around the announcement date. Previous studies suggest a number of reasons why this hypothesis should hold. Betton et al. (Betton et al. 2008) argues that mergers may create price wars due to predatory pricing, which would indicate that the stock prices of rival firms should fall when a takeover is announced. Further Eckbo (Eckbo 1983) adds that rival firms may also enjoy monopoly rents from collusive behaviour, motivating price increases on the announcement date. Additionally, Andrade & Stafford (Andrade, Stafford 2004) were able to show that once a rival has been acquired the chance of additional acquisitions within the same industry increases. This would be another factor motivating price increases for rival firms. Hence we expect the stock price to move in either a positive or negative direction for the Swedish stock market.

Hypothesis 2: Rival firms show different abnormal returns after a takeover offer has been announced, depending on industry type

The industry size and nature are expected to impact the reaction of the takeover offer. Schumann (Schumann 1993) argues that firms with the lowest market share enjoy the highest abnormal returns after a takeover offer has been announced. We believe that the same may be applicable on industry types. That certain industry types are more dependent upon rival firms then others.

Hypothesis 3: There is a correlation between the magnitude of abnormal returns for the target firm and the magnitude of abnormal returns for industry rivals

It is reasonable to believe that if there is a large impact on target firms' stock prices, the rival firms' stock prices is expected to be impacted to a higher degree as well. We expect that the reaction of the target firm works as a proxy for the attractivity of the takeover announcement. This would mean that if a target firm gets a high bid price compared to its underlying value, the market might price industry rivals based on this new information. Causing industry rivals' stock prices to correlate with target firms prices.

1.1 Outline of Thesis

Section 2 presents the data set used for the thesis, as well as the databases from which the data was gathered. In section 3 we discuss previous literature on the topic and learnings that can be obtain from these studies. Section 4 describes the theoretical framework and the methodology used to test our hypothesises. In section 5 we present our findings and in section 6 we arrive at our conclusions. Section 7 summarizes the limitations of our thesis as well as suggestions for future research.

2. Data

The primary data sources are Thomson Reuters SDC Platinum, Finbas and Compustat Capital IQ. Complementary data has been gathered from Nasdaq.

2.1 Takeover Offer Data

The database used for gathering data on takeover offers is SDC Platinum (Thomson Reuters). SDC Platinum is a financial transaction database managed by Thomson Reuters, that contains data on new issues, M&A, syndicated loans, private equity, project finance, poison pills and more.

The obtained data is adjusted in numerous ways. Firstly, the data is limited to takeover offers on Swedish publically traded companies from January 1st 1990 to March 3rd 2016, yielding a sample size of 2033 takeover offers. Further our selection criteria are limited to takeover offers, which for this thesis is defined as the acquiring company owning less than 50% of the shares prior to the takeover offer and more than 50% after the transaction. The definition deletes 1015 observations from the data set. Additionally, the offer needs to concern a purchase of at least 30% of the shares, which excludes another 23 observations. The criterion is applied in order for the offer to create significant signals for investors. This also means that companies for which observations regarding the size of ownership is lacking, are deleted from the data set, which excludes another 598 observations. Additionally, rumoured deals are erased from the data set, hence 11 observations are dropped. While rumours may have an impact on stock returns, our thesis focuses only on actual takeover offers. All observations prior to year 2000 are deleted since takeover records prior to this date are insufficient. This excludes another 152 observations are deleted. Additionally, the single takeover announcement from 2016 is deleted because we lack stock price data for this period. No selection criteria are imposed on the acquiring companies. All adjustments above entail a data set containing 233 takeover offers.

2.2 Stock Price Data

Compustat Capital IQ as well as Finbas were evaluated as data sources for stock price data. Compustat Capital IQ provides data directed at bankers, advisors, analysts, universities and institutional investors (Standard & Poor´s).

Finbas is published by The Research Data Center of the Swedish House of Finance (The Research Data Center of the Swedish House of Finance) and contains end-of-day stock price data, corporate actions and fundamentals from the Nordic Stock Exchanges, MTFs and OTC markets.

Finbas was chosen primarily because Compustat Capital IQ is lacking complete stock price data for smaller Swedish stock exchanges such as First North. Data was gathered for years 2000-01-01 to 2015-12-31. The data contains last traded price per day and trading volume for 1140 stocks classified by their International Securities Identification Number (ISIN). The last traded price per day is adjusted for corporate actions, enabling for price comparisons over time. Our selection criteria limit the data set to a maximum of one stock class (class-A, -B or -C) per company. The filter is applied in order for the data set not to be biased towards companies with several stock classes. In case of numerous stock classes, the ones with the lowest traded volume are dropped, which excludes 70 stocks. Most frequently the stock class A is dropped from the data set. One ISIN code labelled "Dummy" was dropped as well. This resulted in a data set of 1069 stocks.

There is a clear payoff in terms of increased power from reducing the sampling interval (MacKinlay 1997 & Morse 1984). We therefore choose to use daily stock price data rather than less frequent sampling, in order to obtain stronger power for our tests..

As a proxy for market return we use Nasdaq OMX Stockholm PI index that was obtained from the Nasdaq database (Nasdaq OMX). The OMXSPI index is a value-weighted index of all shares trading on the Nasdaq Stockholm Exchange and is one of the most commonly used market indexes in Sweden (Nasdaq OMX).

2.3 Industry Data

There are numerous ways of classifying companies by their industry, e.g. International Standard Industrial Classification (ISIC), North American Industry Classification System (NAICS) and Standard Industrial Classification (SIC). Comparing the different classification systems we find that the SIC system provides us with the greatest number of classified companies, thus we classify the companies using this system. The SIC system is based on a four-digit number that specifies the industry. The first two digits represents the major industry sector and the last two digits specifies the sub-classification. For this thesis we choose to apply the SIC codes at a 4-digit level, in order to get the highest specification possible. The main source of SIC codes is Compustat Capital IQ (Standard & Poor´s). Since this database does contain SIC codes for all the stocks in our data set, we combine the Compustat Capital IQ data with SIC code data from SDC Platinum, Nasdaq (Nasdaq) and Compustat Security daily code lookup (Standard &

Poor´s). This resulted in SIC codes for 889 stock types out of the total of 1069 stocks from our data set. In case the SIC codes differ in-between the takeover data from SDC Platinum and Compustat Security daily code lookup, we choose to apply the SIC codes from SDC Platinum in order to be consistent.

2.4 Merged Data

The takeover offer data, stock price data, Nasdaq Stockholm OMXSPI and industry data was merged into one data set. The merged data set contains ISIN-numbers, announcement dates, SIC codes, OMXSPI prices and stock prices. 38 takeover offers are dropped since they lack a match in the stock data. This resulted in a merged data set containing 195 takeover offers. However, since some takeover announcements lack substantial amounts of data for the estimation period, additional 31 takeovers are excluded from the statistical tests concerning rival firms. Further, two events coincide with the estimation window of other announcements for rivals and are eliminated from the statistical tests concerning rival firms. This implies that the statistical tests are based on a data set containing 164 takeover announcements of which 162 are generating industry rivals to analyse. The total number of industry rival to analyse are 526.

3. Previous Literature

In the section below we review and discuss literature related to the subject of this paper. Firstly, we will analyse previous research concerning abnormal returns for target firms as a result of takeover offers. Secondly we will briefly discuss research that has been conducted on the comovement of stocks within the same industry. Thirdly we will explore papers related to industry-clustering of mergers which is closely related to why industry rivals stock prices' may be impacted after a takeover announcement. Lastly we will review previous research concerning the effect of horizontal takeover offers on rival firms made in the US, Canada & Europe.

3.1 Abnormal Returns as a Consequence of Takeover Offers

One of the first major studies on abnormal returns related to takeover offers was G. Mandelker's paper "Risk and Return: The Case of the Merging Firm", published in the *Journal of Financial Economics* in 1974 (Mandelker 1974). Mandelker shows that stockholders of target firms earn abnormal returns of approximately 14% on average as a consequence of a takeover. By applying the two factor model developed by Black-Jensen-Scholes and Fama-MacBeth on US data from year 1948 to 1967, Mandelker was able to show that the market is effective in pricing mergers. Mendelker's research was followed by a paper on the same topic written by Rudback & Jensen in 1983 (Ruback, Jensen 1983). The authors concluded that target shareholders benefit from a takeover, while the bidder shareholders are not worse off. In comparison to Mandelker's paper, Jensen & Rudback distinguished the return between different types of offers. The paper concludes that the target shareholders enjoy abnormal stock returns of 20% in case of mergers and 30% in case of tender offers.

3.2 Intra-industry Comovements

In order for us to investigate if takeover offers can impact the performance of rivals, it is beneficial to learn from previous studies concerning intra-industry comovements. One of the first studies on the topic was "Intra-industry information transfers associated with earnings releases" written by Foster and published in the Journal of Accounting and Economics in 1981 (Foster 1981). The paper showed that earning announcements impact the stock prices of industry rivals. Foster also concluded that firms with similar cash flow sources as the announcing firm was impacted to a higher degree. Further the paper examines the impact of different scenarios after earnings reports have been announced. Firstly, Foster identifies a significant impact on the stock price of rival firm *j* after earnings announcement of firm *i* has been released. Secondly the paper identifies that if the earnings announcement is positive for firm *i*, the abnormal return for firm *j* will also be positive. The opposite is found to be true as well. Eleven years after Foster's paper, Lang & Stultz (Lang, Stulz 1992) published another paper on the topic with focus on bankruptcy announcements. Lang & Stulz state that bankruptcy announcements impact industry rivals' equity. According to the authors, the effect on industry rivals was 1%. However, Lang & Stulz also found that bankruptcies in highly levered industries tend to impact industry rivals to a higher degree, 3%. Additional research on the topic of intra-industry comovements have been conducted since. For example in 2015 Akhigbe et al. (Akhigbe et al. 2014) published the paper "Intra-industry effects of negative stock price surprises". In the paper they argue that, on average, a stock price decline for one firm creates a negative effect on the value of industry rivals. The findings show that there is a comovement within the industry after a negative surprise has occured. Additionally, Akhigbe et al. conclude that the drivers for the effect on industry rivals are, among others, the degree of the surprise and characteristics of the industry.

3.3 Industry-clustering of Mergers

As previously discussed, target firms enjoy short term abnormal returns at the time of the offer. Based on these findings it is interesting to learn more about what happens to the industry after an acquisition. Andrade & Stafford are able to identify that mergers are clustered based on industry (Andrade, Stafford 2004). The paper concludes that the probability of a merger increases as an industry rival is acquired. Andrade & Stafford's findings imply that once an acquisition has occurred the likelihood of another acquisition within the same industry is increasing. This would indicate that takeover offers potentially could impact the stock prices of industry rivals positively.

3.4 Abnormal Returns for Industry Rivals as a Consequence of Horizontal Takeovers

Reviewing the literature concerning earnings announcements, bankruptcy announcements, comovements due to shocks and industry-clustering of mergers, it is expected that takeover offers may have an impact on industry rivals' stock prices as well. This area has been the subject of a few previous studies in the US, Canada & Europe.

Eckbo (Eckbo 1984) examined the intra-industry wealth effect of 191 industry horizontal and 68 vertical mergers between 1963 to 1978 in the US. Among the 191 horizontal mergers, 65 were challenged by either the Federal Trade Commission or the Departments of Justice. Additionally, 11 of the vertical mergers were challenged as well. For each merger, Eckbo identified a number of rivals based on their SIC code. Eckbo was able to prove a small but significantly positive abnormal performance for industry rivals when a successful horizontal merger was announced. In 1993 Schumann (Schumann 1993) was able to show similar results as Eckbo. Schumann studied 37 cases of horizontal merger proposals during 1981-1987. The 37 mergers were all challenged by the Federal Trade Commission. Schumann concluded that rival firms enjoy significantly positive returns at the proposal announcement and zero at the time of the antitrust complaint. Additionally, the paper reported that rivals in the lowest market share quartile show the largest abnormal returns.

However, several studies also document statistically significant negative abnormal returns for rival firms in response to announcements of horizontal mergers. Eckbo (Eckbo 1992) proves a negative industry wealth effect for horizontal mergers in Canada. Additionally, Aktas et al. (Aktas et al. 2007) were able to prove significantly negative rival abnormal returns for industry rivals when analysing horizontal mergers within the European Union.

Further Stillman (Stillman 1983) conducted a study on horizontal merger proposals in the U.S. for the period 1964-1972 and finds zero average abnormal return. The rival returns were showed to be unaffected by both the takeover announcement and antitrust complaint.

4. Theory and Methodology

In this section we will discuss the methodological approach in detail, as well as the theories used to analyse the industry rivals' reaction to takeover offers. The outline of our analysis follows the event study methodology. Firstly the predicted return is compared to the actual return over the event window in order to generate abnormal returns. Additionally, we test if the abnormal returns and the cumulative abnormal returns differ significantly from zero, using a number of parametric and non parametric tests. After conducting our tests on abnormal returns and cumulative abnormal returns, we test if the variance is affected by the takeover announcements. Further we test if industries differ in their reaction to takeover announcements. Lastly we focus on regression analyses to test the correlation between abnormal target returns and abnormal rival returns.

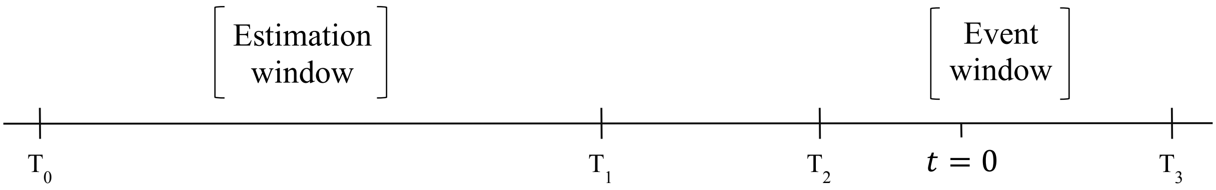
4.1 Event Study

MacKinlay (MacKinlay 1997) states that an event study measures the impact of a specific event on the value of a firm. McWilliams & Siegel (McWilliams, Siegel 1997) adds to MacKinlay's definition by stating that the event study helps researchers determine whether there is an abnormal stock price effect associated with an unanticipated event. Connecting to the topic of this thesis we find that the event study methodology is appropriate to apply. In the following sections we will discuss how our event study has been conducted.

4.2 Event- and Estimation Window

Normal performance is calculated based on previous returns, for a pre-specified estimation window $[T_0, T_1]$. Around the event date, an event window is created $[T_2, T_3]$. Abnormal returns are calculated in the event window using expected returns. The event date is denoted $t = 0$. MacKinlay proposes an estimation window of 120 trading days. However due to missing observations in our data set, a 200-day estimation window with at least 120 non-missing observations will be applied. The minimum requirement concerning number of observations, is applied in order to obtain an acceptable level of accuracy in estimations of expected returns. To avoid information leakage to impact the normal returns a 40 trading day gap will be applied between the end of the estimation window and the beginning of the event window (Betton et al. 2008). Therefore, the estimation window will range from $t = -240$ to $t = -40$ and the event window will range from $t = -10$ to $t = 20$, as illustrated in Figure 1.

Figure 1. Timeline for event study



4.3 Different Methods for Calculating Expected Returns

Fama states that all estimation models are incomplete descriptions of the systematic patterns in average returns (Fama 1998). This indicates that the most appropriate model to use in an event study is the one with the highest possible accuracy. There are generally two different groups of models for measuring normal performance of a security in event studies, statistical and economical models (Campbell et al. 1996). Statistical models are based on statistical assumptions, separated from economical theories. In contrast to statistical models, the economical models rely on economic assumptions rather than only statistical theories. The market model is the most commonly used statistical model. The economic capital asset pricing model was very popular in event studies during the 1970s (MacKinlay 1997). Fama & French (Fama, French 1992) argues that the application of a multifactor model gives more accurate estimations of the stock return. In the following section we will discuss these models in more detail.

4.3.1 Statistical Models

4.3.1.1 The Market Model

The market model is at present the most commonly used model when conducting event studies. The model has the following formula for returns (MacKinlay 1997):

$$R_{i,t} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{1}$$

Where $R_{i,t}$ is the return for security i at time t, R_{mt} is the return of the market portfolio at time t and ε_{it} is the disturbance term with an expected mean zero. α_i and β_i are parameters of the model. The abnormal return in the event window is calculated using:

$$AR_{i,t} = R_{it} - E(R_{it}|X_t) \tag{2}$$

Formula 2 is the general formula for abnormal returns for security i at time t. $X_t$is the factor that in normal cases explains the return.

$$\widehat{AR_{\iota,t}} = R_{it} - \widehat{\alpha_\iota} - \widehat{\beta_\iota} R_{mt} \tag{3}$$

Formula 3 is the abnormal return formula for the market model specifically, where $\widehat{\alpha_{\iota}}_i$ and $\widehat{\beta_{\iota}}_i$ are estimated from the estimation window.

4.3.1.2 Multifactor Models

The market model can be expanded with additional parameters to estimate normal performance (Campbell et al. 1996). MacKinlay (MacKinlay 1997) suggests that an additional factor to add to the model is the size of the firm measured by market value of equity. Further, Sharp et al. (Sharpe et al. 1995) argue that an additional factor taking industry classification into account may contribute to the explanatory value. The benefit of using a multifactor model is that the variance of the abnormal returns is lowered by explaining a higher degree of the normal return variations.

4.3.2 Economical Models

4.3.2.1 The Capital Asset Pricing Model - CAPM

The CAPM (Bodie et al. 2013) estimates the expected return of a stock to be:

$$E(r_i) = r_f + \alpha_i + \beta_{mkt,i}(r_{mkt} - r_f) + \varepsilon_i \tag{4}$$

In formula 4, $E(r_i)$ is the expected return for security i, α_i is the expected firm specific return and $\beta_{mkt,i}$ measures the systematic risk of the security i in relation to the market. Additionally r_{mkt} is the market return which is estimated using Nasdaq OMXSPI index and r_f is the risk free rate. Based on the CAPM formula, the abnormal return for security i is calculated as:

$$AR_{i,t} = R_{i,t} - [r_f + \alpha_i + \beta_{mkt,i}(r_{mkt,t} - r_f)] \tag{5}$$

4.3.2.2 Fama French Three-Factor Model

Fama & French (Fama, French 1992) argues that by applying the Fama-French three-factor model rather than the CAPM the accuracy in predictions will increase. However, since this thesis focuses exclusively on Swedish stocks and the SMB (Small Minus Big) and HML (High Minus Low) data is lacking for the Swedish market, the Fama-French three factor model is not applicable in this thesis.

4.3.3 Comparison Between the Models

Comparing the statistical models to the economical model, Campbell et al. argues that during the last ten years, deviations from CAPM have been discovered. (Campbell et al.1996). Additionally MacKinlay (MacKinlay 1997) states that statistical models are better at predicting normal performance than economical models. Focusing on statistical models, MacKinley (MacKinlay 1997) argues that since the marginal explanatory power and the variance reduction of additional model factors is small, the gains from applying a multifactor model is highly limited. Thus for this thesis the market model will be applied.

4.4 Cumulative Abnormal Return

The cumulative abnormal return is calculated as the cumulative sum of abnormal returns in the event window as illustrated in Formula 6:

$$CAR_i(t_i, t) = \sum_{t=t_1}^{t} AR_{i,t} \tag{6}$$

Where $T_2 \leq t_1 \leq t \leq T_3$.

4.5 Average Abnormal Return and Cumulative Average Abnormal return

The average abnormal return (AAR) is calculated as the average of the abnormal returns:

$$AAR_t = \overline{AR_t} = \frac{1}{N}\sum_{i=1}^{N} \widehat{AR_{\iota,t}} \tag{7}$$

The cumulative average abnormal return (CAAR) is calculated as the average of the cumulative abnormal returns:

$$CAAR(t_1, t) = \overline{CAR}(t_1, t) = \frac{1}{N}\sum_{i=1}^{N} \widehat{CAR}\,(t_1, t) \tag{8}$$

4.6 Statistical Tests

Parametric tests assume that each firm's abnormal returns are normally distributed. However non parametric tests do not make the same assumption. In order to test for significance, we choose to apply two different significance tests, the parametric Student's T-test and the nonparametric Wilcoxon Signed-Rank test. By applying both methods, we will be able to confirm our findings to a higher degree.

4.6.1 Student's T-test

When testing if the abnormal returns and the cumulative abnormal returns differs from zero for different time periods, we choose to apply the parametric Student's T-test, with the following test statistic:

$$t_{CAAR(t_1,t)} = \sqrt{N}\frac{CAAR(t_1, t)}{S_{CAAR(t_1,t)}} \tag{9}$$

where

$$S^2_{CAAR(t_1,t)} = \frac{1}{N-1}\sum_{i=1}^{N}(CAR_{t,i} - CAAR(t_1, t))^2 \tag{10}$$

and $t_{CAAR(t_1,t)}$ is the test statistic and $S^2_{CAAR(t_1,t)}$ is the variance of the cumulative average abnormal returns.

4.6.2 Wilcoxon Signed-Rank Test

In addition to section 4.6.1, we also apply the nonparametric Wilcoxon Signed-Rank test. The test is used in order to analyse if the population mean rank of the cumulative abnormal returns in the event window significantly differ from zero. The following test statistic is used:

$$z = \frac{T_+ - E(T_+)}{\sqrt{Var_{adj}(T_+)}} \tag{11}$$

where

$$Var_{adj}(T_+) = \frac{1}{4}\sum_{j=1}^{n} r_j^2 \tag{12}$$

and

$$T = \sum_{j=1}^{n} S_j r_j \tag{13}$$

z is the test statistic, T_+ is the sum of positive signed-ranks, r_j is the observed signed ranks, considered fixed, and S_j is either +1 or -1 (Wilcoxon 1945 & Snedecor, Cochran 1989).

4.6.3 Testing for Event-induced Variance Using Interquantile Regressions

In order to analyse if the abnormal returns change in ways not detected by the Student's T-test and Wilcoxon Signed-Rank test, we will perform interquantile regressions. An interquantile regression makes it possible to analyse if the range between the two specified quantiles is different during the event window in relation to the comparison period. For example, if the variance increases during the event window without changing the mean and ranks, tests on means and ranks will not fully cover the changes of abnormal returns, even if the interquantile range increases. Therefore, changes in the interquantile range will reveal event-induced variance. Bootstrapping, first introduced by Efron in 1979 (Efron 1979), accounting for event clustered cumulative abnormal returns observations, will be applied in the interquantile regression.

4.6.3.1 The Quantile Regression Model

The base of the quantile regression is the conditional quantile function (CQF). The CQF can be defined as:

$$Q_\tau(Y_i|X_i) = F_Y^{-1}(\tau|X_i) \tag{14}$$

where Y_i is a continuously-distributed random variable, τ is the quantile given a vector of regressors X_i and $0 \leq \tau \leq 1$ (Angrist, Rischke 2009). The CQF solves the minimization problem:

$$Q_\tau(Y_i|X_i) = \arg min_{q(X)} E[\rho_\tau(Y_i - q(X_i))] \quad (15)$$

where the "check function" (Angrist, Rischke 2009) is defined as

$$\rho_\tau(u) = 1(u > 0) * \tau u + 1(u \leq 0) * (1 - \tau)u \quad (16)$$

The positive and negative terms are asymmetrically weighted in the check function and creates a minimand to find conditional quantiles (Koenkel 2005). The quantile regression substitutes a linear model for $q(X_i)$ in Formula 15, generating:

$$\beta_\tau = \arg min_{b \in R^d} E[\rho_\tau(Y_i - X_i' b] \quad (17)$$

where the regression estimator, $\hat{\beta}_\tau$ is the sample analog of Formula 17.

4.6.3.2 Interquantile Regression Model

Consider two quantile regression models

$$Q_{\tau_1}(y) = a_{\tau_1} + b_{\tau_1,1} x_1 \quad (18)$$

$$Q_{\tau_2}(y) = a_{\tau_2} + b_{\tau_2,1} x_1 \quad (19)$$

where τ_1 and τ_2 are two quantiles. The interquantile range is defined as the difference between two quantiles, τ_1 and τ_2, hence the interquantile regression is defined as:

$$Q_{\tau_1}(y) - Q_{\tau_2}(y) = (a_{\tau_1} - a_{\tau_2}) + (b_{\tau_1} - b_{\tau_2})\, x_1 \quad (20)$$

4.7 Regression Analysis

In order to test the correlation between abnormal returns between target and rival firms a regression analysis is conducted. The linear regression model between the two variables is calculated using the ordinary least squares method (OLS). The method enables us to test relationship between abnormal returns for rival and target firms. Additionally, we calculate the correlation coefficient showing the statistical relationship between the two variables.

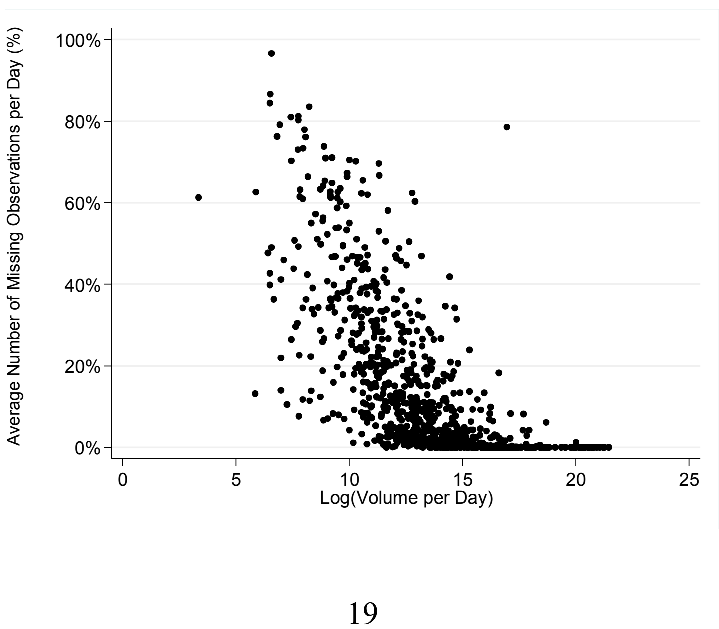
4.8 Outliers and Missing Data

Sorokina et al. (Sorokina et al. 2013) argues that researchers in finance and accounting fields often use one of three methods to treat outliers: ignore them, trim the sample to remove inconvenient data points or winsorizing the largest and smallest observations by replacing them with the values of arbitrary selected cut-off points. Further Sorokina et al. argues that removing outliers may delete important information from the analysis, while winsorizing makes the worst choice since it adds unambiguously incorrect observations to the data set. Based on Sorokina et al. we choose to ignore the outliers instead of trimming or winsorizing the data.

There are several different methods to handle missing data (Little, Rubin 1987). As illustrated in Figure 2, it is found that when stock prices are missing for a specific day, they are highly dependent on trading volume. The missing observations in our data set are exclusively due to a lack of transactions for that specific day and hence the price difference for that trading day is non-existing. Since the missing observations are dependent on a lack of transactions, imputation is misleading and would falsely improve test statistics. Based on a regression analysis, there seems to be no correlation between missing observations and abnormal returns, or between traded volume and abnormal return. Which indicates that dropping these observations will not create any misleading bias in our study.

Figure 2. Scatter over average number of missing observations per day compared to the logarithmic trading volume per day

Figure 2 provides an overview over the relationship between missing values and trading volume for the security. The volume per day is logarithmic based on the transaction volume in SEK.



4.9 Clustering of Events

When a target firm in our study has several rivals at the time of the takeover announcement, the events are clustered. MacKinlay (MacKinlay 1997) argues that when event windows overlap and the covariances between abnormal returns are no longer zero, distributional results presented for the aggregated abnormal returns are no longer applicable. Additionally Bernard (Bernard 1987) states that if the covariance due to clustered events is not taken into account the null hypothesis will be over rejected. Further Bernard argues that addressing this problem by applying alternative methods introduce other more serious difficulties. Therefore we conduct the T-test, accounting for, and ignoring time-clustering of events.

5. Results

In the following section we firstly discuss descriptive statistics concerning the number of takeovers per year and industry.

Following the descriptive statistics, graphs illustrating the cumulative average abnormal returns are discussed. Firstly, we graph the cumulative average abnormal returns of industry rivals and compare it to target firms. Secondly we compare the cumulative average abnormal returns for different industries to analyse if the abnormal returns differ in-between industry types.

Further we conduct a number of statistical tests. Firstly, we use the Student's T-test and the Wilcoxon Signed-Rank test to test if the cumulative abnormal returns for industry rivals and target firms differ from zero. Secondly we test if the variance of abnormal returns is impacted by the announcement, applying interquantile regression. Thirdly we test if there is a correlation between abnormal target return and abnormal industry rival returns.

5.1 Descriptive Statistics

Table 1. Number of announcements and rival events per year

Table 1 describes the distribution of the takeover announcement over the years 2000-2015. Additionally, the table shows the number of rivals concerned by the takeover announcements per year (denoted Number of rival events). The average number of rivals concerned with each announcement is displayed as well.

Year	Number of announcements	Number of rival events	Number of rival events per announcement
2000	16	10	0,63
2001	16	47	2,94
2002	5	0	0,00
2003	14	56	4,00
2004	10	38	3,80
2005	9	7	0,78
2006	11	41	3,73
2007	13	34	2,62
2008	9	15	1,67
2009	8	42	5,25
2010	12	22	1,83
2011	10	60	6,00
2012	6	10	1,67
2013	3	8	2,67
2014	10	73	7,30
2015	10	63	6,30
Total	162	526	

As illustrated in Table 2 the number of takeover announcements fluctuates over the years. For some takeovers no industry rivals are identified at all, yielding a minimum value of zero. This is due to some target firms having no publically traded rivals at the time of the announcement.

Table 2. Descriptive statistics of the number of announcements and rival events
Table 2 shows the mean, maximum, minimum and standard deviation for the number of takeover announcements, number of rival events as well as the number of rival events per announcement, per year for the period 2000 - 2015.

	Number of announcements	Number of rival events	Number of rival events per announcement
Mean	10,13	32,88	3,20
Max	16,00	73,00	7,30
Min	3,00	0,00	0,00
Std. Dev	3,63	23,12	2,16

Table 3 shows that industry 67 (holding and other investment offices) and 73 (Business Services) contains a large part of the announcements and number of concerned rivals per event. The two categories combined stand for 67% of the number of rival events and 36% of the number of announcements. In industry 67 the number of industry actors is high with an average number of 18,17 rivals concerned with each announcement. In industry 67, the dominant sub-classification is 6799 (Investors not elsewhere classified). Industry 73 is noticeable since the number of takeovers is high. The major sub-classification in this industry is 7372 (Pre-packaged software).

Table 3. Number of announcements and rival events per SIC code
This table displays all SIC codes, on a two-digit level, used in the thesis as well as the number of announcements per industry type. Table 3 also provides a summary of the number of rivals concerned with each takeover announcement per industrial classification.

SIC code	SIC code description*	Number of announcements	Number of rival events	Number of rival events per announcement
10	Metal Mining	2	1	0,50
13	Oil and Gas Extraction	3	0	0,00
15	Building Construction General Contractors and Operative Builders	1	0	0,00
17	Construction Special Trade Contractors	1	0	0,00
20	Food and Kindred Products	3	0	0,00
22	Textile Mill Products	1	0	0,00
23	Apparel and other Finished Products Made from Fabrics and Similar Materials	1	0	0,00
24	Lumber and Wood Products, except Furniture	1	2	2,00
26	Paper and Allied Products	4	1	0,25
27	Printing, Publishing, and Allied Industries	2	1	0,50
28	Chemicals and Allied Products	4	15	3,75
33	Primary Metal Industries	4	1	0,25
34	Fabricated Metal Products, except Machinery and Transportation Equipment	6	1	0,17
35	Industrial and Commercial Machinery and Computer Equipment	8	6	0,75
36	Electronic and other Electrical Equipment and Components, except Computer Equipment	5	17	3,40
37	Transportation Equipment	2	4	2,00
38	Measuring, Analyzing, and Controlling Instruments; Photographic, Medical and Optical Goods; Watches and Clocks	12	27	2,25
39	Miscellaneous Manufacturing Industries	1	1	1,00
42	Motor Freight Transportation and Warehousing	1	0	0,00
44	Water Transportation	4	11	2,75
47	Transportation Services	3	2	0,67
48	Communications	4	6	1,50
49	Electric, Gas and Sanitary Services	1	1	1,00
50	Wholesale Trade-Durable Goods	1	1	1,00
51	Wholesale Trade-Nondurable Goods	1	0	0,00
55	Automotive Dealers and Gasoline Service Stations	1	0	0,00
56	Apparel and Accessory Stores	2	3	1,50
57	Home Furniture, Furnishings, and Equipment Stores	2	0	0,00
58	Eating and Drinking Places	2	1	0,50
59	Miscellaneous Retail	1	0	0,00
60	Finance, Insurance, Real Estate	1	4	4,00
62	Security and Commodity Brokers, Dealers, Exchanges, and Services	4	5	1,25
63	Insurance Carriers	4	5	1,25
65	Real Estate	11	38	3,45
67	Holding and other Investment Offices	6	109	18,17
70	Hotels, Rooming Houses, Camps, and other Lodging Places	2	3	1,50
73	Business Services	35	241	6,89
75	Automotive Repair, Services, and Parking	1	0	0,00
78	Motion Pictures	1	1	1,00
80	Health Services	3	1	0,33
82	Educational Services	1	0	0,00
87	Engineering, Accounting, Research, Management, and Related Services	8	17	2,13
89	Miscellaneous Services	1	0	0,00
Total		162	526	

*SIC code descriptions received from SICCODE (SICCODE)

5.2 Abnormal Returns Around Takeover Announcements

Figure 3 describes the distribution of cumulative abnormal returns for target firms for the period $t = -1$ to $t = +1$. The graph is biased towards positive cumulative abnormal returns. The majority of the target firms enjoy a stock price increase of 5% to 25% and a few firms have a cumulative abnormal return higher than 50%. A small fraction of the companies also have negative cumulative abnormal returns. The findings are highly consistent with expectations and previous research on the area.

Figure 3. CAR distribution for target firms around the announcement day

Figure 3 provides an overview of the CAR for the target firms for day $t = -1$ to day $t = +1$. Figure 3 is based on 164 takeover announcements and the CAR is calculated using the market model.

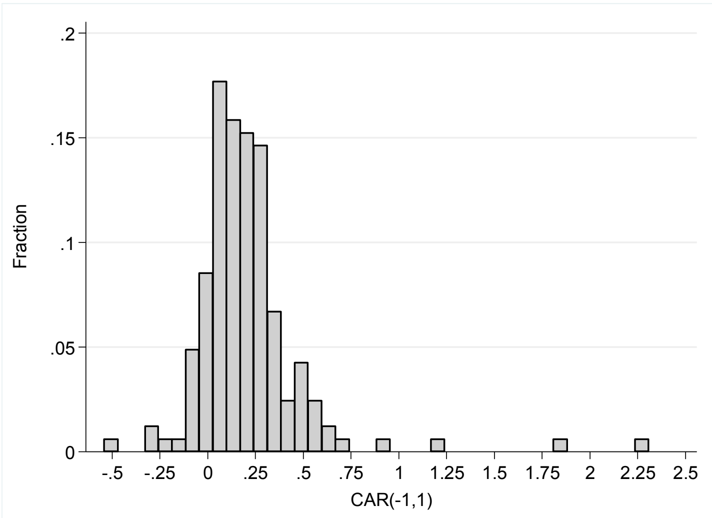
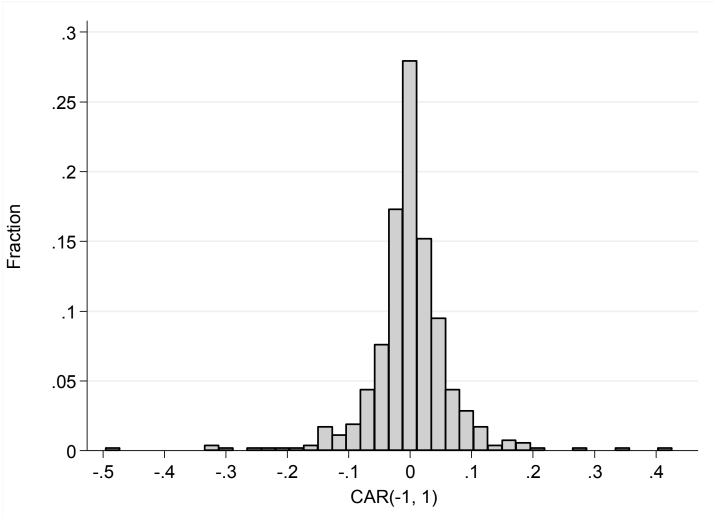


Figure 4 shows the same type of graph for rival firms instead of target firms. As illustrated in Figure 4, the cumulative abnormal returns seem to be normally distributed. The majority of the rival firms enjoy cumulative abnormal returns close to zero for the period $t = -1$ to $t = +1$. The fraction of rival firms showing cumulative abnormal returns higher or lower than 10% is low. As illustrated, the fraction of rivals showing a negative cumulative abnormal returns is similar to the fraction showing a positive one.

Figure 4. CAR distribution for rival firm around the announcement day

Figure 4 provides an overview of the CAR for rival firms for day $t = -1$ to day $t = +1$. Figure 4 is based on 526 industry events and the CAR is calculated using the market model.



As illustrated in Figure 5, the cumulative average abnormal returns for the target firms increase substantially around the event date with an increase of 25%. Figure 5 also indicates that there probably is information leakage in the market prior to the announcement date as seen in the price increase of almost 5% for target firms. The findings are consistent with previous studies identifying abnormal returns before the event as a consequence of takeover rumours (Betton et al. 2008).

Further, the cumulative average abnormal return for industry rivals does not show a similar price increase as the target firm and does not deviate substantially from zero. The figure shows that the cumulative average abnormal return is close to zero prior to the announcement date and does not seem to be affected by the announcement. The low impact of takeover announcements on industry rivals is not consistent with expectations.

Figure 5. CAAR for target firms and industry rivals

Figure 5 provides a graphs of the CAAR for the period $t = -10$ to $t = +20$. Figure 5 is based on 164 takeover offers and 526 rival events. The data is not adjusted for outliers.

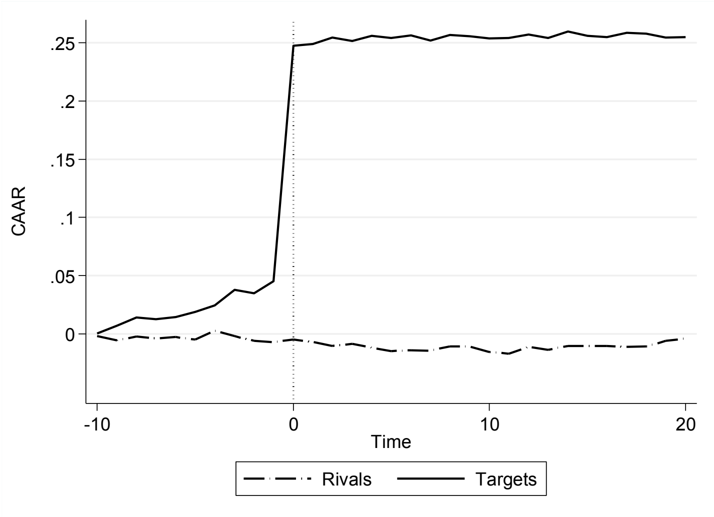


Figure 6 shows the cumulative average abnormal return for target firms compared to industry rivals divided by industry categories. Table 4 provides a detailed description of the SIC codes used in Figure 6. As illustrated in Figure 6 the different industry types differ only slightly when comparing cumulative average abnormal return in the event window. More importantly the industries do not show a significant deviation in their cumulative average abnormal return around the announcement date, which is unexpected. Further the figure shows that SIC category 2 deviates from the rest of the industries with a negative cumulative average abnormal return of almost -10%. The negative cumulative average abnormal return deviation of -10% for $t = -10$ is likely independent of the takeover announcement. Additionally, Table 4 states that SIC category 2 contains only one industry rival, which increases the risk for the decrease in cumulative average abnormal return to be dependent upon a firm specific event. Category 7 shows a slightly positive cumulative average abnormal return for the period from the takeover announcement to 15 days after.

Figure 6. CAAR for target firms and industry rivals specified by industry type

Figure 6 shows the CAAR for the target firm and industry rivals divided by industry classification for the period event window. The figure is based on 164 takeover offers and the CAAR is calculated using the market model. The data is unadjusted for outliers.

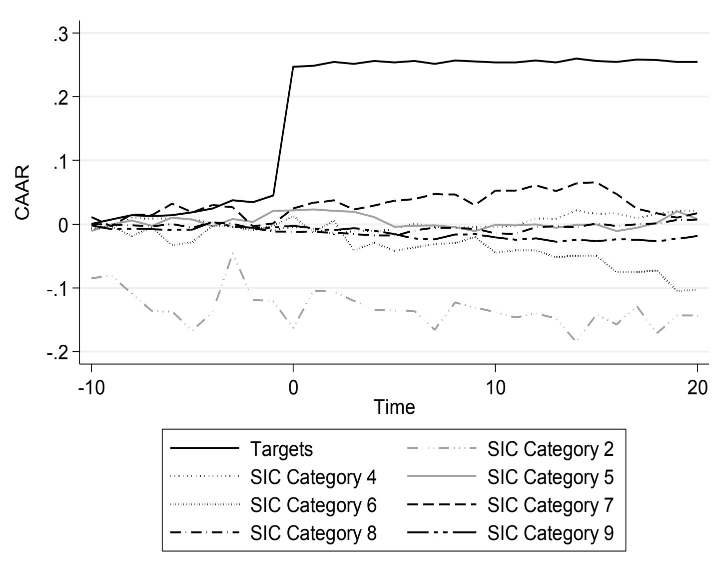


Table 4. Description of SIC categories

Table 4 provides a description over the different categories of SIC codes used in Figure 6

SIC Category	SIC Codes	SIC Code description	Number of rival events
Category 1	01-09	Agriculture, Forestry, Fishing	0
Category 2	10-14	Mining	1
Category 3	15-17	Construction	0
Category 4	20-39	Manufacturing	76
Category 5	40-49	Transportation & Public Utilities	20
Category 6	50-51	Wholesale Trade	1
Category 7	52-59	Retail Trade	4
Category 8	60-67	Finance, Insurance, Real Estate	161
Category 9	70-89	Services	263
Category 10	91-99	Public Administration	0
Total			526

5.2.1 Testing for Significance

Table 5. Testing CAR for significant deviations from zero during different time intervals for rival firms

Table 5 provides statistical tests showing if the CAR:s for different time periods differ significantly from zero. Both the results from the Student's T-test as well as the Wilcoxon Signed-Rank test is described. The table shows the number of observations, the mean return and the standard deviation for each time period. Additionally, the one sided p-value (lower tail), two sided p-value, T-statistic and the standard error for the Student's T-test is included. Additionally, the Z-statistic and probability is displayed for the Wilcoxon Signed-Rank test. Accounting for robust standard errors and time-clustered events in the T-test, we obtain similar results.

				Student's T-test				Wilcoxon Signed-Rank Test	
Period	Obs	Mean return	Std. Dev	One-sided p-value (lower)	Two sided p-value	T-statistic	Std,Error	Z-statistic	Prob > |z|
CAR(-10,-1)	526	-0,663%	13,950%	0,138	0,275	-1,090	0,006	-2,370	0,017**
CAR(-5,-1)	526	-0,410%	10,733%	0,190	0,381	-0,870	0,004	-1,770	0,076*
CAR(-2,-1)	526	-0,485%	6,122%	0,034**	0,069*	-1,810	0,002	-2,330	0,019**
AR(-1)	496	-0,099%	4,752%	0,321	0,642	-0,460	0,002	-0,420	0,672
AR(0)	486	0,230%	4,526%	0,131	0,263	1,120	0,002	0,559	0,575
AR(1)	490	-0,233%	4,081%	0,103	0,207	-1,260	0,001	-1,660	0,096*
CAR(0,1)	526	-0,004%	5,718%	0,493	0,986	-0,010	0,002	-0,060	0,950
CAR(0,2)	526	-0,315%	6,698%	0,140	0,281	-1,070	0,002	-0,550	0,578
CAR(0,3)	526	-0,160%	7,444%	0,310	0,621	-0,490	0,003	-0,180	0,855
CAR(0,5)	526	-0,724%	9,902%	0,047**	0,094*	-1,670	0,004	-1,530	0,123
CAR(0,10)	526	-0,792%	12,818%	0,078*	0,156	-1,410	0,005	-1,450	0,144
CAR(0,20)	526	0,271%	17,660%	0,362	0,725	0,351	0,007	0,505	0,612
CAR(-1,1)	526	-0,098%	6,932%	0,373	0,746	-0,320	0,003	-0,140	0,886
CAR(-2,2)	526	-0,800%	9,141%	0,022**	0,045**	-2,000	0,003	-1,860	0,062*
CAR(-5,5)	526	-1,134%	15,551%	0,047**	0,095*	-1,670	0,006	-1,770	0,076*
CAR(-10,10)	526	-1,456%	19,929%	0,047**	0,094*	-1,670	0,008	-1,500	0,131
CAR(-10,20)	526	-0,393%	24,372%	0,355	0,711	-0,360	0,010	-0,050	0,958

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table 5 shows the two different tests that have been applied when testing if the cumulative abnormal returns differ significantly from zero for different time periods. The results confirm our previous findings from Figures 5. The two tests show no significant deviations from zero for the different time periods. While CAR (-2,2) is significant using the Student's T-test at the 5% level, we find that according to the Wilcoxon Signed-Rank test it is significant only at the 10% level. For other time periods, the both tests are significant only in a few time intervals and always on a 10% significance level. The tests do not show any clear patterns regarding when returns are significant. Significant returns for one time period should also be reflected by significant results in adjacent time intervals. Hence the tests indicate that there is no significant effect on the stock price of rival firms.

Conducting the same tests as in Table 5, based on industry groups classified on a two-digit level specified in Table 4, yields the results showed in appendix Table A1-A5 (we do not include category 1,2,3,6 and 10 since they contain too few rival firms). The two tests shows similar results as Figure 6, indicating that abnormal returns and cumulative abnormal returns for different industries do not seem to differ from zero. However, category 8, including finance, insurance and real estate stocks, shows statistically significant negative returns of -1,309% at a 5% significance level for both the Student's T-test and the Wilcoxon Signed-Rank test. The findings are significant for the time interval CAR (-2,2). However, we do not see any patterns for when results are significant for this category neither. Additionally the previously discussed increase in section 5.2, regarding the positive cumulative abnormal returns for category 7 is not statistically significant, see Table A3. In Table A6 tests on abnormal returns and cumulative abnormal returns for target firms are presented. As expected the abnormal returns and cumulative abnormal returns are statistically significant for almost all periods.

Table 6. Testing for differences between industry rivals

Table 6 shows the results from testing if the AR(0) and CAR(0,5) differs between industry category. The table displays the differences in percentage points, displayed in decimal form, between the categories.The differences are specified as the row category minus the column category. The lower left part of the table displays the test for AR(0), while the upper right corner shows the same test for CAR(0,5).

	Category 4	Category 5	Category 7	Category 8	Category 9
Category 4	-	0,024	-0,036	0,006	0,010
Category 5	0,004	-	-0,061	-0,018	-0,014
Category 7	-0,019	-0,023	-	0,043	0,047
Category 8	0,006	0,002	0,025	-	0,004
Category 9	0,002	-0,002	0,021	-0,004	-

AR(0) (lower left); CAR(0,5) (upper right)

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table 6 indicates that there are no significant differences between rival firms in different industries. In appendix Table A7 the same test is conducted for time periods CAR(-5,5) and CAR(-10,20). In appendix Table A8 a Rank-Sum test is conducted for all four time intervals. None of the tests show any significant differences between categories, and hence industries do not seem to differ in their dependency upon industry rivals stock prices.

5.2.2 Testing for Event-Induced Variance

The interquantile regression will be conducted using 10-day windows of cumulative abnormal returns. The windows range from $t = -39$ to $t = -29$ as well as $t = 0$ to $t = 10$ for each event. The independent variable in the regression is a dummy variable indicating if the cumulative abnormal returns concern the comparison returns before the event or in the event window. A ten-day cumulative abnormal return, rather than the abnormal return on just the event day, is chosen in order to account for the variance of the variance of abnormal returns over time. Table 7 shows the results from the interquantile regression analysis. Our findings indicate that there is no statistical significant increase or decrease in the interquantile range for any of the ranges. This is also indicated in Figure 7. Based on these findings the variance of abnormal returns does not increase during the event period. In Table A9 and Figure A1 interquantile regressions for target firms and industry categories as well as boxplots for target firms are presented. Increases in interquantile range are, as expected, statistically significant for all interquantile ranges specified for target firms. As illustrated in Table A9, category 7 shows statistically significant increases in two interquantile ranges. This depends on outliers and should therefore not be interpreted as a justified increase. Otherwise no industry category shows significance.

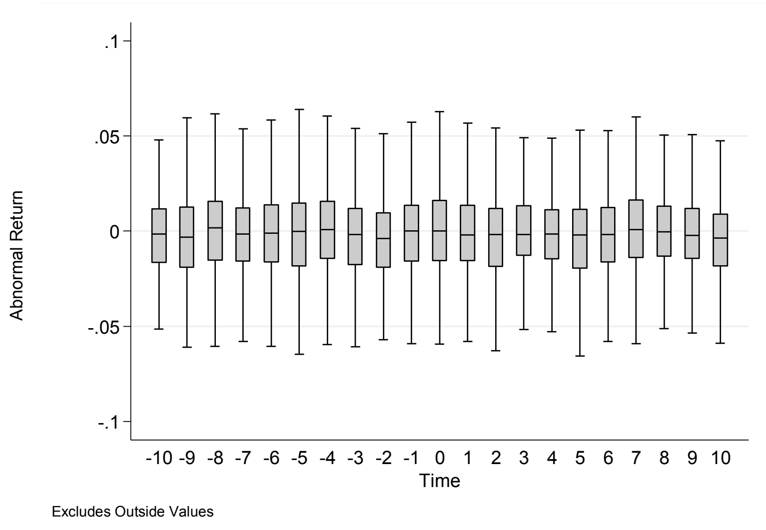
Table 7. Interquantile regression for rival firms

Table 7 provides a summary of the number of observations and β coefficients for three different quantile pairs. Additionally, the table shows the bootstrapped standard errors of beta, the z value and the probability.

Quantiles	Obs	β Coefficient	Bootstrap Std,Error of β	z	Prob>|z|
(,1 ,9)	1052	-0,008	0,020	-0,400	0,692
(,2 ,8)	1052	-0,005	0,011	-0,430	0,668
(,3 ,7)	1052	0,003	0,006	0,530	0,593

Figure 7. Boxplot of AR for rival firms

Figure 7 is based on 526 rival events and shows boxplots of AR for each day between $t = -10$ to $t = +10$. The lower and upper hinges indicates the 25th and 75th percentile respectively. The upper and lower adjacents are calculated as upper quartile + 1.5 inter quartile ranges (IQR) and lower quartile –1.5 IQR, as defined by Tukey in 1977 (Tukey 1977).



5.3 Testing for Correlation Between Target and Rival Returns

Table 8 shows the results from our regression analysis between abnormal target returns and abnormal rival returns. Our findings show that there is no statistical relationship between the two variables. The regression model is insignificant for all time periods except for two, CAR (-

10, -1) and CAR (-10, 10). For the period CAR (-10,1) we find that the regression is significant at the 10% level, however the correlation is low. Additionally, the regression is significant at the 10% level for the time interval CAR (-10,10) as well, but as for the previous time interval the correlation is low. This indicates that there is not enough evidence to prove a statistical relationship between the two variables. In appendix tables A10 to A14 regressions between target returns and rival returns based on industry classification is specified.

Table 8. Regression between target returns and rival returns

Table 8 provides a short description of the statistical relationship between abnormal target returns and abnormal rival returns. Multiple regressions are made based on each time interval. The number of observations, R square, F-value, probability and ρ (correlation coefficient) are displayed.

Period	Observations	R2	F-value	Prob > F	ρ
CAR(-10,-1)	413	0,007	2,793	0,095*	0,082
CAR(-5,-1)	413	0,000	0,197	0,657	0,022
CAR(-2,-1)	413	0,000	0,020	0,888	0,007
AR(-1)	373	0,001	0,248	0,619	0,026
AR(0)	397	0,002	0,952	0,330	-0,049
AR(1)	409	0,004	1,785	0,182	0,066
CAR(0,1)	443	0,001	0,251	0,617	-0,024
CAR(0,2)	442	0,002	0,784	0,376	-0,042
CAR(0,3)	442	0,002	0,682	0,409	0,039
CAR(0,5)	434	0,001	0,390	0,533	-0,030
CAR(0,10)	429	0,003	1,280	0,258	0,055
CAR(0,20)	384	0,000	0,111	0,740	0,017
CAR(-1,1)	443	0,001	0,546	0,460	-0,035
CAR(-2,2)	442	0,001	0,265	0,607	-0,025
CAR(-5,5)	434	0,000	0,011	0,915	-0,005
CAR(-10,10)	429	0,007	3,163	0,076*	0,086
CAR(-10,20)	384	0,002	0,758	0,384	0,045

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

6. Conclusions

We have studied the effects on industry rivals' stock prices after a takeover offer within the same industry has been announced. This implies testing if takeover offers are strong enough signals to impact the returns of rival firms. The study has been conducted by testing three different hypotheses.

Firstly we have tested the hypothesis that takeover offers do create abnormal returns for rival firms' stock prices, using Swedish stock price data. By testing if the cumulative abnormal returns differ significantly from zero, we find that the stock prices of industry rivals is not significantly affected by the takeover announcements. Additionally, an interquantile regression analysis was conducted in order to identify eventual event-induced variance. However, the interquantile regression shows no increased volatility in industry rivals stock prices. Based on previous literature by Lang & Stulz (Lang, Stulz 1992), Foster (Foster 1981) and Akhigbe et al. (Akhigbe et al. 2014), showing that earning announcements, negative surprises and bankruptcy announcements impact industry rivals stock prices, our results are unexpected. However, Eckbo (Eckbo 1983), using US-data, finds positive small, but significant, abnormal returns for industry rivals, while Eckbo (Eckbo 1992) shows significant negative abnormal returns for Canadian rival stocks. Additionally Stillman (Stillman 1983) finds no significant impact on rival firms at all. This would indicate that results differ significantly based on data set, time and location. Hence when setting the findings of this thesis in context, we see that the results are unexpected but not unlikely.

Secondly we test if rival firms show abnormal returns or abnormal variances regardless of industry type, after a takeover offer on an industry rival is announced. All industries show a cumulative average abnormal return close to zero, unaffected by the takeover announcement on the event day. We also show that industries do not differ significantly in their reactions. The findings are not in line with our second hypothesis.

Thirdly we have tested the hypothesis that there is no correlation between the magnitude of abnormal returns for the targeted firm and the magnitude of abnormal returns for industry rivals by conducting a regression analysis. Our findings show that there is no significant statistical relationship between the abnormal returns of the two variables.

Our findings therefore indicate that takeover offers, in the Swedish stock market, is not a strong enough signal to impact the stock prices of industry rivals, regardless of industry type. To conclude we were not able to reject any of our three hypothesises.

7. Limitations & Future Research

When conducting this thesis a number of assumptions and limitations has been made. The most relevant assumptions will be discussed in the section below.

In order to classify stocks based on industry type, the Standard Industrial Classification system was applied. The codes was applied on a four-digit level, the maximum specification possible. In our data set a number of industries containing only few industry rivals. However the category "Services" contained almost 50% of all rival firms in the event study. Since the "Service" category has a very broad definition we expect some rivals to be poorly classified and not to be key competitors in reality. This bias could potentially have diluted the effect of the takeover offers on rival firms since we only expect true rivals to be impacted. Conducting the same study on US data, we expect that this bias would decrease since industries are probably more accurately defined and the larger sample would enable for smaller standard errors in our analysis.

The topic of this thesis was limited to takeover offers in general. Based on previous studies conducted on the US market with horizontal mergers, it would be yielding to conduct a similar study focusing on hostile or friendly takeovers. In our study no adjustments have been made concerning the motive of the merger. Some mergers in our sample include spinoffs and divestments, while others are privately negotiated takeovers or public takeovers. Based on the characteristics of the acquirer and the acquisition the market is expected to react differently. Focusing on hostile takeovers only, it would be interesting to study rival firms that are poorly managed and hence potential targets for hostile takeovers. If the hostile takeover for some reason would not be completed it could be expected that the acquirer would move on to a rival firm. Differentiating along this parameter could potentially reveal interesting findings.

A related area of interest would be to expand the study to include global key competitors. Today's companies operate on a global scale and thus competitors may be based in other countries. A reasonable explanation for our findings could be that numerous Swedish firms are lacking publically traded key competitors in Sweden. Competitors of similar size and cash flow sources may be traded on other exchanges, hence focusing on Swedish stocks may create less significant results. Conducting a similar study globally with focus on a few, but key competitors for each target firm, regardless of nationality would be interesting.

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9. Appendix

Table A1 Testing CAR for significant deviations from zero during different time intervals for rival firms in industry category 4

Table A1 provides statistical tests for whether the CAR:s for different time periods differ significantly from zero. Both the results from the Student's T-test as well as the Wilcoxon signed rank test is described. Table A1 shows the number of observations, the mean return and the standard deviation for each time period. Additionally, the one sided p-value (lower tail), two sided p-value, T-statistic and the standard error for the Student's T-test is included. The Z-statistic and probability is displayed for the Wilcoxon Signed-Rank test as well. Accounting for robust standard errors and time-clustered events in the T-test, we obtain similar results.

				Student's T-test				Wilcoxon Signed-Rank Test	
Period	Obs	Mean return	Std. Dev	One-sided p-value (lower)	Two sided p-value	T-statistic	Std,Error	Z-statistic	Prob > |z|
CAR(-10,-1)	76	-0,812%	13,722%	0,304	0,607	-0,516	0,016	-1,693	0,09*
CAR(-5,-1)	76	-1,743%	8,715%	0,043**	0,085*	-1,744	0,010	-2,040	0,041**
CAR(-2,-1)	76	-0,404%	5,674%	0,269	0,537	-0,620	0,007	-1,509	0,131
AR(-1)	71	-0,247%	5,470%	0,352	0,704	-0,381	0,006	0,029	0,977
AR(0)	73	0,476%	6,004%	0,750	0,500	0,678	0,007	-0,107	0,915
AR(1)	74	-0,300%	5,102%	0,307	0,614	-0,506	0,006	-1,139	0,255
CAR(0,1)	76	0,165%	7,393%	0,577	0,846	0,195	0,008	-0,293	0,770
CAR(0,2)	76	-0,670%	7,613%	0,223	0,445	-0,768	0,009	-1,457	0,145
CAR(0,3)	76	-0,184%	9,094%	0,430	0,860	-0,176	0,010	-1,020	0,308
CAR(0,5)	76	0,061%	13,473%	0,516	0,969	0,040	0,015	-1,015	0,310
CAR(0,10)	76	0,450%	13,224%	0,616	0,767	0,297	0,015	-0,507	0,612
CAR(0,20)	76	2,857%	18,768%	0,906	0,188	1,327	0,022	0,352	0,725
CAR(-1,1)	76	-0,066%	8,268%	0,472	0,945	-0,069	0,009	0,018	0,986
CAR(-2,2)	76	-1,074%	10,826%	0,195	0,390	-0,865	0,012	-1,910	0,056*
CAR(-5,5)	76	-1,682%	18,354%	0,213	0,427	-0,799	0,021	-2,019	0,043**
CAR(-10,10)	76	-0,362%	19,431%	0,436	0,871	-0,162	0,022	-0,896	0,370
CAR(-10,20)	76	2,045%	23,117%	0,778	0,443	0,771	0,027	-0,067	0,946

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A2 Testing CAR for significant deviations from zero during different time intervals for rival firms in industry category 5

Table A2 provides statistical tests for whether the CAR:s for different time periods differ significantly from zero. Both the results from the Student's T-test as well as the Wilcoxon signed rank test is described. Table A2 shows the number of observations, the mean return and the standard deviation for each time period. Additionally, the one sided p-value (lower tail), two sided p-value, T-statistic and the standard error for the Student's T-test is included. The Z-statistic and probability is displayed for the Wilcoxon Signed-Rank test as well. Accounting for robust standard errors and time-clustered events in the T-test, we obtain similar results.

				Student's T-test				Wilcoxon Signed-Rank Test	
Period	Obs	Mean return	Std. Dev	One-sided p-value (lower)	Two sided p-value	T-statistic	Std,Error	Z-statistic	Prob > |z|
CAR(-10,-1)	20	1,814%	6,609%	0,883	0,235	1,227	0,015	0,821	0,411
CAR(-5,-1)	20	1,038%	5,131%	0,812	0,377	0,905	0,011	1,045	0,296
CAR(-2,-1)	20	1,172%	5,723%	0,814	0,371	0,916	0,013	0,299	0,765
AR(-1)	19	1,760%	5,997%	0,891	0,217	1,279	0,014	0,926	0,355
AR(0)	18	0,112%	5,566%	0,533	0,933	0,085	0,013	0,501	0,616
AR(1)	19	0,170%	3,033%	0,595	0,810	0,244	0,007	1,087	0,277
CAR(0,1)	20	0,262%	7,028%	0,565	0,869	0,167	0,016	1,419	0,156
CAR(0,2)	20	0,021%	8,871%	0,504	0,992	0,011	0,020	1,344	0,179
CAR(0,3)	20	-0,148%	7,520%	0,465	0,931	-0,088	0,017	1,045	0,296
CAR(0,5)	20	-2,379%	9,939%	0,149	0,298	-1,071	0,022	-0,672	0,502
CAR(0,10)	20	-2,001%	13,408%	0,256	0,512	-0,667	0,030	-0,784	0,433
CAR(0,20)	20	-0,857%	12,122%	0,378	0,755	-0,316	0,027	-1,195	0,232
CAR(-1,1)	20	1,934%	5,816%	0,923	0,153	1,487	0,013	1,717	0,086*
CAR(-2,2)	20	1,193%	8,346%	0,735	0,530	0,639	0,019	1,867	0,062*
CAR(-5,5)	20	-1,341%	9,301%	0,263	0,527	-0,645	0,021	0,112	0,911
CAR(-10,10)	20	-0,188%	15,907%	0,479	0,958	-0,053	0,036	0,933	0,351
CAR(-10,20)	20	0,957%	13,550%	0,622	0,756	0,316	0,030	0,299	0,765

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A3 Testing CAR for significant deviations from zero during different time intervals for rival firms in industry category 7

Table A3 provides statistical tests for whether the CAR:s for different time periods differ significantly from zero. Both the results from the Student's T-test as well as the Wilcoxon signed rank test is described. Table A3 shows the number of observations, the mean return, and the standard deviation for each time period. Additionally, the one sided p-value (lower tail), two sided p-value, T-statistic and the standard error for the Student's T-test is included. The Z-statistic and probability is displayed for the Wilcoxon Signed-Rank test as well. Accounting for robust standard errors and time-clustered events in the T-test, we obtain similar results.

				Student's T-test				Wilcoxon Signed-Rank Test	
Period	Obs	Mean return	Std. Dev	One-sided p-value (lower)	Two sided p-value	T-statistic	Std,Error	z-statistic	Prob > |z|
CAR(-10,-1)	4	0,073%	5,675%	0,509	0,981	0,026	0,028	0,000	1,000
CAR(-5,-1)	4	-3,170%	8,650%	0,258	0,517	-0,733	0,043	0,365	0,715
CAR(-2,-1)	4	-2,679%	7,476%	0,263	0,525	-0,717	0,037	-0,365	0,715
AR(-1)	3	0,438%	0,783%	0,783	0,434	0,970	0,005	1,069	0,285
AR(0)	4	2,403%	6,106%	0,756	0,489	0,787	0,031	0,365	0,715
AR(1)	4	0,876%	4,310%	0,644	0,712	0,407	0,022	0,365	0,715
CAR(0,1)	4	3,279%	4,580%	0,876	0,248	1,432	0,023	0,730	0,465
CAR(0,2)	4	3,555%	7,316%	0,799	0,403	0,972	0,037	0,730	0,465
CAR(0,3)	4	2,465%	7,140%	0,730	0,539	0,691	0,036	0,730	0,465
CAR(0,5)	4	3,701%	8,517%	0,776	0,449	0,869	0,043	0,730	0,465
CAR(0,10)	4	5,248%	9,711%	0,821	0,359	1,081	0,049	1,095	0,273
CAR(0,20)	4	2,550%	10,961%	0,663	0,673	0,465	0,055	0,730	0,465
CAR(-1,1)	4	3,608%	4,419%	0,899	0,201	1,633	0,022	1,095	0,273
CAR(-2,2)	4	0,876%	8,387%	0,576	0,848	0,209	0,042	0,000	1,000
CAR(-5,5)	4	0,531%	9,229%	0,542	0,916	0,115	0,046	-0,365	0,715
CAR(-10,10)	4	5,321%	12,581%	0,770	0,460	0,846	0,063	0,730	0,465
CAR(-10,20)	4	2,623%	14,759%	0,627	0,746	0,355	0,074	0,365	0,715

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A4 Testing CAR for significant deviations from zero during different time intervals for rival firms in industry category 8

Table A4 provides statistical tests for whether the CAR:s for different time periods differ significantly from zero. Both the results from the Student's T-test as well as the Wilcoxon signed rank test is described. Table A4 shows the number of observations, the mean return and the standard deviation for each time period. Additionally, the one sided p-value (lower tail), two sided p-value, T-statistic and the standard error for the Student's T-test is included. The Z-statistic and probability is displayed for the Wilcoxon Signed-Rank test as well. Accounting for robust standard errors and time-clustered events in the T-test, we obtain similar results.

				Student's T-test				Wilcoxon Signed-Rank Test	
Period	Obs	Mean return	Std, Dev	One-sided p-value (lower)	Two sided p-value	T-statistic	Std,Error	z-statistic	Prob > |z|
CAR(-10,-1)	161	-1,097%	11,286%	0,110	0,219	-1,233	0,009	-1,986	0,047**
CAR(-5,-1)	161	-1,157%	10,341%	0,079*	0,158	-1,419	0,008	-1,496	0,135
CAR(-2,-1)	161	-1,136%	7,047%	0,021**	0,042**	-2,046	0,006	-1,531	0,126
AR(-1)	149	-0,477%	4,832%	0,115	0,231	-1,204	0,004	-0,181	0,856
AR(0)	141	-0,082%	4,160%	0,407	0,814	-0,235	0,004	-0,816	0,414
AR(1)	142	0,044%	3,712%	0,556	0,887	0,142	0,003	-0,264	0,792
CAR(0,1)	161	-0,033%	4,598%	0,464	0,927	-0,092	0,004	-0,360	0,719
CAR(0,2)	161	-0,173%	5,295%	0,339	0,679	-0,415	0,004	-0,407	0,684
CAR(0,3)	161	-0,336%	6,257%	0,248	0,497	-0,681	0,005	-0,214	0,831
CAR(0,5)	161	-0,578%	7,935%	0,179	0,357	-0,924	0,006	-0,548	0,584
CAR(0,10)	161	-0,308%	10,668%	0,357	0,715	-0,366	0,008	0,173	0,863
CAR(0,20)	161	1,680%	12,167%	0,959	0,082*	1,752	0,010	1,358	0,175
CAR(-1,1)	161	-0,474%	6,008%	0,159	0,318	-1,002	0,005	-0,794	0,427
CAR(-2,2)	161	-1,309%	8,141%	0,021**	0,043**	-2,041	0,006	-2,134	0,033**
CAR(-5,5)	161	-1,734%	14,373%	0,064*	0,128	-1,531	0,011	-1,608	0,108
CAR(-10,10)	161	-1,405%	15,919%	0,132	0,265	-1,120	0,013	-0,735	0,462
CAR(-10,20)	161	0,583%	18,093%	0,659	0,683	0,409	0,014	0,293	0,770

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A5 Testing CAR for significant deviations from zero during different time intervals for rival firms in industry category 9

Table A5 provides statistical tests for whether the CAR:s for different time periods differ significantly from zero. Both the results from the Student's T-test as well as the Wilcoxon signed rank test is described. Table A5 shows the number of observations, the mean return and the standard deviation for each time period. Additionally, the one sided p-value (lower tail), two sided p-value, T-statistic and the standard error for the Student's T-test is included. The Z-statistic and probability is displayed for the Wilcoxon Signed-Rank test as well. Accounting for robust standard errors and time-clustered events in the T-test, we obtain similar results.

				Student's T-test				Wilcoxon Signed-Rank Test	
Period	Obs	Mean return	Std, Dev	One-sided p-value (lower)	Two sided p-value	T-statistic	Std,Error	z-statistic	Prob > |z|
CAR(-10,-1)	263	-0,513%	15,925%	0,301	0,602	-0,522	0,010	-1,046	0,296
CAR(-5,-1)	263	0,343%	11,801%	0,681	0,638	0,471	0,007	-0,528	0,598
CAR(-2,-1)	263	-0,178%	5,631%	0,304	0,609	-0,513	0,003	-1,165	0,244
AR(-1)	252	0,016%	4,412%	0,523	0,954	0,058	0,003	-0,818	0,413
AR(0)	248	0,322%	4,133%	0,889	0,221	1,227	0,003	1,150	0,250
AR(1)	249	-0,435%	4,020%	0,045**	0,089*	-1,706	0,003	-1,750	0,08*
CAR(0,1)	263	-0,108%	5,739%	0,380	0,760	-0,305	0,004	-0,167	0,867
CAR(0,2)	263	-0,394%	7,041%	0,182	0,365	-0,908	0,004	-0,183	0,854
CAR(0,3)	263	-0,074%	7,655%	0,438	0,876	-0,156	0,005	0,219	0,827
CAR(0,5)	263	-0,966%	9,861%	0,057*	0,113	-1,589	0,006	-0,907	0,364
CAR(0,10)	263	-1,431%	13,921%	0,048**	0,097*	-1,667	0,009	-1,633	0,102
CAR(0,20)	263	-1,240%	20,386%	0,163	0,325	-0,986	0,013	-0,245	0,807
CAR(-1,1)	263	-0,093%	7,169%	0,417	0,834	-0,209	0,004	-0,354	0,724
CAR(-2,2)	263	-0,572%	9,319%	0,160	0,320	-0,995	0,006	-0,513	0,608
CAR(-5,5)	263	-0,623%	15,942%	0,263	0,527	-0,634	0,010	-0,051	0,959
CAR(-10,10)	263	-1,944%	22,601%	0,082*	0,164	-1,395	0,014	-1,191	0,234
CAR(-10,20)	263	-1,752%	28,565%	0,160	0,321	-0,995	0,018	-0,279	0,781

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A6 Testing CAR for significant deviations from zero during different time intervals for target firms

Table A6 provides statistical tests for whether the CAR:s for different time periods differ significantly from zero. Both the results from the Student's T-test as well as the Wilcoxon signed rank test is described. Table A6 shows the number of observations, the mean return and the standard deviation for each time period. Additionally, the one sided p-value (lower tail), two sided p-value, T-statistic and the standard error for the Student's T-test is included. The Z-statistic and probability is displayed for the Wilcoxon Signed-Rank test as well. Accounting for robust standard errors and time-clustered events in the T-test, we obtain similar results.

				Student's T-test				Wilcoxon Signed-Rank Test	
Period	Obs	Mean return	Std. Dev	One-sided p-value (lower)	Two sided p-value	T-statistic	Std,Error	Z-statistic	Prob > |z|
CAR(-10,-1)	164	4,261%	14,772%	1,000	0***	3,694	0,012	4,188	0***
CAR(-5,-1)	164	2,921%	11,225%	0,999	0,001***	3,333	0,009	4,206	0***
CAR(-2,-1)	164	0,676%	5,417%	0,944	0,112	1,599	0,004	2,859	0,004***
AR(-1)	154	1,021%	3,943%	0,999	0,002***	3,212	0,003	3,084	0,002***
AR(0)	162	20,230%	28,607%	1,000	0***	9,000	0,022	9,894	0***
AR(1)	163	0,151%	6,731%	0,613	0,775	0,287	0,005	-1,428	0,153
CAR(0,1)	164	20,133%	29,106%	1,000	0***	8,858	0,023	9,502	0***
CAR(0,2)	164	20,694%	28,517%	1,000	0***	9,293	0,022	9,828	0***
CAR(0,3)	164	20,414%	28,931%	1,000	0***	9,036	0,023	9,653	0***
CAR(0,5)	164	20,651%	29,286%	1,000	0***	9,030	0,023	9,571	0***
CAR(0,10)	163	20,826%	30,788%	1,000	0***	8,636	0,024	9,463	0***
CAR(0,20)	163	20,926%	32,931%	1,000	0***	8,113	0,026	8,729	0***
CAR(-1,1)	164	21,091%	29,354%	1,000	0***	9,202	0,023	9,656	0***
CAR(-2,2)	164	21,370%	29,632%	1,000	0***	9,236	0,023	9,873	0***
CAR(-5,5)	164	23,572%	32,245%	1,000	0***	9,362	0,025	9,871	0***
CAR(-10,10)	163	25,137%	36,040%	1,000	0***	8,905	0,028	9,615	0***
CAR(-10,20)	163	25,237%	37,157%	1,000	0***	8,671	0,029	9,231	0***

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A7. Testing for differences between industry rivals

Table A7 shows the results from testing if the CAR(-5,5) and CAR (-10,20) differs between industry categories. The table displays the differences in percentage points, displayed in decimal form, between the categories .The differences are specified as the row category minus the column category. The lower left part of the table displays the tests for CAR(-5,5), while the upper right corner shows the same tests for CAR(-10,20).

	Category 4	Category 5	Category 7	Category 8	Category 9
Category 4	-	0,011	-0,006	0,015	0,038
Category 5	-0,003	-	-0,017	0,004	0,027
Category 7	-0,022	-0,019	-	0,020	0,044
Category 8	0,001	0,004	0,023	-	0,023
Category 9	-0,011	-0,007	0,012	-0,011	-

CAR(-10,20)

CAR(-5,5)

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A8. Testing for differences between industry rivals using Rank-Sum test

Table A8 shows the results from testing if the AR and CAR differs between industry categories. The table displays the probabilities in percentage, displayed in decimal form, between the categories .The differences are specified as the row category minus the column category. The lower left part of the first table displays the test for AR(0), while the upper right corner shows the same test for CAR(0,5). The lower left part of the second table displays the test for CAR(-5,5), while the upper right corner shows the same test for CAR(-10,20)

	Category 4	Category 5	Category 7	Category 8	Category 9
Category 4	-	0,907	0,402	0,318	0,509
Category 5	0,530	-	0,439	0,641	0,667
Category 7	0,614	0,865	-	0,484	0,396
Category 8	0,857	0,453	0,673	-	0,789
Category 9	0,507	0,819	0,678	0,236	-

CAR(0,5)

AR(0)

	Category 4	Category 5	Category 7	Category 8	Category 9
Category 4	-	0,822	0,659	0,615	0,920
Category 5	0,295	-	0,642	0,892	0,823
Category 7	0,791	0,816	-	0,546	0,625
Category 8	0,158	0,572	0,907	-	0,825
Category 9	0,0479**	0,883	0,809	0,237	-

CAR(-10,20)

CAR(-5,5)

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A9. Interquantile regression for rival categories and target firms

Table A9 provides a summary of the number of observations and β coefficients for three different quantile pairs. Additionally, the table shows the bootstrapped standard errors of beta, the z value and the probability.

Category 4

Quantiles	Obs	β Coefficient	Bootstrap Std,Error of β	z	Prob>|z|
(,1 ,9)	152	-0,091	0,114	-0,800	0,423
(,2 ,8)	152	0,013	0,037	0,350	0,724
(,3 ,7)	152	0,003	0,027	0,100	0,920

Category 5

Quantiles	Obs	β Coefficient	Bootstrap Std,Error of β	z	Prob>|z|
(,1 ,9)	40	-0,074	0,092	-0,810	0,418
(,2 ,8)	40	-0,019	0,049	-0,400	0,692
(,3 ,7)	40	-0,037	0,043	-0,850	0,393

Category 7

Quantiles	Obs	β Coefficient	Bootstrap Std,Error of β	z	Prob>|z|
(,1 ,9)	8	0,113	0,037	3,070	0,002***
(,2 ,8)	8	0,113	0,037	3,060	0,002***
(,3 ,7)	8	0,075	0,062	1,210	0,227

Category 8

Quantiles	Obs	β Coefficient	Bootstrap Std,Error of β	z	Prob>|z|
(,1 ,9)	322	0,006	0,027	0,210	0,835
(,2 ,8)	322	-0,023	0,018	-1,280	0,199
(,3 ,7)	322	-0,003	0,010	-0,350	0,729

Category 9

Quantiles	Obs	β Coefficient	Bootstrap Std,Error of β	z	Prob>|z|
(,1 ,9)	526	-0,030	0,032	-0,940	0,346
(,2 ,8)	526	0,011	0,017	0,620	0,538
(,3 ,7)	526	0,007	0,012	0,590	0,558

Target

Quantiles	Obs	β Coefficient	Bootstrap Std,Error of β	z	Prob>|z|
(,1 ,9)	327	0,217	0,053	4,070	0,000***
(,2 ,8)	327	0,147	3,000	4,080	0,000***
(,3 ,7)	327	0,107	2,000	4,000	0,000***

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A10. Regression between target returns and rival returns for industry category 4

Table A10 provides a short description of the statistical relationship between abnormal target returns and abnormal rival returns. Multiple regressions are made based on each time interval. The number of observations, R square, F-value, probability and ρ (correlation coefficient) are displayed.

Period	Observations	R^2	F-value	Prob > F	ρ
CAR(-10,-1)	62	0,119	8,130	0,006***	0,345
CAR(-5,-1)	62	0,012	0,717	0,401	0,109
CAR(-2,-1)	62	0,001	0,065	0,799	-0,033
AR(-1)	57	0,000	0,009	0,923	0,013
AR(0)	70	0,052	3,693	0,059*	-0,227
AR(1)	71	0,001	0,078	0,781	-0,034
CAR(0,1)	73	0,012	0,853	0,359	-0,109
CAR(0,2)	73	0,009	0,630	0,430	-0,094
CAR(0,3)	73	0,000	0,024	0,877	-0,018
CAR(0,5)	73	0,016	1,157	0,286	-0,127
CAR(0,10)	73	0,000	0,012	0,912	0,013
CAR(0,20)	72	0,000	0,000	0,994	-0,001
CAR(-1,1)	73	0,014	1,016	0,317	-0,119
CAR(-2,2)	73	0,013	0,962	0,330	-0,116
CAR(-5,5)	73	0,008	0,573	0,451	-0,089
CAR(-10,10)	73	0,094	7,385	0,008***	0,307
CAR(-10,20)	72	0,056	4,184	0,045**	0,237

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A11. Regression between target returns and rival returns for industry category 5

Table A11 provides a short description of the statistical relationship between abnormal target returns and abnormal rival returns. Multiple regressions are made based on each time interval. The number of observations, R square, F-value, probability and ρ (correlation coefficient) are displayed.

Period	Observations	R^2	F-value	Prob > F	ρ
CAR(-10,-1)	16	0,020	0,287	0,600	-0,142
CAR(-5,-1)	16	0,004	0,050	0,825	-0,060
CAR(-2,-1)	16	0,038	0,555	0,469	0,195
AR(-1)	14	0,377	7,250	0,02**	0,614
AR(0)	15	0,128	1,916	0,190	0,358
AR(1)	15	0,475	11,752	0,004***	-0,689
CAR(0,1)	16	0,066	0,987	0,337	0,257
CAR(0,2)	16	0,080	1,221	0,288	0,283
CAR(0,3)	16	0,158	2,621	0,128	0,397
CAR(0,5)	16	0,125	2,005	0,179	0,354
CAR(0,10)	16	0,136	2,199	0,160	0,368
CAR(0,20)	14	0,155	2,207	0,163	0,394
CAR(-1,1)	16	0,146	2,402	0,144	0,383
CAR(-2,2)	16	0,016	0,234	0,636	0,128
CAR(-5,5)	16	0,012	0,177	0,680	0,112
CAR(-10,10)	16	0,013	0,179	0,679	0,112
CAR(-10,20)	14	0,025	0,310	0,588	0,159

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A12. Regression between target returns and rival returns for industry category 7

Table A12 provides a short description of the statistical relationship between abnormal target returns and abnormal rival returns. Multiple regressions are made based on each time interval. The number of observations, R square, F-value, probability and ρ (correlation coefficient) are displayed.

Period	Observations	R^2	F-value	Prob > F	ρ
CAR(-10,-1)	3	0,992	119,114	0,058*	-0,996
CAR(-5,-1)	3	0,999	948,378	0,021**	-0,999
CAR(-2,-1)	3	0,999	714,667	0,024**	-0,999
AR(-1)	2	-	-	-	-
AR(0)	3	0,942	16,376	0,154	0,971
AR(1)	3	0,655	1,898	0,400	-0,809
CAR(0,1)	3	0,151	0,178	0,746	0,388
CAR(0,2)	3	0,011	0,011	0,934	0,104
CAR(0,3)	3	0,057	0,061	0,846	-0,239
CAR(0,5)	3	0,075	0,081	0,824	-0,274
CAR(0,10)	3	0,049	0,052	0,858	-0,221
CAR(0,20)	3	0,006	0,006	0,950	0,078
CAR(-1,1)	3	0,110	0,124	0,784	0,332
CAR(-2,2)	3	0,475	0,904	0,516	-0,689
CAR(-5,5)	3	0,536	1,155	0,477	0,732
CAR(-10,10)	3	0,263	0,357	0,657	0,513
CAR(-10,20)	3	0,641	1,782	0,409	0,800

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A13. Regression between target returns and rival returns for industry category 8

Table A13 provides a short description of the statistical relationship between abnormal target returns and abnormal rival returns. Multiple regressions are made based on each time interval. The number of observations, R square, F-value, probability and ρ (correlation coefficient) are displayed.

Period	Observations	R^2	F-value	Prob > F	ρ
CAR(-10,-1)	114	0,004	0,475	0,492	0,065
CAR(-5,-1)	114	0,011	1,215	0,273	0,104
CAR(-2,-1)	114	0,000	0,018	0,892	-0,013
AR(-1)	105	0,013	1,362	0,246	-0,114
AR(0)	105	0,000	0,022	0,883	-0,015
AR(1)	107	0,035	3,776	0,055*	0,186
CAR(0,1)	117	0,000	0,028	0,867	-0,016
CAR(0,2)	116	0,000	0,003	0,954	-0,005
CAR(0,3)	116	0,007	0,842	0,361	0,086
CAR(0,5)	108	0,020	2,179	0,143	0,142
CAR(0,10)	107	0,046	5,036	0,027**	0,214
CAR(0,20)	84	0,015	1,236	0,269	0,122
CAR(-1,1)	117	0,003	0,326	0,569	0,053
CAR(-2,2)	116	0,001	0,115	0,735	0,032
CAR(-5,5)	108	0,007	0,694	0,407	0,081
CAR(-10,10)	107	0,012	1,254	0,265	0,109
CAR(-10,20)	84	0,002	0,203	0,654	0,050

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Table A14. Regression between target returns and rival returns for industry category 9

Table A14 provides a short description of the statistical relationship between abnormal target returns and abnormal rival returns. Multiple regressions are made based on each time interval. The number of observations, R square, F-value, probability and ρ (correlation coefficient) are displayed.

Period	Observations	R^2	F-value	Prob > F	ρ
CAR(-10,-1)	216	0,001	0,251	0,617	0,034
CAR(-5,-1)	216	0,001	0,198	0,657	-0,030
CAR(-2,-1)	216	0,000	0,099	0,754	0,021
AR(-1)	193	0,000	0,005	0,944	-0,005
AR(0)	202	0,000	0,004	0,952	0,004
AR(1)	211	0,033	7,110	0,008***	0,181
CAR(0,1)	232	0,000	0,009	0,926	-0,006
CAR(0,2)	232	0,003	0,604	0,438	-0,051
CAR(0,3)	232	0,002	0,400	0,528	0,042
CAR(0,5)	232	0,000	0,021	0,884	-0,010
CAR(0,10)	228	0,005	1,022	0,313	0,067
CAR(0,20)	209	0,000	0,074	0,786	0,019
CAR(-1,1)	232	0,001	0,139	0,710	-0,025
CAR(-2,2)	232	0,000	0,020	0,888	-0,009
CAR(-5,5)	232	0,000	0,010	0,920	-0,007
CAR(-10,10)	228	0,001	0,208	0,649	0,030
CAR(-10,20)	209	0,000	0,019	0,892	-0,009

Stars indicate significance levels of: * p<0,1, ** p<0,05, ***p<0,01

Figure A1. Boxplot of AR for target firms

Figure A1 is based on 164 target firms and shows boxplots of AR for each day between $t = -10$ to $t = +10$. The lower and upper hinges indicates the 25th and 75th percentile respectively. The upper and lower adjacents are calculated as upper quartile + 1.5 IQR and lower quartile –1.5 IQR, as defined by Tukey in 1977 (Tukey 1977).