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Merger and acquisition performance: Evidence from Norway

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0. Abstract

This event study examines how acquiring firms' stock price react to merger and acquisition announcements. I use data from the Norwegian market, and have identified a total of 423 M&A deals, carried out by a total of 97 firms, between 2007 and 2021. This study is performed by examining daily abnormal returns (AR) and cumulative abnormal returns (CAR) in what is define as the event period consisting of 21 days surrounding the announcement day. I also define an estimation period, consisting of 180 days prior to the event period. A simple market model is used to estimate abnormal returns, which is fitted in the estimation period, and used to estimate abnormal returns out of sample. I find that the M&As on average added value for the acquiring company's shareholders in our sample, but the statistical significance of the results are weak.

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1. Introduction

Firms can grow its business through internal or external expansion. Internal expansion is growing with the use of the business' own resources, and can include adopting new technology, business reengineering, new products and new market strategies. In contrast, external expansion is growth by the use of outside resources and primarily involves either a merger or an acquisition (M&A). A merger is the consolidation of two firms into one single entity, while an acquisition is the purchase of one firm by another individual or firm (Hirschleifer, 1995).

Mergers and acquisitions represent a popular growth strategy because it gives the acquiring company instant access to resources that otherwise would have been costly or time consuming to develop internally. However, in order to execute an M&A transaction, firms incur contracting cost for advisors. These fees represent around 1% of the deal value (King et al., 2004). Therefore, firms need to decide if the potential gain outweigh the costs. This brings to question whether or not mergers and acquisitions create or destroy value for the shareholders in general. The goal of this study is to provide some insight into this question, by assessing whether or not an event (like an M&A announcement) causes a reaction in the stock prices, and whether nor not this creates or destroys value for the acquiring firm's shareholder.

The research question studied in this thesis is: "*How is the acquiring firms' stock price affected by the announcement of a merger or an acquisition for firms listed on Oslo Stock Exchange?*"

In the M&A literature, many existing studies goes a bit further and tries to find out which deal-, or firm-specific factors determine the profitability of the deal. Despite the vast number of studies in this area, the variables that affect the profitability of M&A is not well understood (Renneboog & Vansteenkiste, 2019). Previous studies suggest multiple variables that may affect M&A profitability, but the results usually differ from study to study. The most likely solution is that numerous variables affect the stock price, but including all of them in a model brings is close to an impossible task, and we would likely encounter other issues, like the curse of dimensionality. This is the motivation for the narrow scope of this study, where we have limited the

focus to whether or not M&As on average add or destroy value for the acquiring firms' shareholders.

Despite mergers and acquisitions being two different strategies, prior literature mainly study the effects of M&A as a combined term (Alexandridis et al., 2012; Mateev, 2017; Mateev & Andonov, 2016; Sehgal et al., 2012; Xu, 2017) which is what I have done in this study.

This study is structured as an event study, which has been a widely popular approach since it was developed by Fama, Fisher, Jensen and Roll in 1969 (Fama et al., 1969). Event studies in general, treats an event as the independent variable and measures its impact on the dependent variable. In this study, the announcement of a merger or an acquisition will be considered as the event or independent variable, while the stock price of the acquiring firm is the dependent variable.

The objective of this study is to investigate the effect of M&A events on acquirer companies' stock prices over a period of time around the event called an event period. The event period consists of ± 10 days relative to the announcement day. Specifically, I examine the change in the abnormal returns (AR) and cumulative abnormal returns (CAR) for the acquiring firm in the period around the event. Abnormal returns are returns beyond expectation. In other word, the observed return minus the predicted return for that day. Thus if we observe abnormal returns beyond expectations on day of the announcement, we could infer that the change in the stock price was caused by the new M&A information.

In order to predict each firm's returns during the event period, this study defines another period called the estimation period. The estimation period is the last 180 days prior to the event period and is used to estimate predicted returns during the event period.

In finance, a wide belief is that the disclosure of any type of new information could impact the stock prices in an efficient market (Fama et al., 1969).With news being released continuously multiple factors potentially affect the stock price around an M&A event. Thus, the further in time you move away from the event, the harder it

is to isolate the effect of the M&A event alone on the stock price. However, if you only investigate a small interval, you might not capture the full effect of the M&A event. This trade-off is a key concern with event studies.

The remainder of the paper is organized as follows. Section 2 presents theories related to the research question. Section 3 contains a literature review of existing empirical literature on the topic. Section 4 is a presentation of the methodology used in this study, and at the end of the section I outline the hypotheses. Section 5 contains a presentation of the data and a description of the sample collection process. In Section 6 the results are presented and interpreted, and in Section 7 a conclusion is drawn.

2. Theory

In this section, I present and explain three central theoretical concepts to understanding and answering the research question. I have based this study upon value creation, efficient capital markets, and asymmetric information. The first part is a study on how firms can create value. The second part reviews the efficient market hypothesis (EMH), which is relevant for understanding how markets react to new information. The last part, agency problems and information asymmetry are relevant for understanding why some firms engage in value destroying M&A, but is also relevant when it comes to potential information leakage and insider trading.

2.1 Value creation or destruction

A firm that engages M&A can either add or destroy value for their shareholders. Value is thought of as an unobservable intrinsic feature of the stock, while observable stock prices is a noisy proxy for this intrinsic value. Thus, because we only observe prices, we can say that value is created when the stock price increase or destroyed when the stock price decrease. Value creation in M&A occurs when a successful dela increases the returns of the combined firm improving the allocation of resources between the participating companies and generate synergy effects

(Salvi et al., 2018). Such synergy effects typically include operational, managerial or financial synergies. Another source of value creation comes when M&A help reduce the future competition, such that the acquirer gains competitive scale.

The theories of regarding value creation mainly consider long-run results, however, in the long-run it is harder to isolate the effect of the event you want to study. However, a general assumption is that investors trade off of their own opinions on whether the M&A event will create value or not. Investors believing that the M&A event will destroy value will want to sell their stock, while investors who believe the opposite will want to buy. Seeing how the stock price reacts to the news can also be considered a signal for the investor sentiment whether the event will create or destroy value.

2.2 Efficient market hypothesis

The efficient market hypothesis (EHM) aims to explains investor behavior when the market is efficient. According to Fama (1970), an efficient market is a market where all available information is fully reflected in the asset prices. We also define three forms of efficient markets; weak form, semi-strong form, and strong form, which is the basis of Fama's theory. In the weak form, current stock prices reflect all historic stock price information. In the semi-strong form, current stock prices reflect all publicly available information. While in the strong form, current prices reflect both public information and insider information, which means that market prices reflect all existing information about a firm. In semi-strong efficient markets, the market reacts immediately to new information. In strong efficient market, it should not be possible for investors to earn abnormal returns.

Thus, if we observe abnormal returns in the period around an M&A event, its meaning may be interpreted differently based on how efficient the market is. If the market is in the strong form, the occurrence of abnormal returns imply that you have failed to include all variables that affect the stock price into your analysis. In a semi-strong efficient market, abnormal returns imply that the market reacted positively or negatively to the new information, because the event either created or

destroyed value. All though the subject of market efficiency is debated, it seems that the majority of literature support that the market is in the weak or semi semi-strong form of efficient (Ţiţan, 2015). In the weak form the market reacts gradually to new public information, while in the semi-strong form the market reacts immediately to new public information. While in the strong form the market prices reflect all public and private information.

However, if we assume that the market is in the weak form or semi-strong form, the occurrence of abnormal returns might mean that the market adjusted its prices, either gradually or immediately, to incorporate this new information. If the stock price increase or decrease are determined by the market's expectation of the deal quality. Hence, positive abnormal returns imply that the market expect value to be added from the deal, while negative abnormal returns imply that the market expect that the deal will destroy value.

2.3 Agency theory and information asymmetry

Agency theory describes the fundamental conflict of interest between managers and owners who act in own self-interest. The theory is relevant because it may explain why some managers choose to partake in mergers or acquisitions with low profitability expectations, because of e.g. overestimated synergy-effects or high bidding prices. Jensen and Meckling (1976) describes how managers with small stakes in the firm have incentives to increase non-pecuniary spending because the managers does not fully bear the costs. In a gamble situation, they get to enjoy the benefit of the upside, but they do not share in the downside-cost as much as the shareholders. This represents a cost for the shareholders, which is referred to as agency costs.

Agency costs is not only related to ownership. Several studies (Barclay & Holderness, 1989; Bebchuk, 1999) have suggest that managers or owners with high stakes in the firm might use their position to acquire private benefits, such as goods produced by the firm, or private use of company assets. The implication is that some managers may engage in negative net present value projects, as long as they get to

extract private benefits from the transaction. Such events will reduce the average profitability of mergers and acquisition.

Information asymmetry describes how stakeholders in a firm have different access to information, and behave accordingly. Information asymmetry is present in weak and semi-strong efficient markets, but not strong efficient markets. There are information asymmetry between the acquirer and the target, which poses two challenges for the acquirer company. One of the challenges is to correctly valuate the target company, and another is to agree on the price. The targets may have incentives to withhold information negative information in order to attract a higher bidding price.

There is also information asymmetry between the managers in the acquirer company and shareholders in the acquirer company. Some managers might extract private benefits out of a deal independent of deal quality (whether it is expected to add or destroy value), and in that case they will signal to the investors that the deal will add value, even if they do not necessarily believe it.

In the event of an M&A announcement, there is indisputably occurrence of information asymmetry, and it is therefore important for managers to address this concern to avoid misinterpretation of deal qualities. Information asymmetry can cause uncertainty regarding the quality of the deal. If investors face information asymmetry and do not feel confident about the quality of the deal, they might react negatively to the news, because they would know from research or previous experience that acquirers on average tend to overpay.

Reactions in the stock price prior to the announcement may indicate that some one is trading off of private information, which is yet to become public. Pinpointing the timing of these returns is key because they could also be a result of superior analysis by investors in the market (Sehgal et al., 2012).

3. Existing empirical litterature

In this section I provide an overview of the existing empirical literature regarding M&A, while extending our efforts to structuring the field into more comprehensive blocks of studies. But because the field of M&A research is vast and diverse, we ultimately narrow the scope to include studies which examines the performance and profitability of mergers and acquisitions.

3.1 Event studies in M&A literature

To study M&A profitability, the most common approach is to measure the change of some metric in the period surrounding the transaction, using the event study methodology (Renneboog & Vansteenkiste, 2019). However, such event studies differ based on key characteristics, and should therefore be structured based on those differences.

We can group the literature by which metric they use to measure profitability. One of studies measure changes in accounting figures, while another block measure the change in stock prices. However, the most popular approach is to use stock prices, which is what I will focus on going forward.

The literature also distinguish between short-run event studies and long-run event studies. Short-run studies usually operates with a horizon in days or months, while long-run studies commonly uses a horizon from 1 to 5 years. Short-run event studies has by far the most popular approach since the 1970s. (Martynova & Renneboog, 2008). Naturally, with a long horizon it is more difficult it is to isolate the effect of the M&A from the rest of factors affecting the stock. Going forward the emphasis will be on short-run studies.

Mergers and acquisitions either creates or destroys value for the shareholders of the target and acquirer. Determining if the event added value to the shareholders of the target firm is clearer, because it can be boiled down to whether the shareholders

were paid a premium or a discount for their stock. However, for the acquiring firm, determining if an event added value is much more indeterminate.

However, M&As are on average expected to create value as reflected in the weighted average of the announcement returns of bidders and targets, but the bulk of the returns accrue to the shareholders of the target, who hold most of the bargaining power in takeover negotiations.(Renneboog & Vansteenkiste, 2019)

Several studies have reported positive abnormal returns for the target company, but the returns differ over time and across location. Eckbo (1983) and Eckbo and Langohr (1989) report 6% 2-day cumulative abnormal returns (CAR) for targets in the US in the 1960s and 1970s. Martynova and Renneboog (2008) report 16% 2-day CARs for targets based in Europe in the 1990s, while Netter et al. (2011) report 24% 2-day CARs for targets in the US in the 2000s. Alexandridis et al. (2017) report 2-day CARs of 29% for US targets in the 2010s.

The returns on the acquirer tend to be close to zero or indistinguishable from zero. (Netter et al., 2011). Asquith (1983) and Eckbo (1983) report slightly positive CARs for US acquirers in the 1960s and 1970s, as do Martynova and Renneboog (2011) of European acquirers in the 1990s. Morck et al. (1990) and Chang (1998) report slightly negative returns for the 1970s and 1980s, while Alexandridis et al. (2017) report slightly positive CARs in the 2010s.

The combined weighted target and acquirer announcement returns are significantly positive and slightly increase over time, but remain close to zero: combined returns amount to 1.5% in the 1970s and 2.6% in the 1980s (Andrade et al., 2001), and 1.06% in the 1990s (Betton et al., 2008), 1.69% in the 1990s and 2000s (Maksimovic et al., 2011), and 4.51% in the 2010s (Alexandridis et al., 2017).

Furthermore, Bouwman et. al (2009) studies whether acquisitions in expanding markets differ from those in contracting markets. The authors find that acquisitions during expansive markets have a significantly higher return abnormal returns than in a contractive market. Hence, it is important to consider that the results obtained may vary dependent on the sample used.

One of the most popular approaches in the literature is to estimate abnormal returns (AR) or cumulative abnormal returns (CAR) (Renneboog & Vansteenkiste, 2019). Abnormal returns are observed returns minus expected returns. The expected "normal" returns is the return we would expect to see if the event did not take place

However, the predicted returns can be estimated in numerous ways, which means that the results are not always directly comparable to each other. The simplest approach is to use a constant mean or a constant market model to predict returns, which means that you estimate the mean of the return on the stock or the market, and use that mean as the prediction. The constant mean method is also referred to as the single index model, which assumes that the securities mean return is constant (Ma et al., 2009).

Another popular approach is to use a market model, which is another popular group of estimation techniques. The common denominator is that you regress the returns of the firm upon the market and or other relative firm-, or market specific factors. CAPM and other factor models all fall in under the market model category. Armitage (1995) finds in his study that the market model methodology is the most frequently used method. Both Arnitage (1995) and MacKinlay (1997) argue that the marked model approach is a potential improvement over the constant mean model

This study will contribute to the existing body of literature by providing research, exploring the Norwegian stock market, which has not been thoroughly studied in the past. I have collected 15 years' worth of data from 2007 to 2022, which was as much as I were able to obtain, with the goal of minimizing the impact of specific time-period related factors.

4. Methodology

In this section I outline the methodological approach used in this study. I have adopted an event study methodology, where abnormal returns is used as the performance measure, and a simple market model is used to estimate the expected returns.

4.1 Event study

An event study treats an event (such as an M&A announcement) as the independent variable and measures its impact on the dependent variable, which is some form of performance metric, i.e. stock returns. This study treats the M&A announcement as the independent variable, and examines its impact on the acquiror abnormal stock returns, which is considered the dependent variable. I will also adopt the event time framework, where time is relevant to the announcement day.

An advantage of the event study with a large sample is that you can use a standardized event period across all observations, then by the Law of Large Numbers, the errors of a too long or too short window will have a small impact in the average (Krivin et al., 2003).

Prior literature debates how an appropriate event period could be defined. However, according the EMH, semi-strong markets should respond immediately to news, so the use of an event period is inconsistent with the EMH. However, the event period gives us a chance to assess whether the EMH holds or not, and to uncover any information leakages or insider trading by studying returns prior to the announcement. But consequently, using a longer period will add potentially confounding noise (McWilliams & Siegel, 1997). Hence, I confine our window to 21 days, which is relatively short, but still wide enough to potentially capture any information leakages or insider trading occurrences.

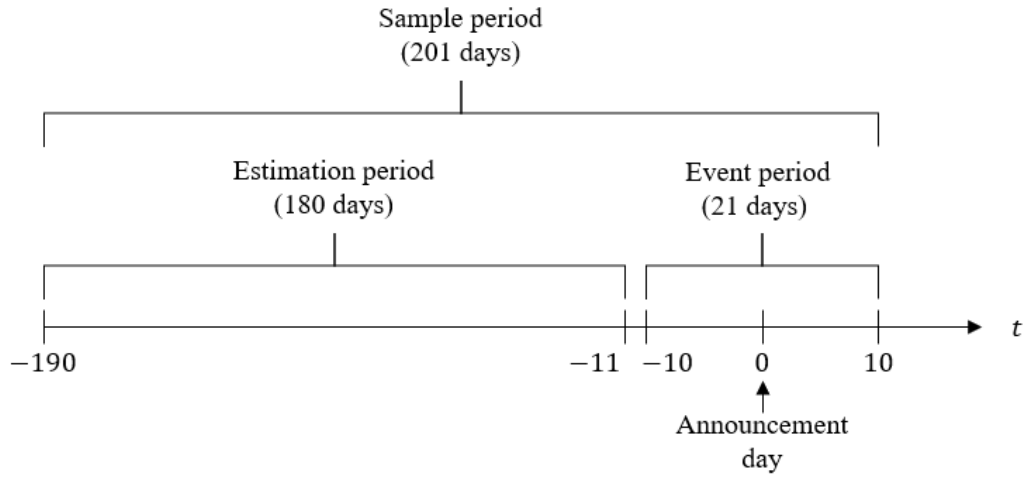
More detailed, the entire *sample period* is split in two non-overlapping consecutive periods which are named the *event period* and the *estimation period*. The *event*

period is the period of interest, and it covers 21 days, from $t = -10$ up to $t = 10$, where $t = 0$ is the day of event (M&A announcement). The second period is called the *estimation period* and covers a total of 180 days from $t = -190$ up to $t = -11$. The purpose of the estimation period is to fit a market model which will be used to predict returns out of sample in the event period.

Peterson (1989) points out that the estimation period typically consist of between 100 to 300 days for event studies on daily data. He also makes the case that the choice of estimation period is a trade-off between the cost and benefit of a longer period. The cost is model parameter instability, and the benefit is an improved prediction model. In this thesis I therefore chose the neutral middle-ground in order to have a balanced trade-off.

MacKinlay (1997) argues that the estimation period should not overlap with the event period, because an overlap potentially lead to the event itself affecting the predicted returns. Which is why I choose two consecutive periods without overlap. The figure below visualizes the periods.

Figure 1: Estimation period and event period



4.2 Abnormal returns (AR)

This thesis uses abnormal returns (AR) and cumulative abnormal returns (CAR) as the performance metrics. Abnormal returns for a given day is simply the difference between the actual returns and the predicted returns. I use a market model to predict returns, and the abnormal returns (AR) then becomes the model error. I estimate abnormal returns for all events, which means that a single firm can be represented inn multiple events at different points in time. I estimate abnormal returns by the following equation.

$$AR_{i,t} = R_{i,t} - E\left(R_{i,t}|X_t\right)$$

Where, $AR_{i,t}$ is the abnormal returns for firm i at time t, $R_{i,t}$ is the actual returns and $E(R_{i,t}|X_{i,t})$ is the predicted returns estimated from the market model conditional to an input of $X_{i,t}$ which can be a vector of several explainatory variables.

4.3 Expected returns

The majority of research uses some kind of market model, which in general regresses the firms return upon a set of firms- or market related variables (Renneboog & Vansteenkiste, 2019). The main challenge however, when it comes to implementation, is to obtain the required data. Hence, due to restrictive data access, this thesis will implement a simple market model. However, MacKinlay (1997) argues that the gains from applying additional factors are limited, and that there is little reduction in the variance of the abnormal returns when adding multiple factors to the model.

I estimate the expected returns using Ordinary Least Squares (OLS). The stock returns are regressed upon the market returns (measured by a market index). Because I use data from Norwegian companies I use the Oslo Børs Exchange Benchmark Index (OSEBX) as a market proxy. The model is fit during the estimation period, and then applied in the event period to predict returns out of

sample. That way, the model only reflects information that was available a priori when it makes its prediction. I estimate the following equation.

$$E\left(R_{i,t}\middle|X_t\right) = \beta_{0,i} + \beta_{1,i}R_{m,t} + \epsilon_{i,t}$$

Where, $E(R_{i,t}|X_t)$ is the conditional expected returns for firm i at time t, $R_{m,t}$ is the market return at time t, and $\epsilon_{i,t}$ is the error term of the model, β_0, i is a constant term, and $\beta_{1,i}$ is a coefficient that can be interpreted as the marginal effect of the market on the firms returns.

4.4 Cumulative abnormal returns (CAR)

Cumulative abnormal returns is the cumulative sum of the returns over an interval from day t_0 to day t_1. The CAR measures the cumulative wealth effect of the acquirers over the course of the event period. The CAR is calculated as cumulative product, in order to account for the compounding effect of stock returns. I estimate CAR by the following equation.

$$CAR_{i,t} = \prod_{t=t_0}^{t_1}(1 + AR_{i,t}) - 1, \qquad t_0 \leq t \leq t_1, \qquad AR_{i,t_0} = 0$$

Where, $CAR_{i,t}$ is the cumulative abnormal returns for firm i at time t in an interval between t_0 and t_1, where t_0 and t_1 is dates (start- and endpoint of cumulative summation). $AR_{i,t}$ is the abnormal returns for firm i at time t.

4.5 Hypotheses

In this section I refine the hypotheses. The hypotheses are based upon the theories outlined in Section 2 and previous findings in existing literature, as seen in Section 3. I refine four hypotheses that will be tested later on in Section 6.

H1: Main hypothesis

Hypothesis 1: "The abnormal stock return of the acquirer on the announcement day (event day) will be close to zero."

$$H_0 : \overline{AR}_t = 0, \qquad t = 0$$
$$H_A : \overline{AR}_t \neq 0, \qquad t = 0$$

This hypothesis is based on value creation and destruction, efficient markets and findings in prior empirical research. If the market is semi-strong efficient, then the market prices reflect all public information, and the market should react immediately to new public information. Therefore, if we observe any positive or negative AR, it could mean that the market on average react positively or negatively to M&A because it either added or destroyed value. However, if the expectation is that M&As on average add value, then this would become public information and the targets would require a higher premium on their stock, which in turn will decrease the profitability of M&As. Based on theory I expect that the market makes price correction on the day of the announcement, but I expect the average corrections to be close to zero. Based on prior literature, I also expect that the average abnormal returns is close to zero at the announcement day.

H2: Efficient markets

Hypothesis 2: "The abnormal stock return of the acquirer will be zero or indistinguishable from zero in the days following the announcement day (event day)."

$H_0 : \overline{AR}_t = 0, \qquad 0 < t \leq 10$

$H_A : \overline{AR}_t \neq 0, \qquad 0 < t \leq 10$

Based on efficient markets. If we observe any AR after the announcement day it could mean that there is a post announcement drift (slow adjustment to new information), which is inconsistent with semi-strong or strong efficient markets, but present in the weak form efficient market. If we assume that the market is semi-strong efficient, then the market should react instantaneously to new information, meaning that we would only observe abnormal returns (if any) on the announcement day. Then any abnormal returns after the announcement day implies that another variable has affected the stock.

H3: Agency theory and information leakage

Hypothesis 3: "The abnormal stock return of the acquirer will be indistinguishable from zero in the days leading up to the announcement day (event day)."

$H_0 : \overline{AR}_t = 0, \qquad -10 \leq t < 0$

$H_A : \overline{AR}_t \neq 0, \qquad -10 \leq t < 0$

If we observe any AR one of the days leading up to the announcement day, it could mean that someone is trading off of private information, which ultimately is illegal. But it could also mean that some unknown variable is affecting the stock returns.

H4: Wealth creation

Hypothesis 4: "The value added for the shareholder of the acquirer will be close to zero"

$H_0 : \overline{CAR}_t = 0$

$H_A : \overline{CAR}_t = 0$

I want to investigate if M&A's on average add or destroy value. However, based on prior literature the expectation is that the net value added will be close to zero. CAR is relevant for estimating the effect of the M&A announcement on the stock returns in weaker market forms, where prices adjust gradually to new information. However in semi-strong efficient markets, the stock prices should only be affected by the announcement at day 0, and CAR is then irrelevant.

5. Data

In this section I describe the data, and elaborate on the data collection process. I describe the used sample and provide rationale for dropping observations, and give a description of how I arrived at the final sample. I give a description of the variables used in this thesis, and provide summary statistics of the data.

5.1 Data collection

In this study I research M&A deals in Norway, using data from the Norwegian stock market. The final sample consist of 423 deals, conducted by a total of 97 acquirer firms between 2007/07/01 and 2021/01/01. The used sample consist of both deal data and stock data, provided from two different sources, which I will go through next. The reasoning behind the starting date is that Yahoo Finance only have data from 2007/01/01, and we need 6 months' worth of observations prior to the event, which makes up the estimation period.

5.1.1 Deal data

The first dataset is a record of historical M&A events for firms listed on the Oslo Stock Exchange (OSE) between 2007/07/01 and 2021/01/01. The data was obtained from the Zephyr database of Bureau van Dijk. I applied the following search criteria: (1) Include both mergers and acquisitions, (2) only include deals in between 2007/07/01 - 2021/01/01, (4) only include deals where acquirors are "listed" (opposed to "delisted" or "unlisted") on the Oslo Stock Exchange (OSE). The search gave a sample of 134 acquirers, which participated in 553 deals . From the sample I extracted three variables. The first is the dates of the announcements, then the name and the ticker of the acquirer in each deal.

The plan was to use the list of acquirer tickets as input into a function that automatically extracts time series data from Yahoo Finance, by using the coding language R. I used the ticket list from the raw data as input and discovered that several of the firms in the raw data had changed their ticker, while some firms had been delisted, such that there were no available data, while other firms simply lacked data. I went through the list of firms and replaced the old tickers with the new, and removed all observations related to the tickers that had been delisted or lacked data. The goal was to maintain the size of the sample as much as possible.
I removed a total of 16 firms which had been delisted, and a total of 7 firms which lacked data. After dropping those 23 firms, the total number of firms is 111 and the total number of events is 505.

5.1.2 Stock prices and returns

The next step was to collect historical stock prices and returns for all of the 111 acquirer firms identified. I collect as much data as possible between: 2007/01/01 and 2022/01/01. I use a starting date which is 6 months prior to the first event announcement, and the end date is 1 year after the last event announcement. We need 6 months prior to the event as the estimation period, and we need at least 10 days of observations after the last event announcement in order to have observations in the entire event period.

For each event, I extract a maximum of 201 days of acquirer returns, starting at $t = -190$ days prior to the event announcement and ending at $t = 10$ days after the announcement. The second condition is that each event has at least 90 calendar days' worth of returns in the estimation period (from $t = -190$ to $t = -11$), and a full 21 calendar days' worth of observations in the event period (from $t = -10$ to $t = 10$), such that the number of observations stays constant for each day t in the event period. However, we only have observations for actual trading days, and missing observations for the days in between. Each event occurred at a unique date, which mean that for each day in the event period, some firms will have a missing value, because it was a weekday for some firms while a weekend for other firms. In order to resolve this issue, and get an equal size of observations each day in the event period, I interpolate the missing values in between observations, such that the stock price over the weekend is a linear function of the prices on Friday and Monday. After filtering on all the conditions mentioned above, the data consist of a total of 97 firms and 423 events.

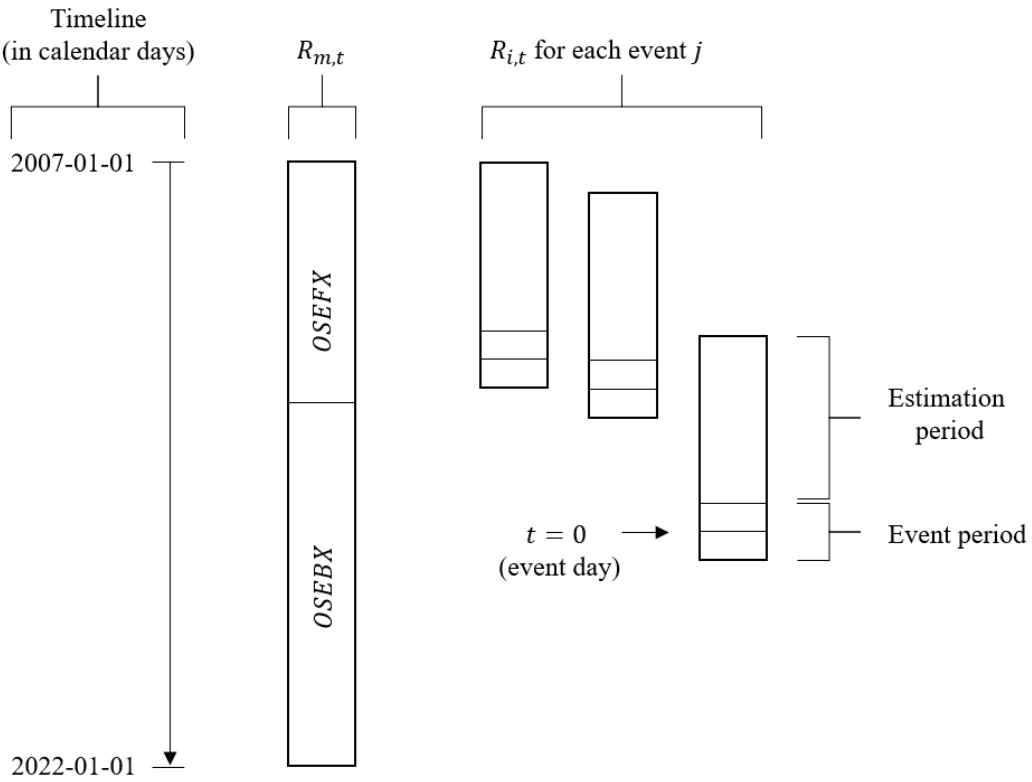
5.1.3 Market returns

I also collect price data for the market. The plan was to use the Oslo Stock Exchange Benchmark Index (OSEBX) as a proxy for the market, and download the data from Yahoo Finance. However, price data for the OSEBX was only available between 2013/03/05 and 2021/10/01. Because we need to match the returns of firm i at time t with the market returns at time t, reducing the number of years would drastically reduce the sample size. One alternative would be to use another index such as the Oslo Stock Exchange All Shares Index (OSEAX), but neither index had data over the entire interval (2007/01/01-2022/01/01). What I ended up with was to use a combination of OSEBX and OSEFX (Oslo Stock Exchange Mutual Fund Index).OSEFX had available data between 2007/01/01 and 2015/09/14. I use OSEFX from 2007/01/01 to 2013/03/04, and OSEBX from 2013/03/05 and 2021/10/01. Both, indices have the same share-composition, which is why I opted for this workaround-solution.

5.1.4 Data structure

I used the coding language R to process, clean and structure the data, as well as all most of the calculations and plots. One of the major challenges with the study has been importing, cleaning and structuring the data. Because all the events occurred at different dates, I adopt the event time framework in order to directly compare similar events across different point in time. In the event time framework, we think of time as relative to the day of the events of interest. However, in order to use a market model to estimate predicted returns, we also need to keep track of the real dates of each event announcement, along with the real dates of the stock prices observation. Figure 2 below visualizes the all the data collected, and show how the data was structured and matched by real dates and relative dates. Each rectangle represents vector of daily returns.

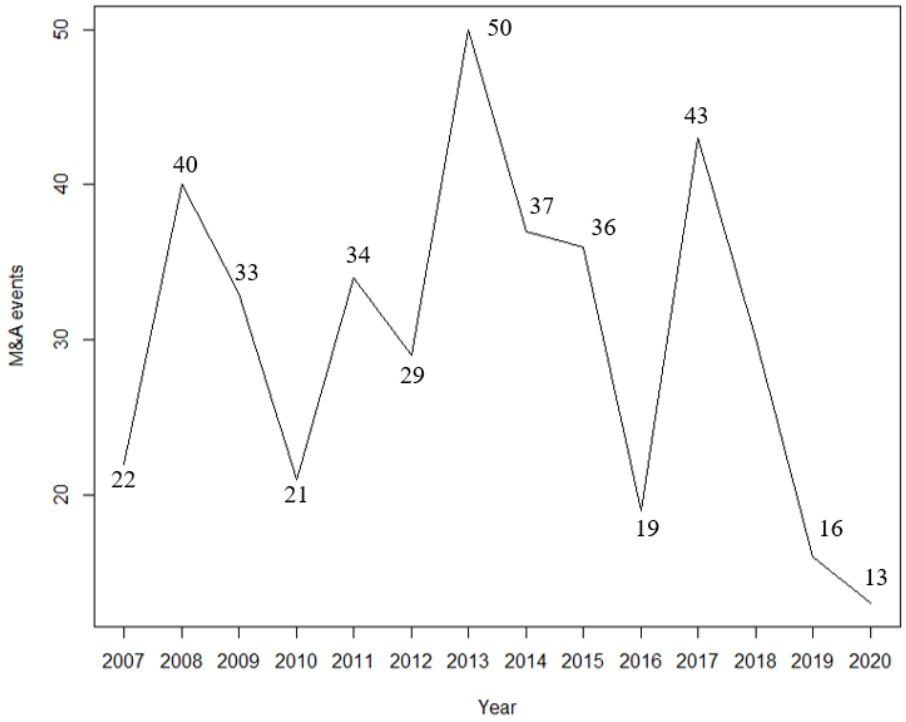
Figure 2: Visualization of data structure



5.2 Dscriptive statistics

The purpose of this section is to analyze and visualize the distribution of the data. I begin by looking at the distribution of M&A events over time, and move on to the distributions of the dependent and independent variables.

Figure 3: Number of M&A announcements pr year



I investigated how the 423 events in our sample are spread out over time, and count the number of M&A events in a given year. I count from 2007/07/01 to 2021/01/01 (note that I only include the second half of 2007 in our sample). The figure above represents the number of M&A announcements pr year. The number of M&A events appear to come in a wavelike pattern. However, I do not count all events, only a subset defined by our search criteria. The number of M&A events peaked in 2013 with a total of 50 events, while 2020 was the year with the least M&A activity with 13 events.

Figure 4: Distribution of market returns

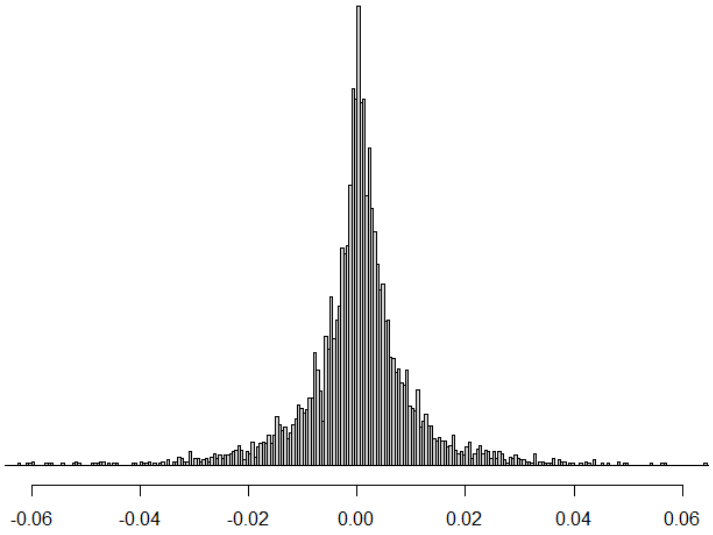


Figure 4 above shows the distribution of the daily market returns (measured by OSEFX and OSEBX). The market returns appear to be slightly leptokurtic, where there an overweight of the observations are centered around the mean, compared to the normal distribution or the t-distribution.

5.2.1 Variable description

Table 1: Summary of variables

Dependent variables and M&A performance measures	
$R_{i,t}$	Observed stock return for acquirer i at time t
$AR_{i,t}$	Abnormal return for acquirer i at time t
$CAR_{i,t}$	Cumulative abnormal returns for acquirer i at time t
$\overline{AR}_t$	Average AR at time t
$\overline{CAR}_t$	Average CAR at time t
Independent variables	
$R_{m,t}$	The return on the OSEFX/OSEBX index at time t
$M\&A_{i,t}$	M&A event j for firm i at time t, works as a dummy which only includes firm i into the examination when it has participated in an M&A event

6. Results

In this section, I report the results from the analysis and interpret the results, and test the hypothesis outlined in the section 4.5. I use daily abnormal returns (AR) as the main performance metric, denoted by AR_t, where t is days relative to the announcement day. I also estimate cumulate abnormal returns (CAR) in order to study the combined net wealth change for the acquirer firms' shareholders over the entire event period, or subsets of the event period. I will start by presenting the results, and from then I will test the hypothesis. Below is a short recap of the hypothesis I have outlined.

H1: "The abnormal stock return of the acquirer on the announcement day (event day) will be close to zero."

$H_0 : \overline{AR}_0 = 0$
$H_A : \overline{AR}_0 \neq 0$

H2: "The abnormal stock return of the acquirer will be zero or indistinguishable from zero in the days following the announcement day (event day)."

$H_0 : \overline{AR}_t = 0, \qquad 0 < t \leq 10$
$H_A : \overline{AR}_t \neq 0, \qquad 0 < t \leq 10$

H3: "The abnormal stock return of the acquirer will be zero or indistinguishable from zero each day leading up to the announcement day (event day)."

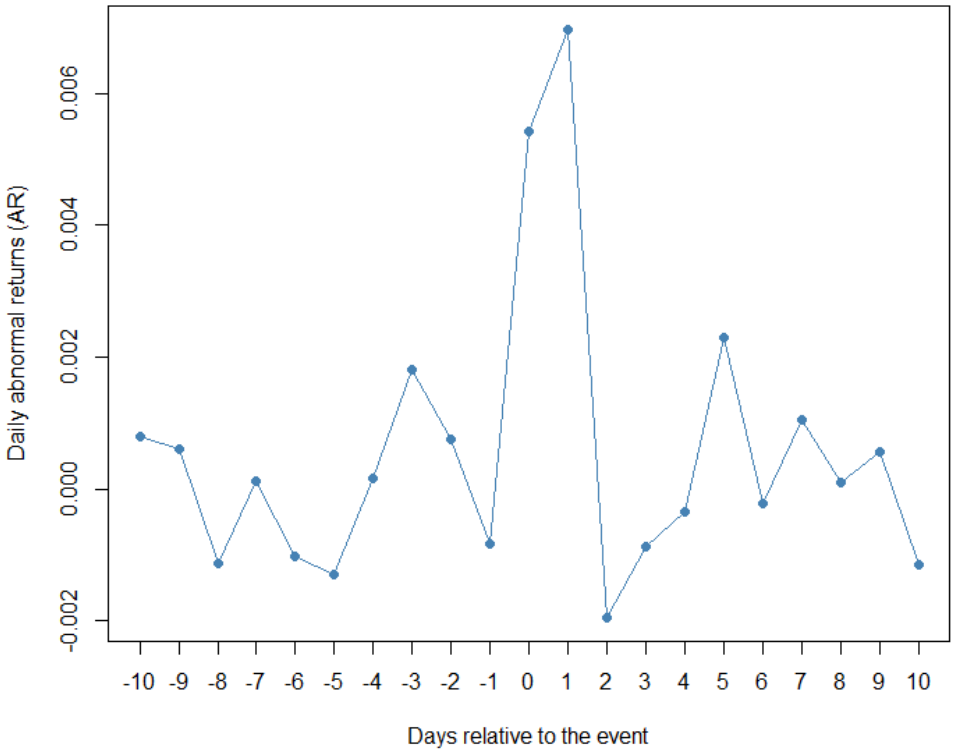
$H_0 : \overline{AR}_t = 0, \qquad -10 \leq t < 0$
$H_A : \overline{AR}_t \neq 0, \qquad -10 \leq t < 0$

H4: "The value added for the shareholder of the acquirer will be close to zero"
$H_0 : \overline{CAR}_t = 0$
$H_A : \overline{CAR}_t \neq 0$

6.1 Impact of M&A on AR

In order to examine the effect of M&A announcements on the stock returns of the acquiror, I estimated abnormal returns for each day in the event period (21 days) and for each event (423 events). Figure 5 shows the average abnormal returns each day in the event period. The purpose of the plot is to do a visual analysis of the results.

Figure 5: Average abnormal returns



On most days, the abnormal returns fluctuates between negative returns and positive returns close to zero, which is what we would expect on an average day. What stands out is the peak around day 0 and day 1. On average, shareholders earn 0.54% abnormal returns at day 0, and even higher AR of 0.70% at day 1. These findings may indicate that the market reacted positively to the new M&A information. However, I did not expect that high returns would be sustained over more days than day 0. The fact that we observe high AR in both day 0 and day 1 may indicate that there is an announcement drift, which is inconsistent with semi-strong efficient markets.

The negative AR of - 0.19% on day 2 may be interpreted as a small correction, but is often seen together with announcement drifts. One interpretation is that the market struggle to correctly interpret the new information, and need some time to correct their estimates. This is however not consistent with semi-strong efficient markets, in which the prices adjust "correctly" immediately after the release of new information.

Further, I test the significance of the estimates. Table 2 below summarizes the abnormal returns estimates for each day in the event period. I observe statistically significant average abnormal returns at day 0 of 0.54% and at day 0.23% at day 5 (0.23%). Both estimates have a p-value at 6%, which means that they are significant at the 6% level.

Table 2: Average abnormal returns

($N = 423$)

Day t	$\overline{AR}_t$	Std	SE	t stat	$P(>\lvert t \rvert)$
-10	0.0008	0.0210	0.0010	0.78	0.43
-9	0.0006	0.0253	0.0012	0.49	0.63
-8	-0.0011	0.0260	0.0013	-0.89	0.37
-7	0.0001	0.0269	0.0013	0.10	0.92
-6	-0.0010	0.0250	0.0012	-0.83	0.40
-5	-0.0013	0.0248	0.0012	-1.07	0.29
-4	0.0002	0.0310	0.0015	0.10	0.92
-3	0.0018	0.0265	0.0013	1.40	0.16
-2	0.0007	0.0263	0.0013	0.58	0.56
-1	-0.0008	0.0241	0.0012	-0.72	0.47
0	0.0054	0.0598	0.0029	1.87*	0.06
1	0.0070	0.1222	0.0059	1.17	0.24
2	-0.0019	0.0339	0.0016	-1.18	0.24
3	-0.0009	0.0223	0.0011	-0.80	0.43
4	-0.0003	0.0187	0.0009	-0.38	0.70
5	0.0023	0.0249	0.0012	1.90*	0.06
6	-0.0002	0.0257	0.0012	-0.17	0.86
7	0.0011	0.0287	0.0014	0.75	0.45
8	0.0001	0.0200	0.0010	0.10	0.92
9	0.0006	0.0194	0.0009	0.60	0.55
10	-0.0012	0.0167	0.0008	-1.41	0.16

Where *,**,*** indicate statistical significance at the 10%, 5% or 1% level respectively, or where * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The results indicate that the abnormal returns at day 0 and day 5 are significantly different from zero. However, there is little ecnomomical justification for why the M&A announcewent would cause significat AR's at day 5. Hence, I make the assumption that the AR at day 5 is unrelated to the M&A announcements. However, I want to go further into the statistical significance of the AR at day 0. Figure 6 and Figure 7 shows the distribution of the abnormal returns at day 0 across all events and time.

Figure 6: Distribution of abnormal returns at day 0

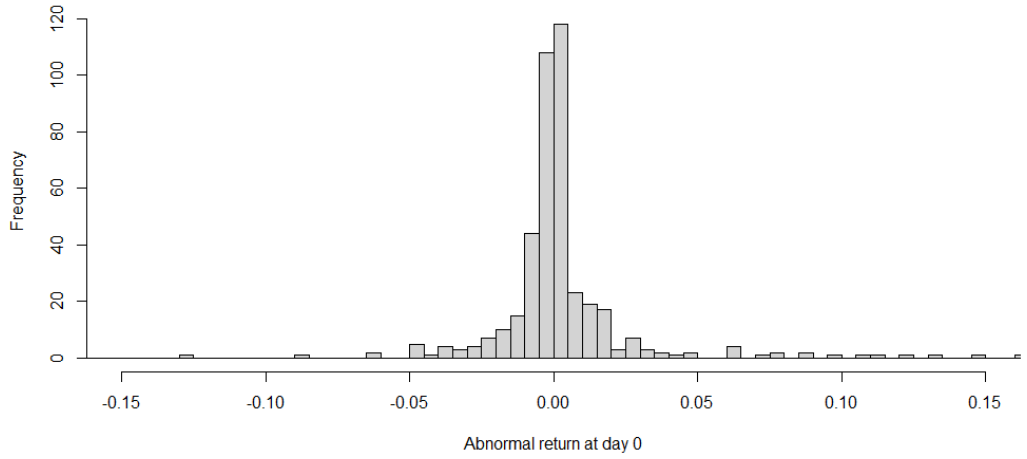
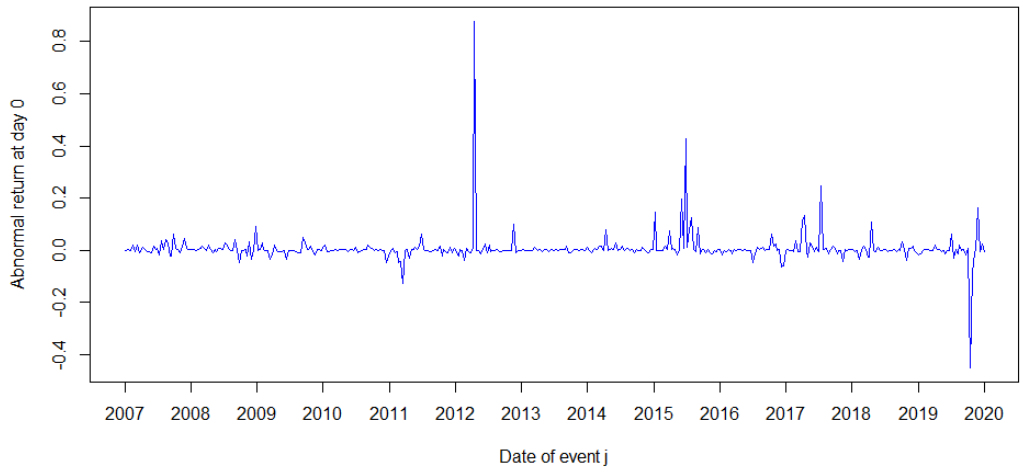


Figure 7: Abnormal returns at day 0 for all events, ordered by date



The distribution of day 0 AR looks leptokuric, but very with wide tails. The majority of the observations are sentered around the mean (0.54%), in addition there is a large number of extreme observations, which is inconsistent with t-distribution or the normal distribution. The largest observation at day 0 was 87.84% in daily abnormal returns. The minum observation was -45.20%.

In addition it seems that the profitability of M&A's come in clusters. Most periods have AR centered around the mean, but we have some small periods with large spikes in profitability (both positive and negative), which may indicate that some other variables are affecting the stock returns, other than the M&A event itself.

These extreme observations unproportionally affects our estimates relative to the observations centered around the mean, and it may cause biased estimates, but it can also be a feature of the day 0 AR distribution of the population. However, based on a visual analysiz, the abnormal returns do not follow an exact students t distribution, which makes decreases the overall confidence of our estimates, because an underlying assumption is that the t-statistic follow a t-distribution.

6.2 Impact of M&A on CAR

I also measure the impact of the M&A announcement on the cumulative abnormal returns, with the goal to measure the net wealth effect of the event on the shareholders of the acquiring company. I assume that share price is not affected by the M&A event prior to the announcement day, which means that the announcement will affects the returns of the shareholders starting at day 0 and onward. I want to examine the wealth effects on all shareholders who own the stock prior to the announcement day 0. Shareholders would then have to own the stock at market closing at day -1.I therefore set the value of the shareholder portfolio to 1 on day -1, and estimate the cumulative net wealth effect up to day 10.

Figure 8: Average CAR

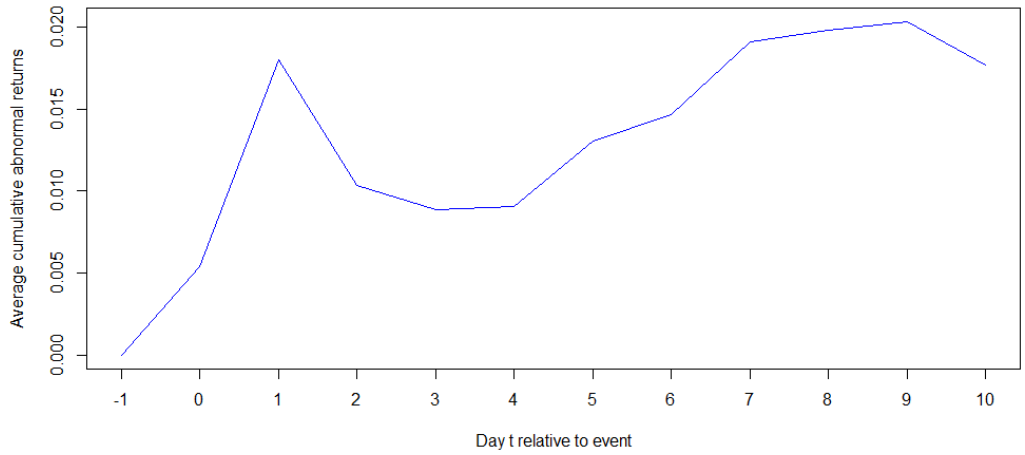


Figure 8 above , shows the average cumulative abnormal returns at day t, starting at day -1 and ending at day 10. The figure represents the cumulative wealth effect of the shareholders over the interval. On average, there is a sharp wealth increase starting at day 0, which is followed by dip at day 2. However, the portfolio value newer dips below its original starting point, which may indicate that M&A add value. However, because a multitude of variables likely affect the stock price, it becomes increasingly more difficult to isolate the effect of the M&A event alone when move further away from day 0. Below is table which summarizes the CAR estimates from day -1, to day 10.

Table 3: Average CAR

($N = 423$)

Day t	$\overline{CAR}_t$	Std	SE	t stat	$P(>\lvert t \rvert)$
0	0.0054	0.2341	0.0029	1.86*	0.06
1	0.0180	0.3918	0.0131	1.38	0.17
2	0.0104	0.2668	0.0064	1.62	0.11
3	0.0089	0.2517	0.0056	1.59	0.11
4	0.0091	0.2707	0.0060	1.51	0.13
5	0.0131	0.3140	0.0076	1.71*	0.09
6	0.0147	0.3707	0.0095	1.55	0.12
7	0.0191	0.4654	0.0130	1.47	0.14
8	0.0198	0.5133	0.0140	1.41	0.16
9	0.0203	0.5391	0.0142	1.43	0.15
10	0.0177	0.5149	0.0121	1.45	0.15

Where *,**,*** indicate statistical significance at the 10%, 5% or 1% level respectively, or where * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

I find significant CAR for day 0 (which effectively is the abnormal returns at day 0), and significant CAR for day 5. However, I believe that the CAR at day 5 has little economic significance, and is probably unrelated to the M&A announcement, should we believe that the market is semi-strong efficient or strong efficient.

In Table 4 below, I provide a brief summary of our findings, using common performance measure. I report abnormal returns of 0.54% at day 0 for the shareholder of the acquirer. I also report a 2 day CAR of 1.8% (from day -1 to day 1), a 5 day CAR of 1.31% (day -1 to day 5) and a 10 day CAR of 1.77% (day -1 to day 10).

Table 4: Summary of results

($N = 423$)

Performance measure	Mean	Std	SE	t stat	$P(>\lvert t \rvert)$
AR_0	0.0054	0.0598	0.0029	1.87*	0.06
$CAR_{-1,1}$	0.0180	0.2696	0.0131	1.38	0.17
$CAR_{-1,5}$	0.0131	0.1571	0.0076	1.71*	0.09
$CAR_{-1,10}$	0.0177	0.2499	0.0121	1.45	0.15

Where *,**,*** indicate statistical significance at the 10%, 5% or 1% level respectively, or where * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6.3 Hypotheses

In this section, I go through the hypotheses outlined in Section 3, and draw a conclusion for each hypothesis.

H1: "The abnormal stock return of the acquirer on the announcement day (event day) will be close to zero."

$H_0 : \overline{AR}_0 = 0$

$H_A : \overline{AR}_0 \neq 0$

I observe an average abnormal return on day zero of 0.54%, which is significant at the 6% level, which normally means that one would discard the null-hypothesis on a significance lever higher than or equal to 6%, and conclude that the estimate is significantly different from zero. However, the day 0 AR does not follow an exact students t distribution, which makes us question the validity of the results, and may imply that the AR are zero or indistinguishable from zero.

If we assume that the results are significant, the interpretation will vary based on the state of the market. In strong efficient markets the observable prices reflect all current information, both public and private. In such a market, the occurrence of abnormal returns imply that we have failed to include all relevant variables that affect the stock price, which is probable because I use two independent variables (M&A event and market returns). However, I assume that the market is semi-strong efficient, where market prices reflect all public information. Hence, positive abnormal returns implies that the market on average assess M&A events to add value.

H2: "The abnormal stock return of the acquirer will be zero or indistinguishable from zero in the days following the announcement day (event day)."

$H_0 : \overline{AR}_t = 0, \qquad 0 < t \leq 10$

$H_A : \overline{AR}_t \neq 0, \qquad 0 < t \leq 10$

I expect to find insignificant AR from day 1 and up to day 10. I find significant AR at day 5, with a p value of 6%, and insignificant estimates for the remainder of the days. However, I question both the statistical and economical significance of this result. I therefore do not reject the null-hypothesis, because we cannot say with high confidence that any of the abnormal returns after the announcement is different from zero. These findings are consistent with semi-strong efficient markets, where market prices adjust immediately (not gradually) to new public information such as an M&A event.

H3: "The abnormal stock return of the acquirer will be zero or indistinguishable from zero each day leading up to the announcement day (event day)."

$H_0 : \overline{AR}_t = 0, \qquad -10 \leq t < 0$

$H_A : \overline{AR}_t \neq 0, \qquad -10 \leq t < 0$

I do not find any significant abnormal returns in the period prior to the announcement. I therefor do not reject the null hypothesis because we cannot statistically distinguish any of the estimates from zero. These results are in line with our expectations. The occurrence of AR's prior to the announcement may imply information leakage or insider trading, but it can also be related to some other unknown variable which I have not examined.

H4: “The value added for the shareholder of the acquirer will be close to zero”

$H_0 : \overline{CAR}_t = 0$
$H_A : \overline{CAR}_t \neq 0$

In order to test this hypothesis I estimate the cumulative abnormal returns for the shareholders of the acquiring company, starting at the announcement day (day 0) and ending at day 10. I obtain a significant 6-day CAR estimate of 1.31% (from day -1 to day 5), but insignificant 2 day CAR of 1.8% and 11 day CAR of 1.77%. I question statistical and economical significance of the significant 6-day CAR estimate. However, on average in our sample, M&A events add net value, measured within the 10 day interval starting at day 0. But we cannot generalize these findings for the population.

7. Conclusion

In this thesis, I conduct an event study, where the goal is to examine the impact of M&A announcements on the acquiring firm’s abnormal returns (AR) and cumulative abnormal returns (CAR) within a 21-day event period surrounding the announcement of an M&A. The research question studied in this thesis is: “How is the acquiring firms’ stock price affected by the announcement of a merger or an acquisition?” Investors will trade on all available public information in semi-strong efficient markets, so when new information becomes public the market will immediately adjust its prices accordingly. This means that the market is determined by whether M&A are expected to add or destroy value.

Our findings suggest that the shareholders of the acquiring company, does on average see a wealth increase to their stock, measured over the event period. On average, the acquiring company’s shareholders earned 0.54% in abnormal returns on the day of the announcement. While over a 11 day period, from day -1 to day 10, the acquirers earn 1.77% in CAR. The average 2-day CAR (day -1 to day 1) is 1.8%, and the 6-day CAR (from day -1 to day 5) is 1.31%.

I obtain statistically significant estimates only at the announcement day (p value of 6%). The results were somewhat expected from theory and prior empirical literature, where multiple prior studies report announcement day abnormal returns close to zero. Our findings suggest that M&A's on average add value to the acquiring company's shareholders, for firms listed on the Oslo Stock Exchange, and that the market adjusted its prices immediately to incorporate the new information.

For further research I suggest using a bigger dataset, which may increase the statistical significance of the findings. One alternative is to use data from the Scandinavian market instead of the Norwegian market, where the nations and possibly also markets share a lot of similar characteristics.

It would also be interesting to study the effect of M&A announcement for tech-companies, where their assets to a larger extent exist of intangible assets in contrast to traditional businesses with a bigger portion of tangible assets. I assume that it is more difficult to correctly assess the market value of intangible assets, and thus such M&A may be seen as riskier. It would be interesting to see how the market processes such new information.

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apologize to those who feel their research has been left out or improperly characterized, and welcome reactions and comments. Some of the material in Section 3 is also found in Eckbo (2008). In *Handbook of Empirical Corporate Finance* (pp. 291–429). Elsevier. https://doi.org/10.1016/B978-0-444-53265-7.50007-X

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