Buying to be bought out

An empirical study of shareholder activists chasing superior returns by guiding their targeted companies into being acquired in an M&A transaction

Master Thesis
Department of Finance – Stockholm School of Economics (SSE)
Stockholm, 15 May 2017

Stanislava Podlesnaya[1]

Abstract

In our thesis we examine the shareholder activism strategy with a focus on attempting to gain superior returns by guiding the companies towards a sale. We specifically look at the wealth creation effect at companies that are targeted by activists, using the event study method and try to tie the abnormal returns of their involvement to the level of premia offered in a later buyout with a simple OLS regression. Our unique sample consists of 105 companies that were both subject to an activist intervention in the last twenty years in addition to being bought out in an M&A transaction no later than 3 years after. We find that shareholder activist's involvement results in statistically significant positive returns, both in the short (2% to 6%)- and long-term (46%), increasing in time. There is also evidence for the abnormal returns being highest in holding period of 18-24 months, while the abnormal returns do not differentiate among various industries or repeat activists. We however cannot tie the activist' involvement nor the positive abnormal returns at intervention date to the premia obtained in the buyout offer, as our difference analysis shows no superiority of premia over a control group and the OLS regression yields very low r-squared results. While our results confirm previous research on the positive effects of shareholder activism to value creation, we cannot confirm the assumption that priced-in expectations are indicative of the premia obtained in a targeted companies' sale.

Key words

Shareholder activism, hedge funds, M&A, buyout, premium, event study, OLS regression

[1]Stanislava Podlesnaya - 40773@student.hhs.se

Acknowledgements

I wish to sincerely thank my tutor, Assistant Professor Laurent Bach from the Stockholm School of Economics, for his inspiration, guidance and continuous support during the writing process of this thesis.

I would further like to highlight the immediate and warm-hearted support from Prof. Alon P. Brav from the Fuqua School of Business at Duke University, providing his extensive sample of identified shareholder activism campaigns in the period of 1994 – 2011 from his recent research work on hedge fund activism that is utilized in a number of academic papers.

I also wish to thank my family and numerous friends for their unlimited support and helpful remarks throughout this writing process.

1 Introduction

"Shareholder activism is not a privilege - it is a right and a responsibility. When we invest in a company, we own part of that company and we are partly responsible for how that company progresses. If we believe there is something going wrong with the company, then we, as shareholders, must become active and vocal."

Mark Mobius, Fund Manager at Franklin Templeton Investments

1.1 Overview

This thesis research project aims to unveil and explain the return characteristics behind shareholder activist interventions, with a particular emphasis on the mergers and acquisitions (M&A) activity following activists' involvement. We are curious to see whether the shareholder activists, in the form of a charismatic fund leader and a team of analysts, historically have been able to create significant value both in the short- as well as the long-term. More importantly, we want to investigate whether there is any substantial evidence that an activist campaign leads to a higher premium paid at their exit executed through an M&A transaction and thus leading to substantial shareholder value creation.

The applied sample includes 105 shareholder activist interventions in publicly traded companies over the period from 1995 – 2015. For this research project, we employ the event study methodology as per MacKinlay (1997) and Kothari and Warner (2007), investigating abnormal returns in targeted companies that were being acquired ex-post directly caused by the activists' interventions.

In a first step, we examine the short- and long-term abnormal returns in target firms around publication of a shareholder activist fund's investment into a targeted firm above 5% of shares outstanding, per becoming public information submitted through a 13D filing by the US-based funds with the Securities and Exchange Commission (SEC) in the United States. Our findings imply positive abnormal returns in the days surrounding such an announcement, that are also statistically robust within the significance level of $\alpha = 5\%$. We show that these figures are significantly high throughout the full data sample as well as indicated subsamples.

The evidence indicates that activism by fund managers is successful in achieving meaningful value creation for shareholders of the target firms. The short-term average abnormal returns around the announcement of the intervention are significantly positive

across the study. On an important note, post-event long-run returns in our sample show no reversion, indicating that the market's initial perception about value creation is justified.

In a second step, we investigate whether there is substantial evidence that shareholder activist campaigns indicate higher premium paid at their exit executed through an M&A transaction by conducting a regression and difference analysis.

The results however show that the M&A transactions by which the activists exit do not have any meaningful relation to the abnormal returns indicated around the activist's intervention announcement (in the 13D filing), nor can activists create higher than normal premia upon their exit, leading us to reject our initial hypothesis that the premiums paid for targets that have an activist investor as a shareholder are driven by the announcement returns of that activist's intervention.

1.2 Background

Shareholder activism, which has been defined as "the employment of the shares owned as a mean to influence the firm policies" (Sjostrom, 2008), is an important phenomenon of corporate governance nowadays, mostly employed by specialized hedge funds or holding companies as an event-driven strategy, one of many strategies available to generate above-market returns[1] (Hedge Fund Research Inc., 2017). In the decade before the financial crisis of 2007-2009, the role of shareholder activists in the governance of public companies has increased significantly, led by flagships and public stagings such as Carl Icahn's Icahn Enterprises, William Ackman's Pershing Square Capital, David Einhorn's Greenlight Capital or Dan Loeb's Third Point Capital. In 2007, at the peak, the hedge fund industry managed more than $2 trillion in assets and estimates on activist strategies pointed to $100 billion or more net assets under management (Inglis, 2015). Activists provide a significant contribution to the mitigation of the well-known agency problems which arise from the separation of management (agent) and shareholder control (principal) of the targets (Fama and Jensen, 1983) or from the conflicts between majority and minority shareholders. In the United States, institutional investors have been actively engaged in the management of the invested firms since the 1980s with the goal of increasing shareholder value (Brav et al. 2010). Activists can influence their target in two ways: shareholder proposals and proxy fights at a company's annual meetings as well as private negotiations. (Karpoff, 2001). One of a common critique

[1] Other strategy-groups include Equity Hedge, Macro-level or Relative Value

about the hedge fund's activist approach lies in the supposedly short-term horizon of investments and egoistic focus on their own gains; however, this problem seems unlikely to undermine the ability of hedge funds to create value for shareholders (Kahan and Rock, 2007). Activists tend to compensate the costs associated with the intervention through abnormal returns. According to Gantchev (2012), proxy fights, negotiations and monitoring costs are estimated to reduce the activists' returns by more than two thirds.

Activists tend to target 'value' firms that have low valuations with respect to 'fundamentals', a technical term for grouping asset, sales, income and cash flow figures, and compared to their industry peers. In addition, activist hedge funds are more likely to target firms that have continuous and non-volatile operating cash flows, but low (sales) growth rates, leverage, and dividend pay-out ratios (Brav et al., 2010).

Brav et al. (2010) outlines five different categories of tactics commonly adopted by hedge funds applying the shareholder activism strategy. In approximately half of the cases, the only tactics applied is a simple communication channel with the management, without more aggressive or public steps. More aggressively perceived tactics are most likely adopted when the resistance from the target management is higher. In addition, empirical evidence suggests that target firms are usually small in size, relatively liquid and tend to have a significant fraction of institutional investors among their shareholders (Brav et al., 2010). The recent literature provides evidence of activists improving the performance and corporate governance of targeted firms (see Brav, Jiang, Partnoy, and Thomas, 2008; Becht, Franks, Mayer, and Rossi, 2008; Brav, Jiang, and Kim, 2015). Yet there is limited evidence on the precise mechanisms through which hedge fund activists help enhance shareholder value. Some of the reasons found in literature are: improvement in operating results and corporate governance, changes in pay-out and capital structure policies, increase in the likelihood of a takeover.

Targets in M&A transactions that have at least one shareholder activism among their shareholder base, and to which the transaction can be tied back to, have become increasingly common in recent years. This triggered a great personal interest in the topic as well as the desire to study the relationship of activist investors' involvement and the takeovers of their targets. Our study complements the recent literature on activism by relating the positive abnormal returns in activism to value creation in mergers (Brav et al., 2008; Clifford, 2008; Klein and Zur, 2009; Boyson and Mooradian, 2011).

The rest of the paper is organized as follows. Chapter 2 outlines main academic papers

relevant for this research topic. Chapter 3 addresses and elaborates on our research hypothesis and motivation. Chapter 4 describes the data collection as well as the complex dataset creation. Chapter 5 lays out the methodology for the performed analyses and introduces relevant concepts to this paper. In Chapter 6, we address the fundamental question of whether hedge fund activism creates meaningful value for shareholders by examining short- and long-run stock returns, and whether premiums at the activists' exit through M&A are related to the abnormal returns at the moment of activists' involvement. With Chapter 7 we conclude our main findings, have final remarks and discuss the limitations.

2 Literature Review

An increasing number of academic studies have been dedicated to the highly relevant topic of shareholder activism in the last decade.

The largest part of the relevant literature is on hedge funds using activism in public companies in the United States as their investment strategy. Brav et al. (2008a), in their sample of 1059 events over the period 2001-2006, analyse the objectives and tactics of the hedge fund activists, the characteristics of targets firms, the market's reaction to activism, and changes in targets' performance after the intervention of activists. The study finds abnormal positive returns of 7% around the announcement, with no reversal in the subsequent year. Klein and Zur (2009) examine 151 events over the period 2003-2005. The focus of their study is confrontational hedge fund activism. The findings show that these hedge funds earn positive abnormal returns of 10% around the announcement, well above the levels achieved by other investors, i.e. individuals, asset management firms, private equity, and venture capital funds. Boyson and Mooradian (2011) collect a sample of 418 observations over the period 1995-2005 and provide evidence of abnormal positive returns not only in short term stock performance, but also in long term operating performance.

Clifford (2008) collects a sample of 1902 cases over the period 1998-2005 and focuses on stock price reactions and changes in operating performance. The findings show that companies targeted by hedge funds for activist investing purposes earn larger excess returns than a control group of companies targeted by the same hedge funds for passive purposes. Moreover, the paper states that companies targeted by activists, experience an increase in operating performance and efficiency following the investment and involvement of the hedge fund. The results can be seen as in line with Brav et al. (2008)'s paper, stating that the activism strategy focused on the sale of the firm or changes in its business strategy results in the highest excess returns to target firms.

According to the more recent academic papers, shareholder activism is associated with the higher abnormal returns around the announcement of the activist intervention. Brav, Jiang, and Kim (2010) show an average return of 5% over the (-20, +20) event window, where day 0 is an announcement of the initiated campaign. Bebchuk, Brav, and Jiang (2015)

document statistically significant four-factor alphas over the five-year period following the activist engagement.

However, the discussion is heated up by an ongoing debate regarding the means activists employ to create long-term wealth effects, whether there is a direct causality between activism campaigns and merger activity. According to Brav, Jiang, and Kim (2010), the highest abnormal returns appear in the campaigns with the purpose of sale of the company but statistically insignificant returns appear in the campaigns targeting capital structure and corporate governance. On the other hand, Greenwood and Schor (2009) study the role of hedge fund activism on M&A collecting a sample of 784 events over the period of 1995–2005. Contrary to some of their colleagues, they report the highest CARs associated with activist intervention related to blocking a target's merger and asset sales. Moreover, the research shows the value creation in the cases when the target was acquired ex-post. Statistically significant (-1, +18) month three-factor CAR of 26% was indicated in the sample of targets that get acquired but an insignificant CAR of 3% for targets that remain independent.

According to Jiang, Li, and Mei (2015) activist targets might have a higher likelihood of being acquired because activism campaigns are often launched after a firm has received an acquisition proposal. If that is the case, the returns will overstate the wealth effects created by the activists. Alternatively, the likelihood might be driven by pre-chosen targets that are more likely to be acquired or to launch campaigns during merger waves.

In Corum and Levit (2015), shareholder activism can have a causal effect on M&A activity by lowering frictions in the market for corporate control. This view is supported by the model, showing an activist intervention lowers the expected cost of an acquisition, thereby increasing the likelihood of an offer. Overall, the paper describes the unique role of activist investors in the M&A market.

Greenwood and Schor (2009), in relation to that, address a question whether the higher returns to activism merger targets can be explained by higher premium paid in acquisitions. Under this interpretation, one can conclude that bidders may overpay when an activist is present and the abnormal returns come at the expense of bidder shareholders.

However, there are discussions regarding the assessment of long term performance of shareholder activism. According to Gillan and Starks (2007), even in cases of shareholder

activism that lead to significant improvements in operating performance or stock price appreciation over the next few years, it is difficult to assure the causality of activism per se that caused the changes.

Additionally, there is a part of academic literature that studies returns to investors invested with the activist hedge funds, in addition to shareholders of target companies. According to Brav et al. (2008b) and Boyson and Mooradian (2007), activist hedge funds outperform the overall market and other types of equity-oriented hedge funds.

Some papers focus on the shareholder activism impact in specific sectors or categories of businesses, being able to isolate some characteristics. Huang (2010), collecting a sample of 237 leveraged buyouts in the period 1990-2007, finds a positive relationship between the level of hedge fund ownership pre-announcement and the premium paid to target shareholders in the buyout. Bradley et al. (2010) investigates shareholder activism of closed-end funds. Jiang et al. (2009) study a large sample of Chapter 11 firms in the period 1996-2000. They provide an overview of strategies that activists employ to gain control and acquire ownership at a low cost. The authors find that the presence of a hedge fund is a driving force underlying the changing nature of Chapter 11.

Finally, there is a limited amount of literature that sheds light on the activism topic outside the United States. Becht et al. (2008) study the hedge fund activism phenomenon in the European Union over the period 2000–2008 and find significantly positive abnormal returns around the announcement date. Mietzner and Schweizer (2008) focus their studies on comparing the performance of hedge funds with private equity funds, acting as shareholder activists. They find that the market positively reacts to the announcement of the acquisition of large stakes in target firms for both groups of investors.

3 Research Hypothesis and Motivation

The interest and motivation for conducting this study stems from the actuality of the topic, since there have been many activist campaigns running over the past two years that advocated for or ultimately ended in an M&A transaction for the targeted company, as well as personal interest and the discovery of a gap in specific research regarding this topic. Activists have been engaged and influencing major companies, mainly in the United States and Western Europe, which made the press using the term of "golden age of activist investing", referring to our time. However, such an increase in shareholder activism has been met with an intense opposition and criticism, mainly addressing the question if activists are short-term opportunists and are detrimental to long-term value creation?

To perform a thorough analysis, it is fundamental followed by our hypothesis and the corresponding framework of the analysis, meeting the goals and the limits of the paper.

In our paper, we conduct an empirical investigation of activist interventions in so-called "targets" that subsequently get acquired as a result of an activism campaign. The respective research questions are:

A. What implications does a Shareholder Activists' involvement in a targeted company have on the target's share price performance?
   i. Short-term?
   ii. Long term?

B. Do shareholder activist campaigns and their abnormal returns indicate and lead to higher premium paid for targets being acquired ex-post?"

We will test our research questions by firstly studying the short-term stock performance of activists' targets associated with the filing of the activist intervention in the 13D filing to the SEC, by applying the event study method with short event windows surrounding the announcement date. In addition to this, we also study whether the short-term wealth effects are temporary, or whether shareholder activists create a long-term value for their targets being acquired ex-post by applying longer event windows. In a final step, we investigate the question whether there is a substantial evidence that activist campaigns indicate higher a premium paid at their exit executed with an M&A transaction.

This paper is the first to examine activism in relation to a specific exit-strategy employed by the activist investor, i.e. it's target for activism is being acquired. To our attention, there are no studies that raise the question of whether the premium paid at target's acquisition is connected with the abnormal returns around the announcement of the initial activists' involvement. Overall, because of its differences from previous research, this paper is an addition to the ongoing research and theories on merger activity in shareholder activism.

Moreover, our paper is based on the empirical research of the close relation between shareholder activism and M&A activity. However, it is hard to say with absolute certainty whether shareholder activism creates long-term shareholder value. Nonetheless, previous research elaborated on in Chapter 2 does indicate that there certainly are hedge funds that focus on the long-term value creation and adopting corporate control strategies which help to lock-in firm value. In contrast to earlier studies on shareholder activists, the research on a unique role of activist investors in a target's M&A activity is very limited. This study tries to answer the question whether the wealth effects created by the activists will also hold in the long-term and whether there is substantial evidence that activist campaigns are indicative of the higher premium paid at the target's acquisition.

The results from this study will be of great value not only to academia, but also to fund managers performing the activist strategy and the larger institutional and individual shareholder base that is to profit or not from such an activist intervention. To a certain degree even the managers of targeted companies belong to the circle of parties that could benefit from our insights.

4 Data and Data Collection

The event study approach requires a significant amount of data to make an analysis meaningful, therefore we spent considerable amount of time and efforts gathering and structuring our data. Our dataset of shareholder activism and M&A activity as investors' exit was gathered using two primary sources – hand-collected data on activism campaigns from SEC filings between 1995 – 2015 as well as M&A data collected from Thomson Reuters SDC Platinum (SDC) over the period of 1996 – 2016.

Since there is no centralized database on shareholder activism, it is important to understand the aspect of the filing system in relation to our analysis, in order to provide a better understanding of both our complicated sample composition and the limitations of existing sources. The SEC is concerned primarily with "promoting the disclosure of important market-related information, maintaining fair dealing, and protecting against fraud". Thus, it is a perfect platform to gather the information about shareholder activists' intervention instances. A list of activist interventions that had been exited with an M&A transaction was compiled using the section 13D of SEC. The identifying information about the events was further used to gather the target specific data from Bloomberg.

Section 13D of SEC requires investors to disclose their stake when acquiring more than 5% with the intention of influencing its operations or management (Brav et al., 2008). However, the 13D files are partially filed by passive investors who leave themselves with an option to be engaged in shareholder activism campaign at a later stage. Section 13D has to be filed within two weeks after an investor has reached the 5% threshold. The SEC reports contain information regarding the investor, his interest in the security, the source and amount of funds used, the acquired stake, and the filing date.

The challenges occurred during the collection of this sample data were much greater than initially anticipated. To mitigate this, we have contacted Professor Alon Brav (Fuqua School of Business at Duke University) regarding his sample that is utilized in a number of academic papers. Professor Brav kindly provided us with identified shareholder activism campaigns in the period of 1994 – 2011 from his recent research work on hedge fund activism. The dataset gathers all SEC filings (13D) in the specified time range, and excludes some events where the purpose of the transaction is not directly related to activism. This includes bankruptcy reorganization or the financing of a distressed firm, engagement in M&A risk

arbitrage or when the targeted company is a closed-end fund or other non-regular businesses (Brav, Jiang and Kim, 2010). For a full description of the obtained dataset, please refer to Brav et al.'s "Hedge Fund Activism Corporate Governance, and Firm Performance" (2008).

With this dataset as a fundament, we wanted to bring it up-to-date in order to investigate shareholder activism in the very relevant recent years. To do so, we compiled a list of relevant transactions between 2011 and 2015 using the previously described 13D SEC filings. We used the names in the existing database to find deals from activist hedge funds in the increased time span. However, there have been a considerable amount of new hedge funds coming into play since 2011 (Preqin Special Report, 2014). New activist funds have been identified through various sources and desktop research, and have been included in our research. After this humongous effort, we are left with a unique and comprehensive dataset spanning from 1995 to 2015, containing about 3,000 activist campaigns in total. Each such activist intervention that activists exited as part of an M&A deal is considered an event. From this data, a full sample of 105 activism events and performance effects on targets was compiled and analyzed.

To narrow our sample to the campaigns that activists left with an M&A deal, we matched activism targets to the merger data from SDC using CUSIPs and manually verifying the quality of each match. We included only completed transactions and adopted the usual filters from prior literature, including all mergers with a deal size of at least $100 million. We also excluded divestitures, spin-offs, and share repurchases. We manually verified the announcement, completion, and withdrawal dates reported in SDC compiled list to ensure that our return calculations are over the correct intervals. For each activism campaign, we tracked subsequent merger activity and require that a merger bid to be announced within 3 years of the announcement of the activism campaign (filing of the 13D).

From the short list of 159 events, we have eliminated the events which are most likely unrelated with any activist campaign, based on researches on the relevant press releases and following the criteria described below.

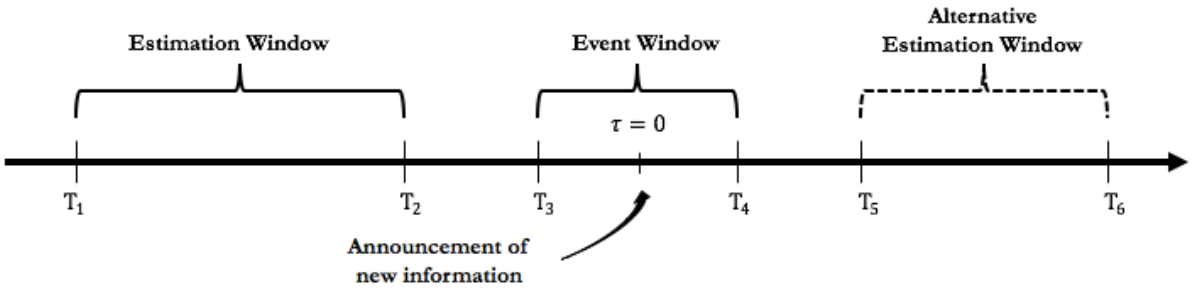
One of the main criterion for the sample selection was the length of the holding period, defined as the number of days between the announcement date of an activist intervention (date 0) and the announcement date of a merger. The rationale behind the restricted holding period is that any activist campaign would require a holding time for at least

two months to be implemented. The shorter holding periods is a sign of a speculative activity on the market, and such events were eliminated from the sample due to not meeting the hypothesis criteria. The limitation of this approach is due to the intervention is measured since the filing with SEC which is only reported once the stake in target's ownership exceeds 5%.

A few further events were eliminated due to the data for the estimation window wasn't available. Some academic papers, including Hauswald (2002), mitigate this issue by using an alternative estimation window which takes place after the event. While the approach might substitute the estimation window in other cases when there is no data available, we deem it is not applicable in our research because the new, alternative, estimation window would have to be placed about 3 years after the actual estimation window. As we assume that beta as well as the correlation between the individual sample company and its market would be changing over that period of time, we deem the substituted estimation window is not reliable enough. Therefore, we eliminated the affected sample companies before moving forward.

Figure 1 – Event study time windows I

Figure 1 shows the various time windows used in the event study



This list of matched shareholder activists taking a position together with their exit via M&A transactions in the last twenty years also includes information about the company's sector, industry, primary stock exchange and similar information to divide the full sample in subsamples with substance. Below is an excerpt of the transactions (events) collected. There are a total of N = 105 events in our sample, consisting of activists' targets being sold within the period of our analysis.

To analyze whether these shareholder activist campaigns achieved higher returns than usually obtained, we built a control group out of the remaining M&A transactions in the SDC file to be able to compare the two.

Figure 2 – Distribution by year of intervention

Figure 2 shows the distribution of events over the period of 1995 - 2015

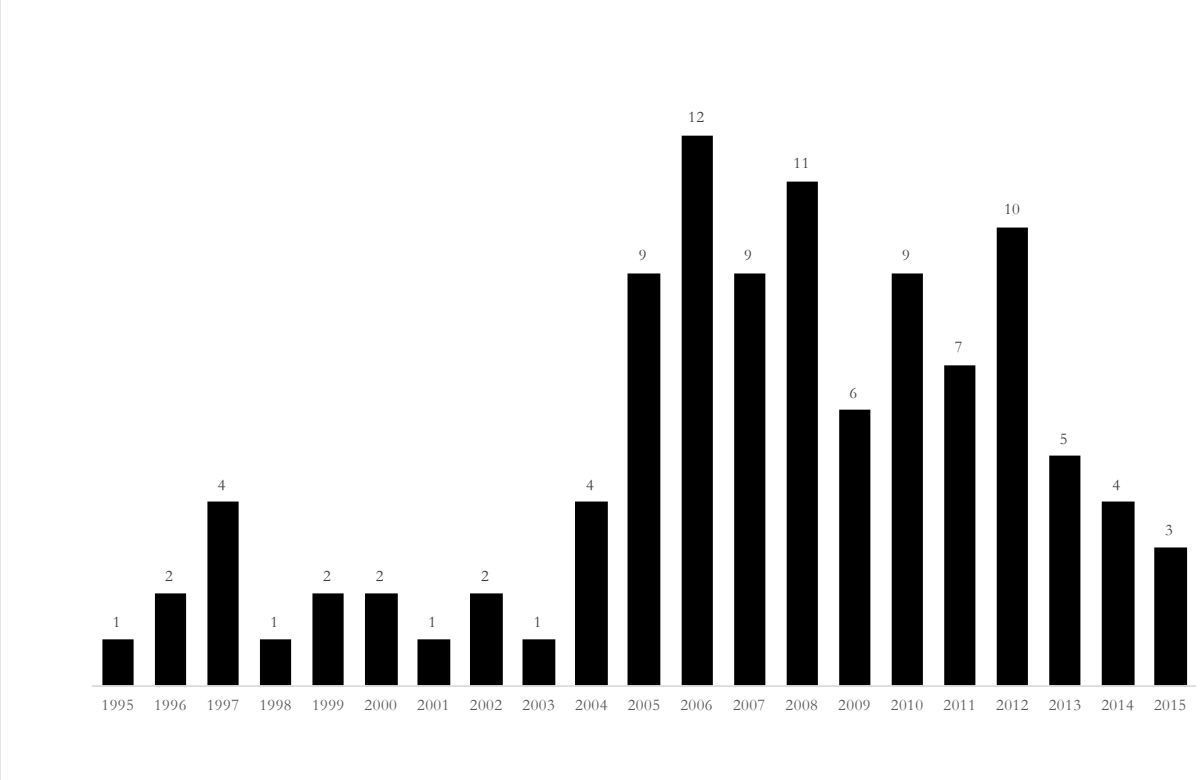


Figure 3 – Distribution by year of exit

Figure 3 shows the distribution of events over the period of 1996 - 2016

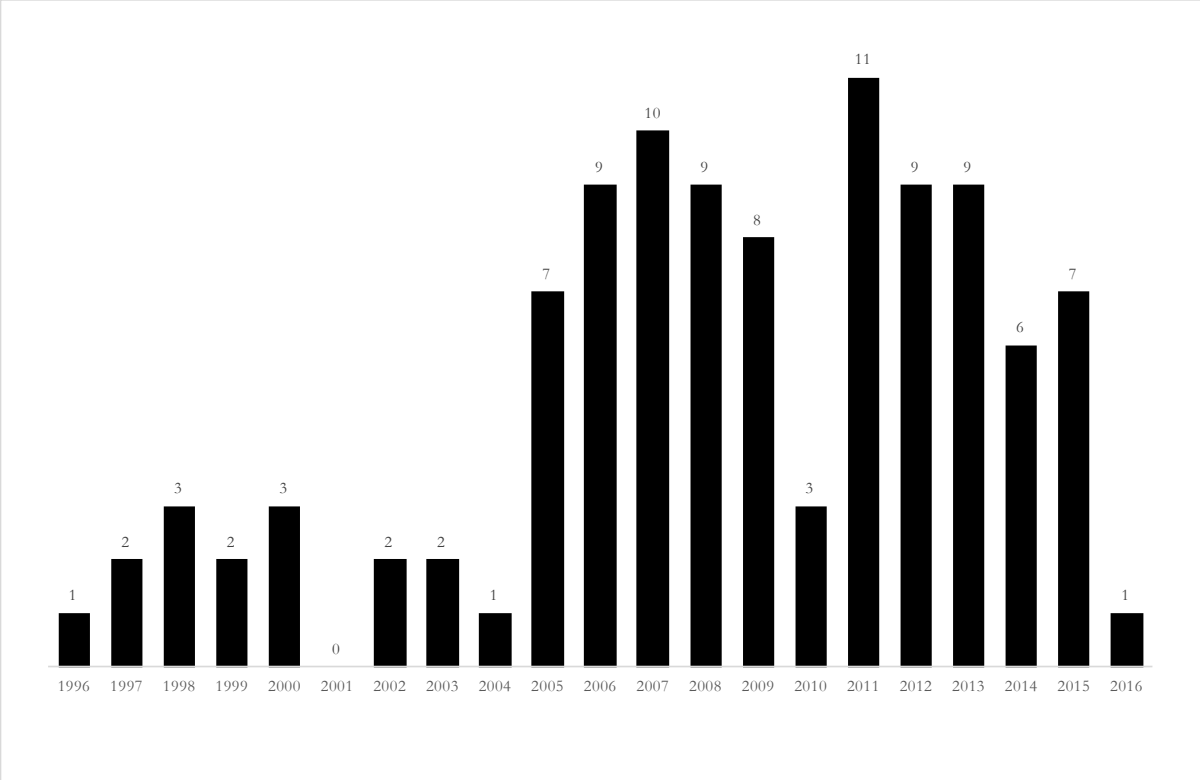


Figure 4 – Distribution of companies by industry

Figure 4 shows the distribution of companies in the sample by industry

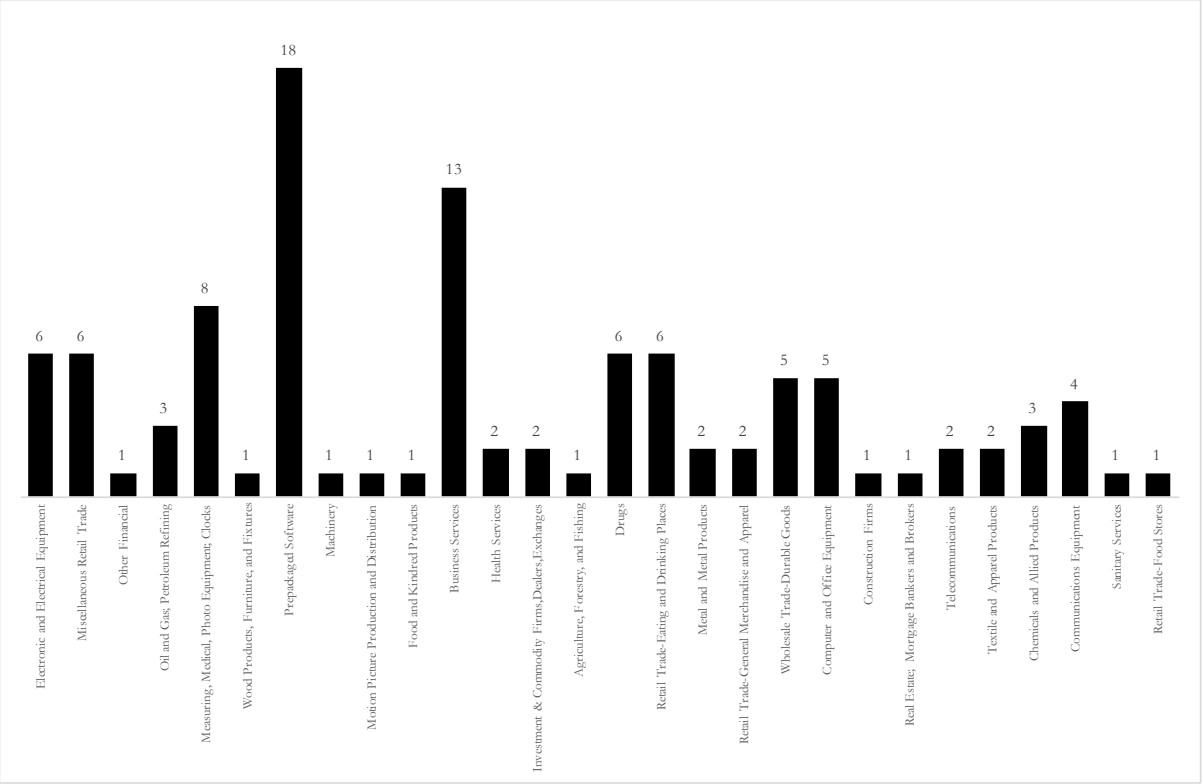


Figure 5 – Distribution of companies by sector

Figure 5 shows the distribution of companies in the sample by sector

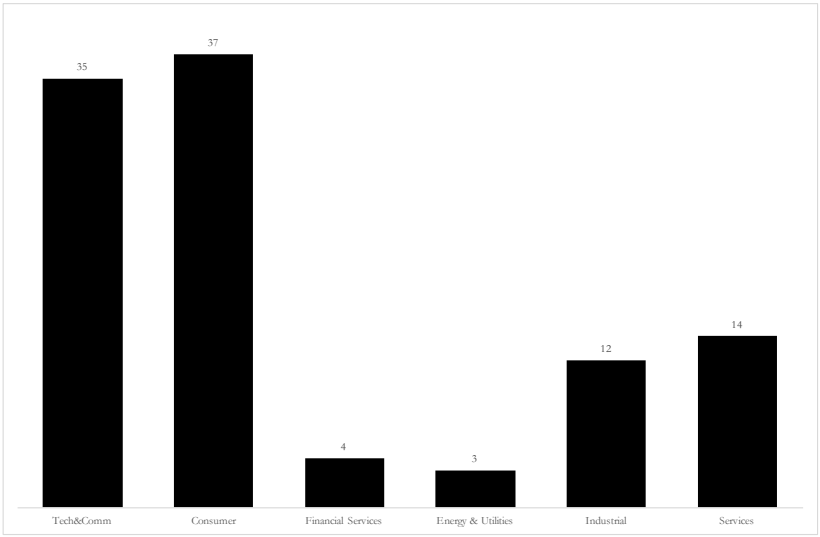


Figure 6 – Distribution of targets by country

Figure 6 shows the distribution of targeted companies in the sample by country

Figure 7 – Distribution by holding period

Figure 7 shows the distribution of the holding period in targeted companies in our sample

For the completed dataset, the stock prices and relevant market index data for 320 days prior day 0 and up to a merger announcement for each target company were downloaded from Bloomberg Database and Wharton Research Data Services (WRDS).

5 Methodology

In this chapter we elaborate on both research methodologies chosen to investigate shareholder activism as per our research questions outlined in chapter 3. The event study method will in a first step show us the level of abnormal returns associated with an activist's intervention in the targeted company, while the regression of M&A acquisition premiums on these observed abnormal lets us conclude whether or not the abnormal returns are indicative of the M&A transaction and the premium obtained by target's shareholders.

5.1 Event Study

The framework used in addressing the first part of our research questions is the statistical method of event studies. The event study methodology is widely used in Finance research for investigating an effect of a particular firm-specific or economy-wide effect on a company's value, or equivalently stock prices, by using financial market data (MacKinlay, 1997). The event study method gauges the market's reaction to a major event for a publicly traded company. They key assumption is that we can aggregate information and the assessment of the new realities from the investors, who are trading in response to the event. Hence, the stock price development before and after the event reflects the market's collective perception of the event (Hauswald, 2002).

Among the many of its applications, we are looking at the value creation effect of a corporate event, in our case the activist engagement announcement. Specifically, we are looking into the effect on stock prices around the announcement of an activist's involvement by filing the 13D form with the SEC, which comprises an event for us. According to MacKinlay (1997), the framework of event studies proved to be effective, given the strong assumptions that markets are efficient, that the information about economic or corporate events is processed by the market in a rational manner and reflected immediately. Therefore, the impact from an event could be observed in security prices over a relatively short period of time. We apply the event study methodology to approach both short- and long-term return characteristics of hedge fund activism.

Shareholder activism plays an increasingly prominent role in the capital markets. The announcement of the activists' engagement is an economic event that has a significant influence on a company and therefore on target shareholders' wealth. According to Eckbo (2007), "an event study seeks to establish whether the returns at the time of an event is

abnormal (i.e. systematically different from predicted)". We identify the unexpected impact on shareholders' wealth by analyzing the market's reaction to activists' engagement, simplified to the target security price movements around the announcement date. Therefore, it is crucial to isolate the stock price reaction from the surrounding information not relevant to the event and from an organic development of the stock prices, both also affecting the pricing. It is based on the assumption that the unexpected impact on the share price, positive or negative, is due to an "abnormal", firm-specific event that is not captured and explained by the market expectation, providing us with an abnormal return. To do this, we calculate abnormal returns for each day in an event window, defined as

$$AR_{i,t} = r_{i,t} - \mathrm{E}[r_{i,t}] \tag{1}$$

where $r_{i,t}$ stands for the actual return of a security i at day t, and $\mathrm{E}[r_{i,t}]$ denotes the expected return of the same security i at the same day t. Specifically, this means subtracting the estimated "normal" returns, as if the event wouldn't occur ($\mathrm{E}[r_{i,t}]$ in Formula (1)) from the actual ex-post returns, resulting in a fraction of realized returns which can be accounted for as abnormal returns. The applied framework can't eliminate all the other economic or firm-specific influences that can have an impact on stock price performance, but it leaves us with the attributable price effect originating from the activist involvement. For example, the estimation window to calculate the expected returns (elaborated on later) is taken with a reasonable interval before the event window, hence not overlapping it. This is done to isolate the firm-specific abnormal returns due to the announcement of the shareholder activists' engagement from the "normal" development.

We calculate these abnormal returns for various time periods surrounding the event, i.e. before and after the event. These periods are called event windows. An event window is a desired period of time under consideration for which the abnormal returns are determined. The day when the information about the event becomes public is called day 0, and the interval surrounding the day of the announcement is the event window $[\mathrm{T}_3; \mathrm{T}_4]$. For the event-specific effects to be fully captured by the market, one might consider a wider event window. In a perfectly efficient market, one would only want to see the wealth effects on the stock generated by one specific event, i.e. activists' engagement. However, according to Brav et al. (2010) and Klein and Zur (2008), markets are not perfectly efficient when pricing-in events such as an activist intervention due to the potential leakage of information ahead of the event or adjusting reactions to fully reflect expectations and reactions after the event. Thus, a wider event window

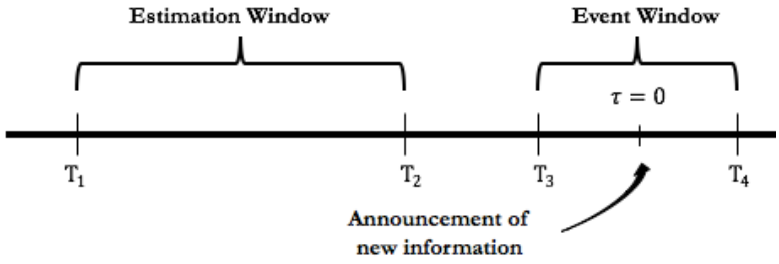
is preferred to capture the complete effect form the activists, also for short-term measurements. However, there is a trade-off. The longer the event window becomes, the higher the chances are to also capture randomly distributed, company-specific return shocks and that the effect would be distorted by confounding events (MacKinlay, 1997). Therefore, considering these noise effects, a shorter event window is preferable.

Given these arguments and the trade-off situation, we decided to look at both short- and long-term event windows to be able to capture the significant wealth effects from the activists' involvement and to elude confounding effects, which is supported by the work from Brav et al. (2008) and Klein and Zur (2006).

The time windows in the event study include the announcement day surrounded by the actual event window and a preceding estimation window. The estimation window captures the stock prices for $\tau = [T_1; T_2]$ that are being used to estimated the expected return ($E[r_{i,t}]$ in Formula (1)) and the event window captures the stock prices for $\tau = [T_3; T_4]$, used to calculate the actual returns ($r_{i,t}$ in Formula (1)). There is an interval between these two windows to avoid the unusual stock price movements to affect the estimation of the normal returns.

Figure 8 – Event study time windows II

Figure 8 graphically shows the time windows used in our event study



The stock prices for our 105 events in the sample, where activist investors obtained a significant stake of a target company and exit with an M&A transaction later on, were gathered between time T_1 and T_4, to calculate the abnormal returns in the event window $\tau = [T_3; T_4]$. In our case, the announcement day $\tau = 0$ is the date of filing the SEC report (form 13D) for obtaining a significant amount of activist's target share (>5% of shares outstanding), and T_4 is the announcement of an M&A deal with the publication of the premium offered. In addition, for each event in our sample, the values of each target's respective stock market index (e.g. S&P 500 for US-listed sample companies) were gathered.

As a first step, we calculated the daily returns for our sample companies and their respective stock market index, both within the estimation and event window, defined as

$$R_{i,t} = \frac{P_{i,t}}{P_{i,t-1}} - 1 \tag{2}$$

where P denotes a company's stock price or a market index's daily value.

As abnormal returns are calculated for each day t in the event window, see Formula (1), the expected returns $\mathrm{E}[\mathrm{r}_{\mathrm{i,t}}]$ for the same days have to be estimated.

In our thesis, we follow the methodology outlined by MacKinlay (1997), Campbell et. al. (1997), and Hauswald (2002). According to these papers, there are two main approaches to estimate the normal, expected returns: the constant mean return model and the market model. Especially Hauswald (2002) advocates for the latter, as it is more commonly used based on its similarity to the CAPM model and assumes that the individual security returns are stimulated by the market returns. The market model assumes that returns are following the subsequent function with a dependence on the market returns:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_i$$

$$E[\varepsilon_{i,t}] = 0 \tag{3}$$

$$Var[\varepsilon_{i,t}] = {\sigma^2}_{\varepsilon_i}$$

where ε_{i} is a mean zero, constant variance error term and $\mathrm{R}_{\mathrm{m,t}}$ is the return on the security i related market index such as the S&P 500 or an industry index. The intercept ($\widehat{\alpha}_{\mathrm{i}}$) and the slope ($\beta_{\mathrm{i}}$) can be estimated by us running a simple OLS regression since the parameters $\mathrm{R}_{\mathrm{i,t}}$ and $\mathrm{R}_{\mathrm{m,t}}$ were collected as data.

Our estimation window ranges from 320 trading days prior to the event (-320) to 60 trading days prior (-60) to the event, making the estimation range a year (260 trading days). Applying this simple OLS regression during our estimation window, we receive the factors $\widehat{\alpha}_{\mathrm{i}}$

and β_i , with which we can calculate the expected returns according to the market model. The formula for that is

$$E[R_{i,t}] = \hat{\alpha}_i + \beta_i \hat{R}_{m,t} \tag{4}$$

As a result, abnormal returns for the market model are then calculated the following

$$AR_{i,t} = R_{i,t} - E[R_{i,t}] = R_{i,t} - (\hat{\alpha}_i + \beta_i \hat{R}_{m,t}) \tag{5}$$

Under the null hypothesis (H_0), abnormal returns should be normally distributed with a zero conditional mean and a variance as follows:

$$\sigma^2(AR_{i,t}) = \sigma^2{}_{\varepsilon_i} + \frac{1}{L_1}\left[1 + \frac{(R_{m,t} - \hat{\mu}_m)^2}{\hat{\sigma}^2{}_m}\right] \tag{6}$$

where L_1 is the length of the estimation period, $R_{m,t}$ the market return on a given date t, $\hat{\mu}_m$ is the mean market return during the estimation period with length L_1, $\hat{\sigma}^2{}_m$ its variance, and $\sigma^2{}_{\varepsilon_i}$ the variance of the disturbance term in equation (3). From equation (6), it follows that the second component of the variance, which is a result from the sampling error estimating $\hat{\alpha}_i$ and β_i, tends towards zero when L_1 becomes large. According to MacKinlay (1997), the abnormal return observation becomes independent over time and it is safe to assume that abnormal returns are normally distributed with mean zero and variance $\sigma^2(AR_{i,t})$, thus they follow $AR_{i,t} \sim N(0, \sigma^2(AR_{i,t}))$.

One can not assume that the information related to the event is released instantly to the market but it is rather revealed gradually: insiders might have had an advanced notice, rumors of filing the SEC report might have leaked, and thus the information might reach the market before official the announcement or investors might even react to it with a delay. Hence, abnormal returns should be aggregated across a time window around the event, to get a better picture and to capture the full wealth effect from activist intervention on stock returns. This yields the cumulative abnormal return (CAR) of an event window (T_3, T_4):

$$CAR_i(T_3, T_4) = \sum_{t=T3}^{T4} AR_{i,t} \tag{7}$$

The event windows used in the paper, in line with the commonly employed horizons in the existing literature on shareholder activism and the purposes of the performed analysis, are:

- (-1,1) and (-2,2) in order to capture the immediate market reaction at announcement;
- (-5,5), (-10,10) and (-20,20) in order to capture the short-term wealth effects;
- (-20, M&A announcement day) in order to capture the stock price performance during the whole holding period of the activists and see the long-term consequences, with date 0 still being the date of the announcement.

The employed event windows are recommended by MacKinlay (1997), Campell et. al. (1997), and Hauswald (2002) and in line with previous works from Boyson and Mooradian (2007) and Greenwood and Schor (2009). Over the event window, one can also look at the cumulative average abnormal return (CAAR), to more simply compare multiple securities i.

Abnormal returns, $\mathrm{AR_{i,t}}$, and cumulated abnormal returns, $\mathrm{CAR_i(T_3, T_4)}$, are calculated for each individual security i. However, our research question aims to look at the full sample. To give a qualitative assessment for the full sample and to make the CAR data testable, we aggregate all companies i in our sample to form the sample average $\overline{CAR}$.

$$\overline{CAR} = N^{-1} \sum_{i=1}^{N} CAR_i \tag{8}$$

5.1.1 Robustness Testing – Student T-test

The results of the event study methodology have to be tested robustness to confirm whether the event is deemed relevant by investors. As such, we test whether the $AR_{i,t}$, $CAR_i(T_3, T_4)$ and $\overline{CAR}$ are significantly different from zero with a two-sided Student T-test. If that is not the case, it implies that the normal and abnormal returns are indistinguishable (at least by statistical methods) and that the event is a non-event in the eyes of the market (Hauswald, 2002).

For this matter, we use a so-called Student T-test. The underlying null hypotheses are

- that the abnormal returns are not significantly different from zero (H_0: $AR_{i,t} = 0$);
- that the cumulated abnormal returns for each event window are not significantly different from zero (H_0: $CAR_i = 0$);

- and that across our full sample, the average cumulated abnormal return CAR is not significantly different from zero (H_0: $\overline{CAR} = 0$).

Because our estimation window is larger than 100 days, in fact 260 day, we are able to assume that, based on the collected stock prices, our calculated T-statistic (z) is supposed to be higher in absolute value than $|1.96|$ normally distributed with a 5% significance level for result robustness (MacKinley, 1997, Hauswald, 2002 and Bach, 2016).

$$\text{T-statistic for } AR_i \;\; z_{i,t} = \frac{AR_{i,t}}{\hat{\sigma}(AR_{i,t})}; \hat{\sigma}(AR_{i,t}) \cong \; \hat{\sigma}^2{}_{\varepsilon_i} \tag{9}$$

$$\text{T-statistic for } CAR_i \;\; z_i = \frac{CAR_i\,(T3,T4)}{\hat{\sigma}_i\,(T3,T4)}; \hat{\sigma}_i\,(T3,T4) = (T4 - T3 + 1)\hat{\sigma}^2{}_{\varepsilon_i} \tag{10}$$

$$\text{T-statistic for } \overline{CAR} \;\; z_{\overline{CAR}} = \frac{\overline{CAR}}{\sigma_{\overline{CAR}}}; \sigma^2{}_{\overline{CAR}} = \; N^{-2} \sum_{i=1}^{N} \hat{\sigma}^2{}_{CAR,i} \tag{11}$$

5.1.2 Robustness Testing – Welch T-test

With our large sample and extensive information gathered per event, as described in chapter 4, we are able to split our full sample into smaller sub-samples to investigate potential differences among events in our sample with similar aspects. To test whether the $\overline{CAR}$ among the formed subsamples differ significantly from each other, we apply Welch's T-test.

We state the null hypothesis that the average cumulative abnormal return doesn't differ significantly among two subsamples:

$$H_0: \overline{CAR}\;(T3,T4)_{Subsample\;1} = \overline{CAR}\;(T3,T4)_{Subsample\;2}$$

To calculate the T-statistic (z) of the Welch T-test, we apply the following formula:

$$z = \frac{\overline{\mu}_a - \overline{\mu}_b}{\sqrt{\frac{\sigma_a{}^2}{N_a} + \frac{\sigma_b{}^2}{N_b}}} \tag{12}$$

5.2 Target's Premia Regression

In the second part of our analysis in this thesis, we investigate whether there is substantial evidence that activist campaigns indicate higher premium paid at their exit executed with an M&A transaction. To look at the market's perception of ex-post acquisition of activists' targets, we run simple OLS regressions to capture market's reaction on the announcement of activists' exit with an M&A transaction. This provides us with important indicators on whether higher than usual premiums, if offered, are already priced in at the moment of activists' intervention seen from the event study results, reflecting the market's expectations towards the strategy applied by the activist and the future of the activists' targeted company.

We regress the premiums offered by the acquirer to the target relative to the share price (of which the shareholder activist is a minority shareholder)

- 1 day prior to the M&A announcement;
- 1 week prior to the M&A announcement;
- and 1 month to the M&A announcement;

against the cumulative abnormal returns (CAR) from the event windows (-10,10), (-20,20) as well as the abnormal return on the day of the activist investment's announcement (AR_0) to see a relation between the two. Shareholder activist's have a 10 day time period during which they need to file the 13D form with the SEC upon gaining more than 5% shareholding in a company, which is why for this analysis we consider the (-10,10) as well as (-20,20) event windows, in addition to the abnormal return on the announcement day that shows the immediate effect, yet not any leakage or anticipation as well as delayed reaction covered by the other two larger event windows. Regressing these two relative numbers against each other enables us to clearly measure the relative reaction by the market upon the activist's involvement together with the relative higher price a buyer is later on willing to pay. Additionally, the key investment case for activists is bring in an idea, knowledge and therefore create value together with the management team, which in turn should increase the targeted companies' share price over time. Comparing the later offer price for that company in the M&A transaction to the pre-activist involvement share price would neglect the activist's contribution to or the management's alternative response for the value creation. Also, almost all of the papers listed in chapter 2 regarding shareholder activists highlight the fact that these activists naturally go after undervalued companies, which in turn increases their return potential. Hence we chose the regression format of M&A premia offered at the acquisition relative to recent share prices (1 day, 1 week and 1 month prior) versus the effect the shareholder activist had, in form of positive abnormal returns.

The goal is to test our hypothesis whether the premia offered at an M&A transaction that an activist uses to exit his position is already indicated in the positive abnormal returns generated by that stock upon the announcement of the involvement of the activist.

To perform the simple linear OLS regression performed in Excel, let's first understand the methodology of it. A regression function typically looks the following:

$$Y = \alpha + \beta \cdot X + \varepsilon \tag{13}$$

where Y is the dependent variable, X is the independent variable, α is the intercept term and β is the regression coefficient on the variable X, with ε being a residual error term. Since we want to test whether the M&A premia offered to companies targeted by shareholder activists, the premia make our dependent variable Y, whereas the CAR_i observed from our event study make our independent variable X.

The upper part of the regression output in Excel shows statistics such as R-squared, adjusted R-squared (adjusted for the number of variables), the number of observations, and the standard error of the regression. The lower part shows the output for each variable in the regression. Following the coefficient estimates we are shown the standard errors of the estimate, its t-stats and p-values, giving us an estimate of the accuracy estimating that coefficient. This is important for knowing how accurately you have estimated that coefficient. However, since we are less interested in the coefficients but rather whether the independent variables, our CAR_i, explains the dependent variables, the M&A premia offered, we focus on the R-squared results, also called coefficient of determination. R-squared essentially is interpreted as the proportion of the variance in the dependent variable that is predictable from the independent variable. R^2 is the square of the correlation (r) between predicted Y values and actual Y values; thus, it ranges from 0 to 1. With our linear regression, R^2 is also equal to the square of the correlation between x and y scores. Thus, an R^2 of 0 means that the dependent variable cannot be predicted from the independent variable, an R^2 of 1 on the other hand means the dependent variable can be predicted without error from the independent variable (StatTrek, 2017). This enables us to gauge the relation between premium paid at the exit and abnormal returns around the announcement of filing 13D. The higher R^2, the higher the linear relationship between the two, meaning that there would be a positive correlation of the two, supporting our hypothesis.

5.2.1 Difference analysis between premia obtained in sample and control group

On top of the regression analysis, we use our existing 105 events as a treatment group and have built a control group from the remaining M&A transactions obtained in the SDC file to be able to assess whether or not the obtained premia by activist investors at their exit are superior or higher to the rest of our M&A sample. To assess that, we subtract the average and medium premia with regards to the price 1-day prior, 1-week prior and 1-month of our treatment group, the 105 events, to the same three premium groups. Positive results indicate indeed higher premia obtained by shareholder activists when they steer their targeted company into an M&A sale, whether purposefully or not, compared to premia obtained by targets in other M&A transactions between 1996 and 2016.

6 Empirical Findings and Discussion

In this chapter we discuss the most important results and findings of the research. To bring it back into the focus, our key research questions are ***"What implications does a Shareholder Activists' involvement have on the target's share price performance?"*** and ***"Do shareholder activist campaigns indicate and lead to higher premium paid for targets being acquired ex-post?"*** At first, let's discuss the results of the first research question, whose results are a basis for answering the second research question.

6.1 Results of the Event Study on Shareholder Activist's Involvement

The key question and factor for success in activism campaigns is whether activist investors are able to create value for the full shareholder base. Essential to this assessment is how the stock market perceives these wealth effects. We study both the short- and long-run influence in companies that were targeted by shareholder activists. We start by investigating the immediate event windows (-1,1) and (-2,2), followed by the short-term event windows (-5,5), (-10,10) and (-20,20) and studying the overall value creation as well as the time trends. Then, we study the more long-term event window (-20, M&A), where "M&A" states for the acquisition announcement of activists' target, to see whether the activists create long-term value for their targets being acquired ex-post. The event day (t=0) is defined as the announcement date, in our case 13D filing date. The most important reason to include a negative time span is to consider the run-up period.

The event studies were performed with the data outlined in chapter 4 and according to the methodology described in chapter 5. The effect of the activists' involvement has been investigated on the full sample of 105 events over the period from 1995 – 2015 for activist campaigns' announcement and from 1996 – 2016 for activists' exit through M&A.

The main hypothesis for the full sample is as follows

Hypothesis $H0_1$: Activists' intervention has no impact on target's stock price – $AR_{i,t} = 0$

Firstly, let's look at the event study results for our full sample. We find average short-term abnormal returns of 2% for a symmetrical window of 1 day around the event day (-1,1), 2.4% (-2,2), 4.1% (-5,5), 5.1% (-10,10), and 6% (-20,20), all statistically significant at the 5% level with the T-test. Long-term abnormal returns have an average of 46.6% (-20; M&A). The median values show similar results, meaning that no extreme outliers have influenced the

average values and thus our interpretation. The market reaction to the shareholder activism activity is hence confirmed to be significantly positive both in the short term following the event as well as in the long-term.

Our sample of activism campaigns shows large positive abnormal returns around the announcement date. We can therefore reject the *H0₁* hypothesis and assess that we have statistically significant positive abnormal returns.

Table 1 – Cumulative Abnormal Return (CAR) results for the entire sample

Table 1 summarizes the cumulative abnormal return (CAR) results for the entire sample, highlighting both the average and median values of the abnormal returns at day 0 as well as the CAR and the cumulative average abnormal return (CAAR) for six event windows as well as the respective Student T-statistic for statistical significance

Cumulative Abnormal Return (CAR) results - full sample

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Average	AR t=0			0,0020			
	CAR	0,0203	0,0238	0,0409	0,0514	0,0604	0,4656
	CAAR	0,0068	0,0048	0,0037	0,0024	0,0015	0,0017
Median	AR t=0			0,0029			
	CAR	0,0201	0,0229	0,0449	0,0544	0,0553	0,3559
	CAAR	0,0067	0,0046	0,0041	0,0026	0,0013	0,0014
Student T-statistic		4,0880	4,7921	7,0025	6,9916	6,7512	12,0262
N		105	105	105	105	105	105

The result of positive abnormal returns in all windows (short- and long-term) is consistent with the existing literature chapter 2. The observed tendency of growing abnormal returns over the immediate- and short-term time windows indicates the time markets need to price in activist intervention. Moreover, the numbers clearly show that shareholder activism brings positive outcomes for the targets in the long-run, at least when measured by the share price development with respect to its expected development. It appears that the short-term wealth effect is sustained and that the activist engagement leads to a significant increase in target's value.

Klein and Zur (2009) find the average abnormal return of 7.2% for the (−30,30) window around the announcement. Both Clifford (2008) and Boyson and Mooradian (2007) report significantly positive average abnormal returns between 3.4% and 8.1% for different event windows. Greenwood and Schor (2009) document the average abnormal return of 3.6%

for the (−10,5) window and the returns are highest for events related to asset sales and block mergers for the target firm. What's more important, Brav et al. (2010) provide evidence that activists aiming at the sale of the target generate the highest abnormal return, with the average of 8.54%. Not only are our results consistent with the existing literature, they also provide an updated view on the matter, as our sample goes four to seven years beyond the above mentioned literature.

To assess the sustainability of the value creation, and hence long-term returns in the activists' targets, we decided to look at the long-term event window, (-20, M&A). Our conclusion is in line with Brav et al. (2010) and Uchida and Xu (2008), namely that the statistical evidence supports the hypothesis that activist campaigns create value for target's shareholders, also in the long run. We already acknowledged and elaborated on the fact that larger event windows are also influenced and affect by noise and other events, but the causality from our events are clearly not negligible. The only previous study that finds slightly different results Boyson and Mooradian (2011), who find that only high-frequency activist hedge funds are able to create long-term abnormal returns.

Overall, the empirical evidence from our event studies, and in line with the relevant studies suggests that the alphas around the announcement are positive for activist targets and the positive abnormal returns do not revert in a long-run. Therefore, the evidence clearly supports the hypothesis that activism creates long-term value for shareholders.

However, there is some critique on such long-term performance measures on shareholder activism. Currently, it is hard to say with certainty whether a positive market reaction is driven by the market expectations of enhanced value to shareholders or by above-average undervalued stock picking ability of the activists and revealing this information to the market. The short-term windows suggest an expectation of outperformance by targeted companies, however the longer-term abnormal returns, whether driven by our event or not, also show a confirmation of these expectations, as over this longer time the changes in operations and efficiency are translated into the market's pricing of the stock.

6.2 Regression Results on obtained Abnormal Returns and M&A Premia offered

Now that we have established that shareholder activists' interventions lead to statistically significant abnormal returns and expectations, we want to compare the levels of abnormal returns for targeted companies (2% to 6%, depending on the short-term windows) to the

premia offered when they get acquired subsequently. For this, our hypothesis 2 is:

Hypothesis $H0_2$: Acquisition of an activist's target has no impact on the premium paid – OLS Regression R-squared = 0

To properly assess the impact of shareholder activism on a target's premium obtained in a signed and announced M&A transaction, we conduct a simple OLS regression analysis as elaborated on in chapter 5.2. Taking into account the specifics of our sample, we, besides using the abnormal returns at the announcement date AR_0, decided to use the cumulative abnormal returns for the (-10,10) and (-20,20) event windows. As was discussed in the earlier chapters, the market needs time to incorporate the newly released information about activist intervention on the one hand, and there is a potential for leakage of the information as activists have 10 days to report their acquired stake to SEC, i.e. file the 13D. The results of the regression analysis in all three groups show very similar, equally low values, with R^2 slightly higher for the CARs in our event windows (-10,10) and (-20,20).

Table 2 – Regression analysis results (R-squared)

Table 2 highlights the R-squared results for the regression analysis of premia offered 1 day, 1 week and 1 month prior to the M&A announcement against the cumulative abnormal returns (CAR) from the event windows (-10,10), (-20,20) as well as the abnormal return on the day of the announcement (AR)

		Event windows		
		(-10,10)	(-20,20)	(AR t=0)
Premia related to share price	1 day prior	0,0056	0,0024	0,0005
	1 week prior	0,0125	0,0027	0,0000
	1 month prior	0,0649	0,0373	0,0011

Table 3 – Regression analysis results (adjusted R-squared)

Table 3 highlights the adjusted R-squared results for the regression analysis of premia offered 1 day, 1 week and 1 month prior to the M&A announcement against the cumulative abnormal returns (CAR) from the event windows (-10,10), (-20,20) as well as the abnormal return on the day of the announcement (AR)

		Event windows		
		(-10,10)	(-20,20)	(AR t=0)
Premia related to share price	1 day prior	-0,0041	-0,0073	-0,0089
	1 week prior	0,0029	-0,0070	-0,0094
	1 month prior	0,0558	0,0280	-0,0084

This can be attributed to the fact that the event windows catch a greater amount of the full reaction to the event, and hence a higher abnormal return, than the event-day abnormal return AR_0.

Unfortunately, R^2 is not even close to reach a threshold level of 0.5 for activists' intervention to be considered as a driving force for targets' premiums at the exit acquisitions. The regressions provide no evidence that the involvement of the activists has a positive impact on premium paid for the takeover targets. The regression results are difficult to interpret for various reasons. First, weak correlation between the variables used in the analysis can be driven by a significant time span between the two. As we know, targeted companies show the highest results being acquired within 18-24 months from the intervention announcement, compared to relative moderate levels of positive abnormal returns in the short term around the event window. We can conclude that the market perceives that interval as too big for the premium to be significantly affected by the fact of activist intervention.

One can also argue to test the very same hypothesis on a shorter holding period but, in the case of target's takeover within the first year of its holding by activists, the period is too short for the activist to become meaningfully "active" and to implement the changes, which is why a sale could not be solely attributed to the activist intervention, making it extremely difficult to isolate the transaction from other observable and unobservable factors.

Another explanation for the non-existing relation between the activist campaigns and higher premia could be the fact of initially targeting companies aimed to be sold that operate in the industries with a high degree of M&A activity. Hence, the market can not isolate the effects of the campaign.

Finally, activists, not stating their intentions from the beginning, mislead the market to offset the significant costs of the campaign by receiving larger returns. Thus, the market believes that the deal was enforced by the implemented strategies and control rather than by the pure fact of activists' interest in a targeted company. The regressions between the activists announcement returns and the M&A premium show no significant impact of activism on the takeovers. The null hypothesis can therefore not be rejected and we cannot confirm a correlation between the abnormal returns witnessed during the announcement of an activist involvement and the perceived premium and thus superior return such an activist could fetch from tendering their shareholding in an exit via M&A sale.

One such explanation is that while the observed abnormal returns for the event windows (-10,10) and (-20,20) are between 5% and 6%, the observed premia in our treatment group of 105 events are on average between 33.7% and 40.94% (median 28.75% to 30.64%).

Table 4 – Acquisition premia in our sample compared to prior share price

Table 4 shows sample acquisition premia of our sample (treatment group) compared to prior share price

	1 day	1 week	4 weeks
Average	33.67%	35.60%	40.94%
Median	28.75%	30.64%	30.53%
Maximum value	158.53%	174.01%	264.66%
Minimum value	-7.57%	-8.43%	-3.74%
Standard deviation	0.316	0.329	0.407
N	105	105	105

6.2.1 Difference analysis between premia obtained in our sample and control group

Table 5 – Acquisition premia in control group compared to prior share price

Table 5 shows sample acquisition premia of our control group compared to prior share price

	1 day	1 week	4 weeks
Average	33.17%	37.11%	41.21%
Median	25.58%	29.96%	32.95%
Maximum value	3123.68%	3210.81%	3041.03%
Minimum value	-99.53%	-99.49%	-99.38%
Standard deviation	65.69%	67.88%	72.25%
N	3941	3910	3909

For this analysis, we created a control group of the 3,941 remaining M&A transactions in the SDC database, that were not targeted by activist investors to be later sold in an M&A transaction in pursuing superior returns, and that had quality data on the M&A premia. The observed premia in our control group of 3941 M&A data points are on average between 33.17% and 41.21% (median 25.58% to 32.95%). These updated, current results are roughly in line with historical premia observed by Jensen and Ruback (1983) who reviewed 13 studies that look at returns around takeover announcements and Jarrell, Brickley, and Netter (1988),

who find historical premia in M&A transactions are between 20% and 30% (with the obvious outliers).

Table 6 – Acquisition premia differences

Table 6 shows the acquisition premia differences between our treatment and control group, the difference between the values in Table 4 and Table 5

	1 day	1 week	4 weeks
Average	0.50%	-1.51%	-0.27%
Median	3.17%	0.68%	-2.42%

With a few outliers in both directions, the average and median premia on the offer prince in the M&A sale observed in our treatment group are only slightly above the historical level for M&A premia. One explanation is that premia in transactions over the last ten years have on average slightly increased compared to the overall historical levels, fuelled by quantitative easing from central bank, hence low interest rate and cheap financing, as well as a record amount of cash on corporate balance sheets (Davis, 2016 and Bryan, 2015).

More meaningfully though is the fact that the premia in our sample of 105 companies, our treatment group, are not any different from our control group with the differences ranging on average between -1.51% and 0.5% (median -2.42% to 3.17%). This suggests only a moderate influence by the activist investor in creating extremely superior returns by attracting a high premium and rejects the hypothesis that activists can infact generate "higher" premia than usually for their targets in an M&A sale.

In the next section, we focus on relevant subsamples of the activist interventions event study to see whether we can draw any conclusion by comparing the various subsamples. We have built and tested subsamples along the following six different categories: 1) date of activists' intervention announcement, 2) date of acquisition announcement, 3) target's geographical origin, 4) industry sector, 5) hedge funds, and 6) target vs. buyer.

6.3 Subsamples

H0₃: There is no difference in the cumulative abnormal returns among different time periods (every 5 years) – $\overline{CAR}(T_3, T_4)_{Period1} = \overline{CAR}(T_3, T_4)_{Period2}$

Table 7 – Subsamples of time periods: Cumulative Abnormal Return (CAR) results

Table 7 shows the cumulative abnormal return (CAR) results of time periods as subsamples, presenting both the average and median values of the cumulative abnormal returns (CAR) for six event windows as well as the respective Student T-statistic for statistical significance

Cumulative Abnormal Return (CAR) - Time periods

		N	(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Average	1995 - 1999	10	0,0338	0,0619	0,0752	0,0306	0,0386	0,0272
	2000 - 2004	10	-0,0177	-0,0049	-0,0044	0,0060	0,0237	0,0385
	2005 - 2009	47	0,0329	0,0351	0,0447	0,0643	0,0748	0,8259
	2010 - 2015	38	0,0111	0,0074	0,0392	0,0529	0,0579	0,2477
Median	1995 - 1999	10	0,0157	0,0578	0,0421	0,0640	0,0678	0,0312
	2000 - 2004	10	0,0085	0,0083	-0,0118	0,0516	0,0317	-0,1698
	2005 - 2009	47	0,0262	0,0251	0,0528	0,0525	0,0787	0,5481
	2010 - 2015	38	0,0166	0,0151	0,0357	0,0522	0,0679	0,3552
Student T-statistic	1995 - 1999		2,1049	4,6962	4,1774	1,4570	1,4102	0,2488
	2000 - 2004		-1,2868	-0,3307	-0,2456	0,2392	0,7623	0,4944
	2005 - 2009		4,8001	4,7613	4,9916	5,9291	5,4578	11,6606
	2010 - 2015		1,2037	0,8349	4,0549	4,1957	4,0513	4,9301

Table 8 – Subsamples of time periods CAR Welch T-test

Table 8 shows the Welch T-test results for the subsample of time periods for all six event windows

CAR - Welch T-test - Subsample of time periods (-1,1)

	1995 - 1999	2000 - 2004	2005 - 2009
1995 - 1999			
2000 - 2004	2,6669		
2005 - 2009	0,0885	-2,8994	
2010 - 2015	1,9177	-1,6045	2,5768

CAR - Welch T-test - Subsample of time periods (-2,2)

	1995 - 1999	2000 - 2004	2005 - 2009
1995 - 1999			
2000 - 2004	3,9185		
2005 - 2009	2,3108	-2,6833	
2010 - 2015	4,3311	-0,7814	2,9173

CAR - Welch T-test - Subsample of time periods (-5,5)

	1995 - 1999	2000 - 2004	2005 - 2009
1995 - 1999			
2000 - 2004	3,3122		
2005 - 2009	1,9824	-2,3703	
2010 - 2015	2,0924	-1,9731	0,4524

CAR - Welch T-test - Subsample of time periods (-10,10)

	1995 - 1999	2000 - 2004	2005 - 2009
1995 - 1999			
2000 - 2004	0,7860		
2005 - 2009	-1,6682	-2,1563	
2010 - 2015	-1,0857	-1,7184	0,8644

CAR - Welch T-test - Subsample of time periods (-20,20)

	1995 - 1999	2000 - 2004	2005 - 2009
1995 - 1999			
2000 - 2004	0,4063		
2005 - 2009	-1,4597	-1,6069	
2010 - 2015	-0,7962	-1,0903	1,0653

CAR - Welch T-test - Subsample of time periods (-20,M&A)

	1995 - 1999	2000 - 2004	2005 - 2009
1995 - 1999			
2000 - 2004	-0,0609		
2005 - 2009	-4,9172	-5,0412	
2010 - 2015	-1,4924	-1,4851	5,3452

With this subsample, we want to examine if there are differences in stock performance in relation to a time period of activists' involvement. The full sample was split into four subsamples based on 13D filing date. The rationale behind this split is based on various macroeconomic events in the last twenty years clearly justify looking at the data split into different periods. Such macroeconomic events include, predominantly focusing on the United States, the dotcom bubble crash and subsequent crisis around the years 2000 and 2001, the subsequent market recovery period including a peak in 2006, the financial crisis starting in 2007 as well as the most recent recovery period with increased M&A activity.

Shareholder activism is a hedge fund strategy and phenomenon that has greatly increased during the last 10 years, with only 20 interventions taken place in the first half (1995 – 2004) of the full sample consisting of 105 events. Of course, one should also attribute the distribution of the events due to the increased M&A activities in the more recent years, as our sample includes only interventions and targets that were acquired within 3 years after the 13D filing announcement date.

The results of the first subset (1995 – 2000) are driven by a few outliers (proven by a high standard deviation) and the fact of rapidly growing shareholder activism combined with the up-and-coming heydays of hedge funds, modified nowadays into hedge fund activism (Freed, 2015). The impact of hedge fund activism is demonstrated by growing figures over the period of our sample; in 1995, the number of activist hedge funds was 18 - twenty years later, the corresponding number had grown to about 100. The shareholder activism development throughout the years of our overall sample is supported by the strong numbers shown in the subset over 2005 – 2009, driven by the before-crisis growth period. We see that in the period of the after-crisis recovery from 2010 to 2015, our last subset, both the average and the median short-term CARs experienced a significant drop compared to the subsample of 2005 to 2009.

With the exception of the 2000 – 2004 period during post-dotcom crisis, all subsamples in this category are statistically significant, with the significance level increasing towards the long-term event window. The insignificance can be explained by the relatively small size of the subset, being not representable enough on the one hand, and having large number of Technology & Communications companies in the overall sample. However, when we look at the robustness results from the Welch T-test, there is no clear picture visible. Most of the subsamples over various event windows are indeed statistically significantly different

from one another, however especially comparison among pairs that include the 2000 – 2004 as well as the 2005 – 2009 subsamples tend to not differ significantly.

$H0_4$: There is no difference in the cumulative abnormal returns among different holding periods $-\overline{CAR}(T_3, T_4)_{Holding\ Period1} = \overline{CAR}(T_3, T_4)_{Holding\ Period2}$

Table 9 – Subsamples of holding periods (1): Cumulative Abnormal Return (CAR) results

Table 9 shows the cumulative abnormal return (CAR) results of half-yearly holding periods as subsamples, presenting both the average and median values of the cumulative abnormal returns (CAR) for six event windows as well as the respective Student T-statistic for statistical significance

Cumulative Abnormal Return (CAR) - Holding period (1)

		N	(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Average	< 6 months	31	0,0272	0,0318	0,0461	0,0530	0,0517	0,2423
	6 - 12 months	24	0,0327	0,0361	0,0727	0,0875	0,1140	0,5886
	12 - 18 months	20	0,0035	0,0122	-0,0013	0,0326	0,0366	0,2657
	18 - 24 months	9	0,0630	0,0654	0,1170	0,1262	0,1888	1,0396
	24 - 30 months	12	-0,0321	-0,0300	-0,0325	-0,0369	-0,0512	0,8593
	30 - 36 months	9	0,0276	0,0200	0,0539	0,0347	0,0201	0,2518
Median	< 6 months	31	0,0265	0,0251	0,0244	0,0480	0,0317	0,2191
	6 - 12 months	24	0,0203	0,0390	0,0829	0,1140	0,1289	0,5777
	12 - 18 months	20	0,0133	0,0147	0,0064	0,0252	0,0272	0,0061
	18 - 24 months	9	0,0666	0,0477	0,0801	0,1183	0,1328	0,8583
	24 - 30 months	12	-0,0089	0,0116	-0,0273	0,0233	0,0318	0,5091
	30 - 36 months	9	0,0270	0,0230	0,0454	-0,0036	0,0510	0,0756
Student T-statistic	< 6 months		3,8617	4,2562	5,1822	3,6017	2,8524	7,5192
	6 - 12 months		1,9417	2,2650	4,2466	4,7156	5,7895	10,6032
	12 - 18 months		0,4818	1,4815	-0,1244	2,7032	2,1323	4,9931
	18 - 24 months		5,0605	4,4260	6,1671	5,3442	6,5663	7,4050
	24 - 30 months		-3,0358	-2,2879	-1,7130	-1,7615	-1,9184	3,7879
	30 - 36 months		2,4733	2,9923	5,2200	2,0313	0,7738	1,1926

Table 10 – Subsamples of holding periods (1) CAR Welch T-test

Table 10 shows the Welch T-test results for the subsample of holding periods for all six event windows.

CAR - Welch T-test - Holding period (1) subsample (-1,1)

	< 6 months	6-12 months	12-18 months	18-24 months	24-30 months
< 6 months					
6-12 months	-0,4269				
12-18 months	2,5979	2,1952			
18-24 months	-3,1090	-2,0189	-4,9430		
24-30 months	3,7657	3,5067	2,2095	5,4038	
30-36 months	-0,0548	0,4185	-2,9729	3,2989	-3,9320

CAR - Welch T-test - Holding period (1) subsample (-2,2)

	< 6 months	6-12 months	12-18 months	18-24 months	24-30 months
< 6 months					
6-12 months	-0,3413				
12-18 months	2,1387	1,7930			
18-24 months	-3,1448	-2,0331	-4,6275		
24-30 months	3,1795	0,0100	2,1219	4,6239	
30-36 months	1,4427	1,2706	-0,8485	4,2330	-2,5706

CAR - Welch T-test - Holding period (1) subsample (-5,5)

	< 6 months	6-12 months	12-18 months	18-24 months	24-30 months
< 6 months					
6-12 months	-1,6721				
12-18 months	3,3365	4,6910			
18-24 months	-3,8250	-2,2397	-6,4247		
24-30 months	3,2496	-3,7415	1,2986	5,5629	
30-36 months	0,0000	1,2661	-4,2525	3,5791	-3,6784

CAR - Welch T-test - Holding period (1) subsample (-10,10)

	< 6 months	6-12 months	12-18 months	18-24 months	24-30 months
< 6 months					
6-12 months	-1,9511				
12-18 months	-0,2482	3,5675			
18-24 months	-3,1922	-22,0332	-4,4117		
24-30 months	3,0765	4,4649	2,4932	5,1851	
30-36 months	0,6735	2,0571	-0,5483	3,0993	-2,0679

CAR - Welch T-test - Holding period (1) subsample (-20,20)

	< 6 months	6-12 months	12-18 months	18-24 months	24-30 months
< 6 months					
6-12 months	-3,1036				
12-18 months	0,6387	3,6344			
18-24 months	-4,6515	-2,7171	-5,0199		
24-30 months	2,3899	3,9572	2,0093	5,1062	
30-36 months	1,1931	3,8563	0,5994	5,1847	-1,5750

CAR - Welch T-test - Holding period (1) subsample (-20,M&A)

	< 6 months	6-12 months	12-18 months	18-24 months	24-30 months
< 6 months					
6-12 months	-11,4487				
12-18 months	-0,3194	4,2669			
18-24 months	-14,6637	-7,8547	-8,7815		
24-30 months	-0,9241	-0,4053	-0,8843	0,2693	
30-36 months	-0,0138	0,4887	0,0201	1,1408	0,6335

Table 11 – Subsamples of holding periods (2): Cumulative Abnormal Return (CAR) results

Table 11 shows the cumulative abnormal return (CAR) results of yearly holding periods as subsamples, presenting both the average and median values of the cumulative abnormal returns (CAR) for six event windows as well as the respective Student T-statistic for statistical significance

Cumulative Abnormal Return (CAR) - Holding period (2)

		N	(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Average	**< 1 year**	54	0,0288	0,0298	0,0541	0,0682	0,0818	0,4223
	1 - 2 years	30	0,0237	0,0358	0,0426	0,0614	0,0784	0,4501
	2 - 3 years	21	-0,0065	-0,0086	0,0045	-0,0062	-0,0207	0,5990
Median	**< 1 year**	54	0,0233	0,0274	0,0472	0,0881	0,1176	0,3552
	1 - 2 years	30	0,0212	0,0247	0,0560	0,0534	0,0530	0,3859
	2 - 3 years	21	0,0154	0,0132	0,0281	0,0209	0,0328	0,4447
Student T-statistic	**< 1 year**		3,4221	3,6304	6,0524	5,8674	6,0600	14,2679
	1 - 2 years		3,6265	4,9114	4,4501	5,4424	5,3595	7,8651
	2 - 3 years		-0,8477	-1,0697	0,3836	-0,4436	-1,0948	3,7887

Table 12 – Subsamples of holding periods (2) CAR Welch T-test

Table 12 shows the Welch T-test results for the subsample of holding periods for all six event windows.

CAR - Welch T-test - Holding period (2) subsample (-1,1)

	< 1 year	1-2 years	2-3 years
< 1 year			
1-2 years	0,6498		
2-3 years	3,6496	3,3616	

CAR - Welch T-test - Holding period (2) subsample (-2,2)

	< 1 year	1-2 years	2-3 years
< 1 year			
1-2 years	-0,7219		
2-3 years	3,1900	3,7141	

CAR - Welch T-test - Holding period (2) subsample (-5,5)

	< 1 year	1-2 years	2-3 years
< 1 year			
1-2 years	1,0589		
2-3 years	3,6493	2,8767	

CAR - Welch T-test - Holding period (2) subsample (-10,10)

	< 1 year	1-2 years	2-3 years
< 1 year			
1-2 years	0,5850		
2-3 years	3,8726	3,5997	

CAR - Welch T-test - Holding period (2) subsample (-20,20)

	< 1 year	1-2 years	2-3 years
< 1 year			
1-2 years	0,2194		
2-3 years	3,9567	3,6717	

CAR - Welch T-test - Holding period (2) subsample (-20;M&A)

	< 1 year	1-2 years	2-3 years
< 1 year			
1-2 years	-0,4699		
2-3 years	-0,3655	-0,3060	

Table 13 – Subsamples of holding periods (3): Cumulative Abnormal Return (CAR) results

Table 13 shows the cumulative abnormal return (CAR) results of holding periods above or below 18 months as subsamples, presenting both the average and median values of the cumulative abnormal returns (CAR) for six event windows as well as the respective Student T-statistic for statistical significance

Cumulative Abnormal Return (CAR) - Holding period (3)

		N	(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Average	**< 18 months**	75	0,0226	0,0279	0,0420	0,0586	0,0676	0,3594
	> 18 months	30	0,0143	0,0136	0,0383	0,0335	0,0422	0,7311
Median	**< 18 months**	75	0,0202	0,0229	0,0420	0,0566	0,0463	0,3337
	> 18 months	30	0,0173	0,0228	0,0485	0,0499	0,0907	0,6324
Student T-statistic	**< 18 months**		3,5240	4,3983	5,8808	6,4483	6,2562	13,6376
	> 18 months		2,1830	1,9039	3,8302	2,7668	2,6739	6,1748

Table 14 – Subsamples of holding periods (3) CAR Welch T-test

Table 14 shows the Welch T-test results for the subsample of holding periods for all six event windows.

Cumulative Abnormal Return (CAR) results - Welch t-test - Holding period (3) subsample

	(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Welch T-statistic	1,1301	1,6418	0,3617	1,8603	1,4313	-1,2752

To test the effect of the holding period by the activists on target's abnormal returns, we split the time horizon employed in the study into a variety of time frames: 1) subsamples of every 6 months in a range between 6 and 36 months, 2) yearly subsamples in a rage of 1-3 years, and 3) splitting the overall sample into two subsamples of holding periods below and above 18 months.

There is a clear difference between the stock performance within various time frames. The results of the subsamples are in line with the empirical evidence. The highest CARs, for both short- and long-term windows, are demonstrated in the subsets of 18-24 months, 1-2 years and below 18 months. Abnormal returns in these intervals prove the activists to be the main reason of the subsequent acquisition of the target. The median holding period is 416 days (average is 423), in line with the median holding period of 369 days found by Brav et al. (2010). In modern academic literature, an average holding period is set from 12 to 22 months, depending on specifics of activists' sample and their objectives.

The reason for this specific time horizon lies in the fact that activists aiming to exit their target position with an M&A deal require a few months to implement corporate control measures and changing strategies, as well as sufficient ramp-up time to orchestrate a sale with an interested buyer. A good example of this is Pershing Square's investment in Allergan Pharmaceuticals to steer it into an arranged sale to Valeant Pharmaceuticals in 2014. Such a complex construct takes times, especially to get the management of the targeted company, as well as the rest of the shareholder base, on board (Lopez, 2016 and Gelles, 2014). This in turn means that events outside this time range were most likely affected by different observable and non-observable factors, bringing activists' target to an M&A transaction. In other words, it's either too short for a target to be influenced by an activist investor or too late to refer the deal to the consequences of the activism campaign.

According to Greenwood and Schor (2009), a large portion of abnormal returns lies in the (+3 months, +18 months) window. Put differently, only a modest portion come from the period around announcement, suggesting that the market underreacts, on average, to the announcement of activism and its positive consequences. The study shows the highest returns for targets that are acquired within 18 months after filing 13D. The 24 months CARs start lacking statistical significance, consistent with Greenwood and Schor (2009). We can reject the null-hypothesis.

Ho_5: There is no difference in the cumulative abnormal returns among the US and non-US targets $-\ \overline{CAR}(T_3, T_4)_{US} = \overline{CAR}(T_3, T_4)_{Non\text{-}US}$

The principal reason we look at this subsample is a combination of regulatory factors, differences in ownership structures and cultural elements that mark the gap between the US and the other developed countries getting recently involved in shareholder activism.

Table 15 – US target vs. non-US target Cumulative Abnormal Return (CAR) results

Table 15 shows the cumulative abnormal return (CAR) results of US target – non-US target subsamples, presenting both the average and median values of the cumulative abnormal returns (CAR) for six event windows as well as the respective Student T-statistic for statistical significance

Cumulative Abnormal Return (CAR) - US target vs. non-US target

		N	(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Average	**US**	99	0,0209	0,0241	0,0426	0,0522	0,0600	0,4813
	Non - US	6	0,0090	0,0193	0,0133	0,0383	0,0660	0,2060
Median	**US**	99	0,0202	0,0229	0,0462	0,0544	0,0553	0,3544
	Non - US	6	0,0169	0,0253	0,0229	0,0557	0,0906	0,6324
Student T-statistic	**US**		4,1373	4,6480	6,9740	6,7816	6,4107	11,8430
	Non - US		0,4994	1,2213	0,7701	1,9319	2,7110	2,3329

Table 16 – Us target vs. non-US target CAR Welch T-test

Table 16 shows the Welch T-test results for the US vs. non-US target subsamples for all six event windows.

Cumulative Abnormal Return (CAR) results - Welch t-test - US target vs. non-US target subsample

	(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Welch T-statistic	0,8800	0,4112	1,7507	0,8171	-0,3283	2,6426

The subsample clearly provides us with the evidence of prevailing US position in the field of activism. The results for the US subset are statistically significant with strong cumulative abnormal returns, whereas the non-US subset includes only 6 targets, therefore being not representative, which is why we can't reject the null-hypothesis and therefore see no meaningful results in these subsamples.

As outlined in Brav et al. (2010), and most of the modern studies on shareholder activism, there is a general evidence of significantly positive returns in the US which sustain long-term supporting value creation hypothesis. We can not provide certain explanation of non-US results due to the lack of previous research or size of data points in our sample.

According to Becht (2010), institutional and cultural factors are the driving forces which discourage many activists' initiatives. In contrast to the US, Europe's public companies are characterized by a relatively high degree of ownership concentration, with a strong presence of family-owner control. The corporate governance of European firms and the control function of minorities might result substantially worse than in the US, with obvious implications on the role of activist hedge funds. One of the few very active and prominent activist hedge funds in Europe, Sweden-based Cevian Capital, elaborated on this difference by stating that stronger corporate governance in favor of shareholders and a different culture mindset do not necessitate as much shareholder activism (Levy and Butt, 2016).

$H0_6$: There is no difference in the cumulative abnormal returns across targets in various industry sectors – $\overline{CAR}(T_3, T_4)_{Sector\ 1} = \overline{CAR}(T_3, T_4)_{Sector2}$

To test this hypothesis, we split the overall sample into six industry sectors: Technology & Communications, Consumer, Financial Services, Energy & Utilities, Industrial, and Services.

Table 17 – Subsamples of industry sectors: Cumulative Abnormal Return (CAR) results

Table 17 shows the cumulative abnormal return (CAR) results of industry sectors as subsamples, presenting both the average and median values of the cumulative abnormal returns (CAR) for six event windows as well as the respective Student T-statistic for statistical significance

Cumulative Abnormal Return (CAR) - Industry sector								
		N	**(-1,1)**	**(-2,2)**	**(-5,5)**	**(-10,10)**	**(-20,20)**	**(-20,M&A)**
Average	**Tech&Comm**	35	0,0227	0,0283	0,0438	0,0655	0,0783	0,8545
	Consumer	37	0,0452	0,0493	0,0810	0,0895	0,1063	0,4597
	Financial Services	4	0,0061	-0,0043	0,0316	-0,0936	-0,1388	-0,9217
	Energy & Utilities	3	0,0357	0,0314	0,0344	0,0048	-0,0173	-0,2625
	Industrial	12	0,0006	0,0145	0,0104	0,0351	0,0118	0,2667
	Services	14	-0,0343	-0,0403	-0,0421	-0,0190	0,0091	0,2318
Median	**Tech&Comm**	35	0,0269	0,0230	0,0449	0,0670	0,0931	0,5481
	Consumer	37	0,0262	0,0251	0,0554	0,0722	0,1028	0,2294
	Financial Services	4	-0,0040	-0,0198	0,0215	-0,1574	-0,2282	-0,1825
	Energy & Utilities	3	0,0376	0,0067	0,0705	-0,0398	0,0463	-0,1099
	Industrial	12	0,0115	0,0284	0,0175	0,0597	0,0274	0,3983
	Services	14	0,0101	0,0076	0,0263	0,0349	0,0225	0,2245
Student T-statistic	**Tech&Comm**		3,6028	3,9731	4,3461	5,6488	4,9744	9,5056
	Consumer		4,9200	5,3171	7,9877	6,2904	6,6587	9,4115
	Financial Services		0,5171	-0,3504	1,3152	-2,9675	-2,4223	-3,1301
	Energy & Utilities		3,2613	3,0676	2,5726	0,2092	-0,5654	-1,8493
	Industrial		0,0897	2,1219	1,0908	2,3116	0,5823	2,9158
	Services		-1,5415	-1,9623	-1,9948	-0,8374	0,3850	4,2397

Table 18 – Subsamples of industry sectors CAR Welch T-test

Table 18 shows the Welch T-test results for the subsample of industry sectors for all six event windows.

CAR - Welch T-test - Subsample of industry sectors (-1,1)

	Tech&Comm	Consumer	Financial Services	Energy & Utilities	Industrial
Tech&Comm					
Consumer	-2,6291				
Financial Services	2,1480	4,6829			
Energy & Utilities	-1,0802	0,7659	-2,4898		
Industrial	3,1963	5,8570	0,8360	3,0875	
Services	3,0473	4,1909	2,1730	3,3701	1,9063

CAR - Welch T-test - Subsample of industry sectors (-2,2)

	Tech&Comm	Consumer	Financial Services	Energy & Utilities	Industrial
Tech&Comm					
Consumer	-2,2909				
Financial Services	1,5044	2,4976			
Energy & Utilities	0,0081	1,4447	-1,5344		
Industrial	1,5257	4,1010	-0,8786	1,3671	
Services	3,3014	4,3595	1,2679	3,1985	2,6744

CAR - Welch T-test - Subsample of industry sectors (-5,5)

	Tech&Comm	Consumer	Financial Services	Energy & Utilities	Industrial
Tech&Comm					
Consumer	-3,1965				
Financial Services	0,6462	2,5100			
Energy & Utilities	-6,3511	2,4395	-0,1173		
Industrial	2,8982	5,5383	1,0812	1,2646	
Services	3,5694	4,9893	2,5551	2,6914	2,1295

CAR - Welch T-test - Subsample of industry sectors (-10,10)

	Tech&Comm	Consumer	Financial Services	Energy & Utilities	Industrial
Tech&Comm					
Consumer	-1,7929				
Financial Services	2,2084	2,5418			
Energy & Utilities	9,8272	2,5764	-1,2608		
Industrial	1,6937	3,0350	-1,7623	-0,8656	
Services	3,4877	4,4825	-0,9978	0,6160	2,0022

CAR - Welch T-test - Subsample of industry sectors (-20,20)

	Tech&Comm	Consumer	Financial Services	Energy & Utilities	Industrial
Tech&Comm					
Consumer	-1,6091				
Financial Services	2,1122	2,3962			
Energy & Utilities	3,0670	4,1886	-1,1516		
Industrial	3,1391	5,0619	-1,4613	-0,9095	
Services	2,6091	3,9576	-1,4182	-0,7379	0,0982

CAR - Welch T-test - Subsample of industry sectors (-20,M&A)

	Tech&Comm	Consumer	Financial Services	Energy & Utilities	Industrial
Tech&Comm					
Consumer	2,6582				
Financial Services	1,8947	1,4892			
Energy & Utilities	5,2852	4,4533	-0,7014		
Industrial	3,8187	2,6449	-1,2800	-3,1669	
Services	4,2571	4,1422	-1,2440	-3,0876	0,5116

Among all the selected sectors, Consumer and Energy & Utilities take the lead, with significant positive cumulated abnormal returns both in the short and long run, followed by Technology & Communications. However, since there are only three companies in our Energy subset, the results are not deemed representative. Also, the Welch t-statistic at a 5% significance level between the various subsamples provide very mixed results, which is why we can't reject the null-hypothesis and therefore see no meaningful differences among these subsamples.

$H0_7$: There is no difference in the cumulative abnormal returns across different hedge funds – $\overline{CAR}(T_3, T_4)_{Activist1} = \overline{CAR}(T_3, T_4)_{Acitivist2}$

We further investigate the effect of the hedge funds' track record. We define three subsets with low (completed less than two deals), medium (three deals) and high (more than three) frequency of deals per activist.

Even though, one might assume a potential learning and or reputational effect in the results, it is surprisingly not necessarily the case here. The sample is equally split between three subsets. The positive abnormal returns are statistically significant, with significance level growing long-term towards higher frequency activists. Quantitatively, the returns are not largely different from each other, which can be explained by the false assumption of better market perception of the more "experienced" with M&A activists. Also, the Welch t-statistic at a 5% significance level between the various subsamples provides very mixed results, which is why we can't reject the null-hypothesis and therefore see no meaningful differences among these subsamples.

Table 19 – Events per Activist Cumulative Abnormal Return (CAR) results

Table 19 shows the cumulative abnormal return (CAR) results of repetitive activists as subsamples, presenting both the average and median values of the cumulative abnormal returns (CAR) for six event windows as well as the respective Student T-statistic for statistical significance

Cumulative Abnormal Return (CAR) - Events per Activist

		N	(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Average	1 Transaction	40	0,0182	0,0259	0,0320	0,0337	0,0336	0,2238
	2 - 3 Transactions	33	0,0158	0,0280	0,0603	0,0872	0,0830	0,7003
	> 3 Transactions	32	0,0274	0,0170	0,0320	0,0366	0,0704	0,5257
Median	1 Transaction	40	0,0023	0,0232	0,0272	0,0428	0,0283	0,2435
	2 - 3 Transactions	33	0,0202	0,0251	0,0583	0,0729	0,0553	0,3559
	> 3 Transactions	32	0,0287	0,0166	0,0441	0,0555	0,0995	0,5065
Student T-statistic	1 Transaction		2,2515	3,1371	3,2747	2,9493	2,2819	4,0156
	2 - 3 Transactions		2,3081	3,9777	6,3701	6,0858	4,7729	7,5108
	> 3 Transactions		2,5871	1,6399	2,8887	2,8983	4,9817	11,6496

Table 20 – Events per Activist CAR Welch T-test

Table 20 shows the Welch T-test results for the subsample of repetitive activists for all six event windows.

CAR - Welch T-test - Subsample of repetitive activists (-1,1)

	1 Deal	2-3 Deals
1 Deal		
2-3 Deals	0,2700	
> 3 Deals	-0,9169	-1,2935

CAR - Welch T-test - Subsample of repetitive activists (-2,2)

	1 Deal	2-3 Deals
1 Deal		
2-3 Deals	-0,2260	
> 3 Deals	0,8592	1,0326

CAR - Welch T-test - Subsample of repetitive activists (-5,5)

	1 Deal	2-3 Deals
1 Deal		
2-3 Deals	-2,2554	
> 3 Deals	-0,0014	2,2036

CAR - Welch T-test - Subsample of repetitive activists (-10,10)

	1 Deal	2-3 Deals
1 Deal		
2-3 Deals	-3,6860	
> 3 Deals	-0,1927	3,3542

CAR - Welch T-test - Subsample of repetitive activists (-20,20)

	1 Deal	2-3 Deals
1 Deal		
2-3 Deals	-2,3806	
> 3 Deals	-2,1521	0,6856

CAR - Welch T-test - Subsample of repetitive activists (-20,M&A)

	1 Deal	2-3 Deals
1 Deal		
2-3 Deals	-2,3775	
> 3 Deals	-3,8103	0,9393

Ho_8: There is no difference in the cumulative abnormal returns across Targets and Buyers – $\overline{\overline{CAR}}(T_3, T_4)_{Target} = \overline{\overline{CAR}}(T_3, T_4)_{Buyer}$

This subsample is provided as an additional sub-test and is not directly linked to the overall sample. Companies acting as a buyer in the M&A deal were eliminated from the overall sample of the events, as our study is focused on activists' targets being acquired ex-post. The rationale behind this decision was primarily the underrepresentation of the buyers' subset to

be considered meaningful for the analysis performed, while at the same time indicating that this is no a strategy for activists to achieve superior returns for their investment. Nevertheless, we deemed it interesting to consider this subsample. We find that the abnormal returns are not significantly different between the two subsets in the short run. However, there's a major gap in the long-term results, being explained by priced-in premium for targets, hence the assumed superiority of the strategy of setting a targeted company up for sale.

Table 21 – Target vs. Buyer Cumulative Abnormal Return (CAR) results

Table 21 shows the cumulative abnormal return (CAR) results of target - buyer as subsamples, presenting both the average and median values of the cumulative abnormal returns (CAR) for six event windows as well as the respective Student T-statistic for statistical significance

Cumulative Abnormal Return (CAR) - Target vs. Buyer

		N	(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Average	**Target**	105	0,0203	0,0238	0,0409	0,0514	0,0604	0,4656
	Buyer	6	0,0051	0,0366	0,0651	0,0505	0,0430	0,3452
Median	**Target**	105	0,0201	0,0229	0,0449	0,0544	0,0553	0,3559
	Buyer	6	0,0085	0,0300	0,0530	0,0193	0,0912	0,3630
Student T-statistic	**Target**		4,0880	4,7921	7,0025	6,9916	6,7512	12,0262
	Buyer		1,1358	6,1093	5,3827	2,4862	1,6767	3,6396

Table 22 – Target vs. Buyer CAR Welch T-test

Table 22 shows the Welch T-test results for the target – buyer subsample for all six event windows.

Cumulative Abnormal Return (CAR) results - Welch t-test - Target vs. Buyer subsample

	(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Welch T-statistic	2,9457	-1,4720	-1,9619	0,0332	0,7768	1,6910

7 Summary and Critical Appraisal

"What turns me on, is the excitement of it all. I really believe in what I'm doing. Don't get me wrong. I like to win. But I love to rock boats that should be rocked. Sometimes I wonder why I keep doing it. I've got enough goddamn money"

Carl Icahn to Fortune Magazine, March 1985

7.1 Summary of Findings

The goal of this thesis research was to investigate whether there was a value increase in the short run in stock prices of public companies targeted by shareholder activist upon the announcement of their involvement is consistent and stays long-term due to the shareholder friendly actions and strategic value creation by the activist investors. Moreover, we connected this value creation test with the important question whether there is any evidence of correlation between premia paid for M&A targets that had been subject to shareholder activists and the abnormal returns of that very same target at the announcement date of the activist's involvement (day 0), as well as testing whether shareholder activists can generate "higher" premia.

Our findings suggest that activist interventions in general are well perceived by the market, finding positive cumulative average abnormal returns for both short- and long-term event windows. By using event studies, we find that activists create significant and statistically robust abnormal returns. We show that short-term impact on target's stock performance is positive, abnormal, and significant and actually increasing in a longer event window. By applying various subsamples of time periods, we can also conclude that the effect stays constant among both stable economic times and in times of crisis. Specifically though, the CAR is higher in economically stable times, and decreases in times of crisis. Moreover, the analysis shows that the wealth effects created by the activist intervention are sustained over long-term horizon. The research provides evidence for the abnormal returns being highest in holding period of 18-24 months. We also found that the levels of abnormal returns do not differentiate among various industries, despite such intuition. There is also no such thing as a rewarded learning curve for hedge fund managers applying the activist playbook, at least in terms of abnormal returns their involvement generates.

The involvement of an activist on both short- and long-term generates an increase in firm value; an effect that was found in the overall sample, as well as applied subsamples. This

positively answers the first research question and indicates that activist hedge funds actually create value instead of just making a short-term impact on target's stock.

Key to this research was to tie the updated abnormal return performance, a proxy for expectations into the performance of the activist, to premia obtained in a later offer to sell the company in an M&A transaction and to test whether these premia are higher compared to other transactions because of the activist's involvement. This constituted of our second hypothesis, stating that there is no such link.

To answer the second hypothesis, multiple simple OLS regressions of the abnormal returns and premia paid for targets acquired as a result of activist involvement was run. The results indicate that M&A transaction at activist exit does not have any meaningful impact on the abnormal returns indicated around the intervention announcement, leading us to reject our initial hypothesis that premium paid in activism mergers are driven by the announcement returns of activist intervention. This is the case for all examined variations, whether the premia offered compared to the 1-day prior, 1-week prior or 1 month prior price, in addition to the abnormal returns of different event windows. Observed abnormal returns as the independent variable tend to be a fraction of the observed premia as well as historical premium levels.

On top of that, we cannot mind any meaningful difference between the M&A premia obtained by companies with an activist among the shareholder base and other targets in our extensive SDC sample. The difference in premia ranged on average from -1.51% to 0.5% (median -2.42% to 3.17%). This suggests only a moderate influence by the activist investor in creating superior returns by attracting a high premium and rejects the hypothesis that activists can in fact generate "higher" premia than usually for their targets in an M&A sale.

As a concluding assessment, we can say with confidence that shareholder activists generate expectations with their investments into superior returns for the other shareholder base, reflected in the robust positive abnormal returns around the publication of their involvement. However, there is no evidence in the returns that such an involvement leads to a sale of the targeted company in an M&A transactions, let alone being an indicator of the premia offered.

7.2 Limitations

We recognize some limitations in our thesis, which can be refined for further research. Many of the limitations, already outlined in the existing literature, are common to event studies, and have been widely investigated in the last decades.

One of the major limitations is the objectivity of the sample. Having a non-random sample, leads to the selection bias in process of identification of the deals. Activists investors try to avoid the leakage of information regarding them acquiring significant stock positions, until they reach the 5% threshold to file 13D and to announce the intervention. One should also take into account that private deals are left outside of the sample. Additionally, samples in that field of studies can be biased towards smaller targets, as it might be challenging to acquirer the required 5% in large cap. Another issue with studying shareholder activism could be misleading information regarding the nature of investment provided to authorities.

In addition, the time horizon implemented in the analysis could present some peculiarities which night have an effect on the overall analysis and extrapolated results. However, since the starting point is a large comprehensive dataset, we do not believe that the selection bias would be far more severe than in a number of other studies.

Moreover, abnormal returns could be explained by other than activists' involvement factors, such as an above-average ability in stock picking, as the effects of the activism cannot be entirely isolated. The calculation of abnormal returns is very much dependent on the time frame and the ability of the market to capture the stock price reaction to the event.

Finally, any results and conclusions in this thesis might be affected by well-known statistical problems. Activism might be only one of the concurrent causes affecting share price performance of the target. Therefore, the concluding picture has to be evaluated in light of the described limits.

References

Bach, L., 2016. 4320 Quantitative Methods in Corporate Finance: Part 2, Lecture 6 - Event studies. Stockholm, Sweden: Stockholm School of Economics, 35.

Bebchuk, L., Brav A., Jiang W., 2015. The Long-term Effects of Hedge Fund Activism. Columbia Law Review, Vol 115 (5), 1085-1155.

Becht, M., Franks, J., Grant, J., 2008. Hedge fund activism in Europe. London Business School Finance Working Paper No. 283/2010.

Becht, M., Franks, J., Mayer, C., Rossi, S., 2008. Returns to shareholder activism: evidence from a clinical study of the Hermes UK Focus Fund. Review of Financial Studies, Vol 22, 3093-3129.

Boyson, N., Mooradian, R. M., 2007. Hedge funds as shareholder activists from 1994–2005. Working Paper, Northeastern University.

Boyson, N., Mooradian, R., 2010. Corporate governance and hedge fund activism. Review of Derivatives Research, Volume 14, 169-204.

Boyson, N., Mooradian, R., 2011. Know When to Hold 'Em, and Know When to Fold 'Em: The Success of Frequent Hedge Fund Activists. Working Paper.

Bradley, M., Brav, A., Goldstein, I., Jiang W., 2010. Activist arbitrage: A study of open-ending attempts of closed-end funds. Journal of Financial Economics, Volume 95(1), 1–19.

Brav, A., Jiang, W., Kim, H., 2010. Hedge fund activism: A review. Foundations and Trends in Finance, Volume 4, 185-246.

Brav, A., Jiang, W., Partnoy, F., Thomas, R., 2008a. Hedge Fund Activism, Corporate Governance, and Firm Performance. The Journal of Finance, Vol 63 (4), 1729-1775.

Brav, A., Jiang, W., Partnoy, F., Thomas, R., 2008b. The Returns to Hedge Fund Activism. ECGI - Law Working Paper No. 098/2008.

Bryan, B., 2015. America's big companies are sitting on a record $1.82 trillion in cash. Business Insider. Available at http://www.businessinsider.com/record-us-corporate-cash-holdings-182-trillion-2015-6.

Campbell, J., Lo, A. & MacKinlay, A., 1997. The Econometrics of Financial Markets. Princeton University Press: 1997.

Clifford, C., 2008. Value creation or destruction? Hedge funds as shareholder activists. Journal of Corporate Finance, Volume 14(4), 323–336.

Corum, A., Levit, D., 2015. Corporate control activism. Unpublished working paper. University of Pennsylvania.

Davis, M., 2016. Cash-Stuffed Balance Sheets No Match for U.S. Company Debt. Bloomberg News. Available at https://www.bloomberg.com/news/articles/2016-05-20/cash-stuffed-balance-sheets-can-t-match-even-bigger-debt-loads.

Eckbo, B., Masulis, R.,Norli, O., 2000. Seasoned Public Offerings: Resolution of the 'New Issues Puzzle'. Journal of Financial Economics, Volume 56, 251-291.

Fama, E. F., Jensen, M. C., 1983. Separation of Ownership and Control. Journal of Law and Economics, Vol 26.

Freed, M., 2015. The dubious history of hedge fund performance 1998 – 2014. NYU Stern School of Business. Available at http://w4.stern.nyu.edu/economics/docs/Financial%20 History/Spring%202015/Freed_HedgeFundHistory.pdf.

Gantchev, N., 2009. The cost of activist monitoring: Evidence from a sequential decision model. Working Paper, Wharton School.

Gantchev, N., 2012. The Costs of Shareholder Activism: Evidence from a Sequential Decision Model. Journal of Financial Economics, Volume 107, 610-631.

Gelles, D., 2014. No Allergan Deal, but a $2.6 Billion Profit for Ackman. New York Times Deal Book. Available at https://dealbook.nytimes.com/2014/11/17/no-allergan-deal-but-a-2-6-billion-profit-for-ackman/?_r=0.

Gillan, S.L., Starks L.T., 2007. The Evolution of Shareholder Activism in the United States. Working paper series.

Greenwood, R., Schor, M., 2009. Investor activism and takeovers. Journal of Financial Economics, Volume 92, 362-375.

Harford, J., 2005. What drives merger waves? Journal of Financial Economics, Volume 77, 529-560.

Hauswald, R., 2002. Event Studies: Assessing the Market Impact of Corporate Policy. American University Kogod School of Business, 1-8. Available at http://www1.american.edu/academic.depts/ksb/finance_realestate/rhauswald/fin673/673 mat/Hauswald%20(2002),%20Event%20Studies%20Note%20(FIN-02-005).pdf.

Hedge Fund Research Inc., 2017. HFR Hedge Fund Strategy Classification System. Hedge Fund Research. Available at https://www.hedgefundresearch.com/hfr-hedge-fund-strategy-classification-system.

Huang, J., 2009. Hedge funds and shareholder wealth gains in leveraged buyouts. Working Paper, Boston College.

Inglis, J., 2015. Unlocking value: the role of activist alternative investment managers. Alternative Investment Management Association (AIMA). Available at https://www.aima.org/article/unlocking-value-the-role-of-activist-alternative-investment-managers-summary.html.

Jarrell, G.A., Brickley, J.A., Netter, J.M. 1988. The Market for Corporate Control: The Empirical Evidence since 1980. Journal of Economic Perspectives, Volume 2, 49-68.

Jiang, W., Li, K., Wang, W., 2009. Hedge fund participation in Chapter 11. Working Paper, Columbia Business School.

Jiang, W., Li, T., Mei, D., 2015. Influencing control: Jawboning in risk arbitrage. Unpublished working paper. Columbia University.

Jensen, M.C., Ruback, R.S., 1983. The Market for Corporate Control. Journal of Financial Economics, Volume 11, 5-50.

Kahan, M., Rock, E.B., 2007. Hedge Funds in Corporate Governance and Corporate Control, University of Pennsylvania Law Review, Volume 155, 1021-1093.

Karpoff, J. M., 2001. The Impact of Shareholder Activism on Target Companies: A Survey of Empirical Findings. Available at SSRN: http://ssrn.com/abstract=885365.

Klein, A. & Zur, E., 2006. Entrepreneurial Shareholder Activism: Hedge Funds and Other Private Investors. AAA 2007 Financial Accounting & Reporting Section (FARS) Meeting Paper; ECGI - Finance Working Paper No. 140/2006; NYU Law and Economics Research Paper No. 06-41; 1st Annual Conference on Empirical Legal Studies.

Lopez, L., 2016. The Bill Ackman problem everyone forgot about is coming back to bite him and Valeant. Business Insider. Available at http://www.businessinsider.com/bill-ackman-valeant-insider-trading-case-2016-8.

Levy, R., Butt, R., 2016. A $13 billion hedge fund you've never heard of is shaking up a whole continent. Business Insider. Available at http://www.businessinsider.com/cevian-capital-biggest-activist-hedge-fund-in-europe-2016-6.

MacKinlay, A., 1997. Event Studies in Economics and Finance. Journal of Economic Literature. Volume 35 (1). p.13-39.

Mietzner, M., Schweizer, D., 2008. Hedge fund versus private equity funds as shareholder activists — differences in value creation. Working Paper, European Business School.

Müller, E., 2004. Returns to Private Equity: Idiosyncratic Risk Does Matter!, ZEW - Centre for European Economic Research Discussion Paper No. 04-029; EFA 2004 Maastricht Meetings Paper No. 3702.

Sjostrom, E., 2008. Shareholder Activism for Corporate Social Responsibility: What Do We Know?, Sustainable Development, Volume 3, 141-154.

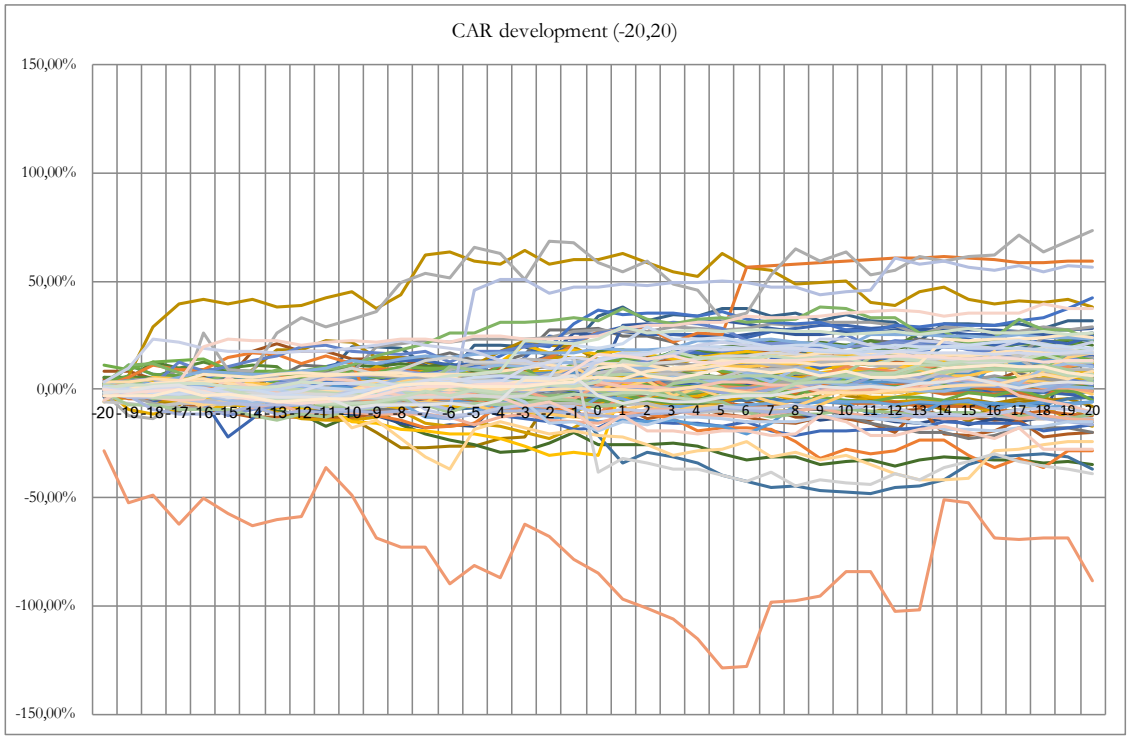
StatTrek., 2017. Statistics and Probability Dictionary – Coefficient of determination. StatTrek.com. Available at http://stattrek.com/statistics/dictionary.aspx?definition= coefficient_of_determination.

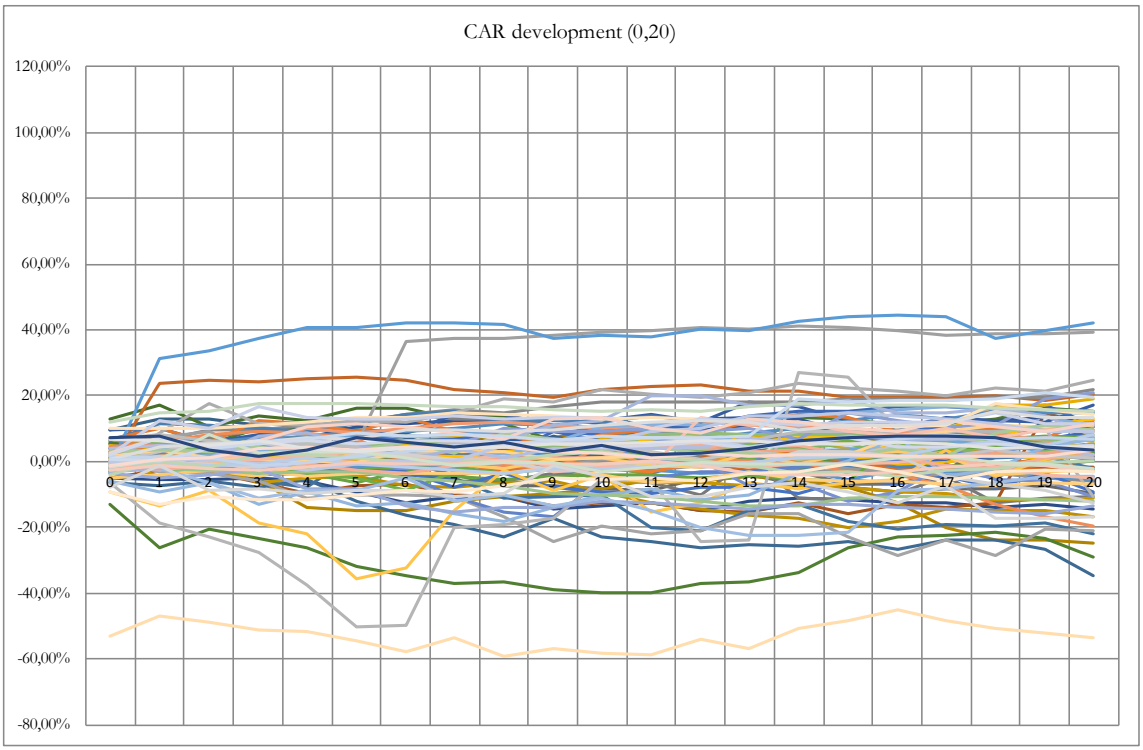
Stokman, W.A., 2008. Influences of hedge fund activism on the medium-term target firm value. Working Paper, Erasmus University Rotterdam.

Uchida, K., and Xu P., 2008. U.S. barbarians at the Japan gate: Cross border hedge fund activism. Working Paper, The Bank of Japan.

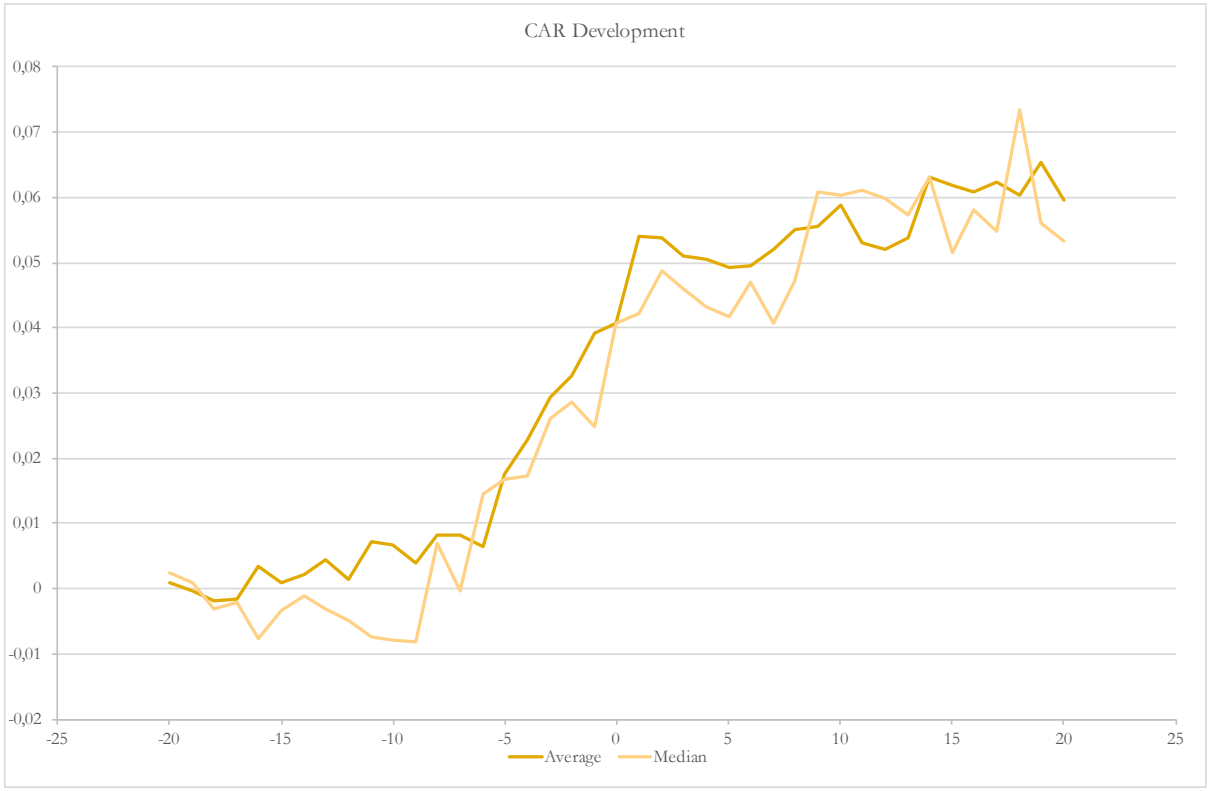
Appendices

Appendix 1 – CAR development of full sample showing every event





Appendix 2 – CAR development of full sample showing sample average and median



Appendix 3 – Subsample A: CAR results of every time period subsample

Cumulative Abnormal Return (CAR) results - Time periods (1995 - 1999)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Average	AR t=0			0,0184			
	CAR	0,0338	0,0619	0,0752	0,0306	0,0386	0,0272
	CAAR	0,0113	0,0124	0,0068	0,0015	0,0009	0,0005
Median	AR t=0			0,0213			
	CAR	0,0157	0,0578	0,0421	0,0640	0,0678	0,0312
	CAAR	0,0052	0,0116	0,0038	0,0030	0,0017	0,0002
Student T-statistic		2,1049	4,6962	4,1774	1,4570	1,4102	0,2488
N		10	10	10	10	10	10

Cumulative Abnormal Return (CAR) results - Time periods (2000- 2004)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Average	AR t=0			-0,0104			
	CAR	-0,0177	-0,0049	-0,0044	0,0060	0,0237	0,0385
	CAAR	-0,0059	-0,0010	-0,0004	0,0003	0,0006	0,0007
Median	AR t=0			0,0004			
	CAR	0,0085	0,0083	-0,0118	0,0516	0,0317	-0,1698
	CAAR	0,0028	0,0017	-0,0011	0,0025	0,0008	-0,0005
Student T-statistic		-1,2868	-0,3307	0,2392	0,2392	0,7623	0,4944
N		10	10	10	10	10	10

Cumulative Abnormal Return (CAR) results - Time periods (2005 - 2009)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			0,0106			
Average	**CAR**	0,0329	0,0351	0,0447	0,0643	0,0748	0,8259
	CAAR	0,0110	0,0070	0,0041	0,0031	0,0018	0,0025
	AR t=0			0,0069			
Median	**CAR**	0,0262	0,0251	0,0528	0,0525	0,0787	0,5481
	CAAR	0,0087	0,0050	0,0048	0,0025	0,0019	0,0018
Student T-statistic		4,8001	4,7613	4,9916	5,9291	5,4578	11,6606
N		47	47	47	47	47	47

Cumulative Abnormal Return (CAR) results - Time periods (2010 - 2015)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			-0,0097			
Average	**CAR**	0,0111	0,0074	0,0392	0,0529	0,0579	0,2477
	CAAR	0,0037	0,0015	0,0036	0,0025	0,0014	0,0013
	AR t=0			-0,0035			
Median	**CAR**	0,0166	0,0151	0,0357	0,0522	0,0679	0,3552
	CAAR	0,0055	0,0030	0,0032	0,0025	0,0017	0,0016
Student T-statistic		1,2037	0,8349	4,1957	4,1957	4,0513	4,9301
N		38	38	38	38	38	38

Appendix 4 – Subsample B: CAR results of every holding period subsample

Cumulative Abnormal Return (CAR) results - Holding period (1) (<6 months)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			0,0138			
Average	**CAR**	0,0272	0,0318	0,0461	0,0530	0,0517	0,2423
	CAAR	0,0091	0,0064	0,0042	0,0025	0,0013	0,0020
	AR t=0			0,0045			
Median	**CAR**	0,0265	0,0251	0,0244	0,0480	0,0317	0,2191
	CAAR	0,0088	0,0050	0,0022	0,0023	0,0008	0,0016
Student T-statistic		3,8617	4,2562	3,6017	3,6017	2,8524	7,5192
N		31	31	31	31	31	31

Cumulative Abnormal Return (CAR) results - Holding period (1) (6 - 12 months)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			-0,0138			
Average	**CAR**	0,0327	0,0361	0,0727	0,0875	0,1140	0,5886
	CAAR	0,0109	0,0072	0,0066	0,0042	0,0028	0,0026
	AR t=0			-0,0036			
Median	**CAR**	0,0203	0,0390	0,0829	0,1140	0,1289	0,5777
	CAAR	0,0068	0,0078	0,0075	0,0054	0,0031	0,0023
Student T-statistic		1,9417	2,2650	4,7156	4,7156	5,7895	10,6032
N		24	24	24	24	24	24

Cumulative Abnormal Return (CAR) results - Holding period (1) (12 - 18 months)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			-0,0028			
Average	**CAR**	0,0035	0,0122	-0,0013	0,0326	0,0366	0,2657
	CAAR	0,0012	0,0024	-0,0001	0,0016	0,0009	0,0007
	AR t=0			0,0001			
Median	**CAR**	0,0133	0,0147	0,0064	0,0252	0,0272	0,0061
	CAAR	0,0044	0,0029	0,0006	0,0012	0,0007	0,0000
Student T-statistic		0,4818	1,4815	2,7032	2,7032	2,1323	4,9931
N		20	20	20	20	20	20

Cumulative Abnormal Return (CAR) results - Holding period (1) (18 - 24 months)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			0,0301			
Average	**CAR**	0,0630	0,0654	0,1170	0,1262	0,1888	1,0396
	CAAR	0,0210	0,0131	0,0106	0,0060	0,0046	0,0021
	AR t=0			0,0207			
Median	**CAR**	0,0666	0,0477	0,0801	0,1183	0,1328	0,8583
	CAAR	0,0222	0,0095	0,0073	0,0056	0,0032	0,0017
Student T-statistic		5,0605	4,4260	5,3442	5,3442	6,5663	7,4050
N		9	9	9	9	9	9

Cumulative Abnormal Return (CAR) results - Holding period (1) (24 - 30 months)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			-0,0092			
Average	**CAR**	-0,0321	-0,0300	-0,0325	-0,0369	-0,0512	0,8593
	CAAR	-0,0107	-0,0060	-0,0030	-0,0018	-0,0012	0,0014
	AR t=0			-0,0145			
Median	**CAR**	-0,0089	0,0116	-0,0273	0,0233	0,0318	0,5091
	CAAR	-0,0030	0,0023	-0,0025	0,0011	0,0008	0,0009
Student T-statistic		-3,0358	-2,2879	-1,7615	-1,7615	-1,9184	3,7879
N		12	12	12	12	12	12

Cumulative Abnormal Return (CAR) results - Holding period (1) (30 - 36 months)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0					0,0012	
Average	**CAR**	0,0276	0,0200	0,0539	0,0347	0,0201	0,2518
	CAAR	0,0092	0,0040	0,0049	0,0017	0,0005	0,0003
	AR t=0			-0,0007			
Median	**CAR**	0,0270	0,0230	0,0454	-0,0036	0,0510	0,0756
	CAAR	0,0090	0,0046	0,0041	-0,0002	0,0012	0,0001
Student T-statistic		2,4733	2,9923	2,0313	2,0313	0,7738	1,1926
N		9	9	9	9	9	9

Cumulative Abnormal Return (CAR) results - Holding period (2) (<1 year)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			0,0001			
Average	**CAR**	0,0288	0,0298	0,0541	0,0682	0,0818	0,4223
	CAAR	0,0096	0,0060	0,0049	0,0032	0,0020	0,0024
	AR t=0			0,0026			
Median	**CAR**	0,0233	0,0274	0,0472	0,0881	0,1176	0,3552
	CAAR	0,0078	0,0055	0,0043	0,0042	0,0029	0,0020
Student T-statistic		3,4221	3,6304	5,8674	5,8674	6,0600	14,2679
N		54	54	54	54	54	54

Cumulative Abnormal Return (CAR) results - Holding period (2) (1 - 2 years)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			0,0103			
Average	**CAR**	0,0237	0,0358	0,0426	0,0614	0,0784	0,4501
	CAAR	0,0079	0,0072	0,0039	0,0029	0,0019	0,0010
	AR t=0			0,0107			
Median	**CAR**	0,0212	0,0247	0,0560	0,0534	0,0530	0,3859
	CAAR	0,0071	0,0049	0,0051	0,0025	0,0013	0,0009
Student T-statistic		3,6265	4,9114	5,4424	5,4424	5,3595	7,8651
N		30	30	30	30	30	30

Cumulative Abnormal Return (CAR) results - Holding period (3) (>18 months)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			0,0057			
Average	**CAR**	0,0143	0,0136	0,0383	0,0335	0,0422	0,7311
	CAAR	0,0048	0,0027	0,0035	0,0016	0,0010	0,0013
	AR t=0			0,0075			
Median	**CAR**	0,0173	0,0228	0,0485	0,0499	0,0907	0,6324
	CAAR	0,0058	0,0046	0,0044	0,0024	0,0022	0,0011
Student T-statistic		2,1830	1,9039	2,7668	2,7668	2,6739	6,1748
N		30	30	30	30	30	30

Cumulative Abnormal Return (CAR) results - Holding period (3) (<18 months)

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			0,0006			
Average	**CAR**	0,0226	0,0279	0,0420	0,0586	0,0676	0,3594
	CAAR	0,0075	0,0056	0,0038	0,0028	0,0016	0,0018
	AR t=0			0,0023			
Median	**CAR**	0,0202	0,0229	0,0420	0,0566	0,0463	0,3337
	CAAR	0,0067	0,0046	0,0038	0,0027	0,0011	0,0018
Student T-statistic		3,5240	4,3983	6,4483	6,4483	6,2562	13,6376
N		75	75	75	75	75	75

Appendix 5 – Subsample C: CAR results of US target vs non-US target subsample

Cumulative Abnormal Return (CAR) results - US target

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Average	AR t=0			0,0011			
	CAR	0,0209	0,0241	0,0426	0,0522	0,0600	0,4813
	CAAR	0,0070	0,0048	0,0039	0,0025	0,0015	0,0017
Median	AR t=0			0,0023			
	CAR	0,0202	0,0229	0,0462	0,0544	0,0553	0,3544
	CAAR	0,0067	0,0046	0,0042	0,0026	0,0013	0,0016
Student T-statistic		4,1373	4,6480	6,7816	6,7816	6,4107	11,8430
N		99	99	99	99	99	99

Cumulative Abnormal Return (CAR) results - non-US target

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
Average	AR t=0			0,0175			
	CAR	0,0090	0,0193	0,0133	0,0383	0,0660	0,2060
	CAAR	0,0030	0,0039	0,0012	0,0018	0,0016	0,0006
Median	AR t=0			0,0134			
	CAR	0,0169	0,0253	0,0229	0,0557	0,0906	0,6324
	CAAR	0,0056	0,0051	0,0021	0,0027	0,0022	0,0010
Student T-statistic		0,4994	1,2213	1,9319	1,9319	2,7110	2,3329
N		6	6	6	6	6	6

Appendix 6 – Subsample D: CAR results of every sector subsample

Cumulative Abnormal Return (CAR) results - Technology & Communications

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			0,0093			
Average	**CAR**	0,0227	0,0283	0,0438	0,0655	0,0783	0,8545
	CAAR	0,0076	0,0057	0,0040	0,0031	0,0019	0,0026
	AR t=0			0,0057			
Median	**CAR**	0,0269	0,0230	0,0449	0,0670	0,0931	0,5481
	CAAR	0,0090	0,0046	0,0041	0,0032	0,0023	0,0020
Student T-statistic		3,6028	3,9731	5,6488	5,6488	4,9744	9,5056
N		35	35	35	35	35	35

Cumulative Abnormal Return (CAR) results - Consumer

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			0,0131			
Average	**CAR**	0,0452	0,0493	0,0810	0,0895	0,1063	0,4597
	CAAR	0,0151	0,0099	0,0074	0,0043	0,0026	0,0018
	AR t=0			0,0058			
Median	**CAR**	0,0262	0,0251	0,0554	0,0722	0,1028	0,2294
	CAAR	0,0087	0,0050	0,0050	0,0034	0,0025	0,0011
Student T-statistic		4,9200	5,3171	6,2904	6,2904	6,6587	9,4115
N		37	37	37	37	37	37

Cumulative Abnormal Return (CAR) results - Financial services

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			-0,0005			
Average	**CAR**	0,0061	-0,0043	0,0316	-0,0936	-0,1388	-0,9217
	CAAR	0,0020	-0,0009	0,0029	-0,0045	-0,0034	-0,0011
	AR t=0			0,0062			
Median	**CAR**	-0,0040	-0,0198	0,0215	-0,1574	-0,2282	-0,1825
	CAAR	-0,0013	-0,0040	0,0020	-0,0075	-0,0056	-0,0007
Student T-statistic		0,5171	-0,3504	-2,9675	-2,9675	-2,4223	-3,1301
N		4	4	4	4	4	4

Cumulative Abnormal Return (CAR) results - Energy & Utilities

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			0,0221			
Average	**CAR**	0,0357	0,0314	0,0344	0,0048	-0,0173	-0,2625
	CAAR	0,0119	0,0063	0,0031	0,0002	-0,0004	-0,0007
	AR t=0			0,0208			
Median	**CAR**	0,0376	0,0067	0,0705	-0,0398	0,0463	-0,1099
	CAAR	0,0125	0,0013	0,0064	-0,0019	0,0011	-0,0010
Student T-statistic		3,2613	3,0676	0,2092	0,2092	-0,5654	-1,8493
N		3	3	3	3	3	3

Cumulative Abnormal Return (CAR) results - Industrial

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			-0,0035			
Average	**CAR**	0,0006	0,0145	0,0104	0,0351	0,0118	0,2667
	CAAR	0,0002	0,0029	0,0009	0,0017	0,0003	0,0006
	AR t=0			-0,0058			
Median	**CAR**	0,0115	0,0284	0,0175	0,0597	0,0274	0,3983
	CAAR	0,0038	0,0057	0,0016	0,0028	0,0007	0,0011
Student T-statistic		0,0897	2,1219	2,3116	2,3116	0,5823	2,9158
N		12	12	12	12	12	12

Cumulative Abnormal Return (CAR) results - Services

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0					-0,0442	
Average	**CAR**	-0,0343	-0,0403	-0,0421	-0,0190	0,0091	0,2318
	CAAR	-0,0114	-0,0081	-0,0038	-0,0009	0,0002	0,0012
	AR t=0			-0,0041			
Median	**CAR**	0,0101	0,0076	0,0263	0,0349	0,0225	0,2245
	CAAR	0,0034	0,0015	0,0024	0,0017	0,0005	0,0011
Student T-statistic		-1,5415	-1,9623	-0,8374	-0,8374	0,3850	4,2397
N		12	12	12	12	12	12

Appendix 7 – Subsample E: CAR results of deals per activist subsample

Cumulative Abnormal Return (CAR) results - 1 event per Activist

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			-0,0026			
Average	**CAR**	0,0182	0,0259	0,0320	0,0337	0,0336	0,2238
	CAAR	0,0061	0,0052	0,0029	0,0016	0,0008	0,0012
	AR t=0			-0,0021			
Median	**CAR**	0,0023	0,0232	0,0272	0,0428	0,0283	0,2435
	CAAR	0,0008	0,0046	0,0025	0,0020	0,0007	0,0011
Student T-statistic		2,2515	3,1371	2,9493	2,9493	2,2819	4,0156
N		40	40	40	40	40	40

Cumulative Abnormal Return (CAR) results - 2 -3 events per Activist

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			0,0163			
Average	**CAR**	0,0158	0,0280	0,0603	0,0872	0,0830	0,7003
	CAAR	0,0053	0,0056	0,0055	0,0042	0,0020	0,0020
	AR t=0			0,0147			
Median	**CAR**	0,0202	0,0251	0,0583	0,0729	0,0553	0,3559
	CAAR	0,0067	0,0050	0,0053	0,0035	0,0013	0,0016
Student T-statistic		2,3081	3,9777	6,0858	6,0858	4,7729	7,5108
N		33	33	33	33	33	33

Appendix 8 – Subsample F: CAR results of Target vs Buyer subsample

Cumulative Abnormal Return (CAR) results - Target

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			0,0020			
Average	**CAR**	0,0203	0,0238	0,0409	0,0514	0,0604	0,4656
	CAAR	0,0068	0,0048	0,0037	0,0024	0,0015	0,0017
	AR t=0			0,0029			
Median	**CAR**	0,0201	0,0229	0,0449	0,0544	0,0553	0,3559
	CAAR	0,0067	0,0046	0,0041	0,0026	0,0013	0,0014
Student T-statistic		4,0880	4,7921	6,9916	6,9916	6,7512	12,0262
N		105	105	105	105	105	105

Cumulative Abnormal Return (CAR) results - >3 events per Activist

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			-0,0069			
Average	**CAR**	0,0274	0,0170	0,0320	0,0366	0,0704	0,5257
	CAAR	0,0091	0,0034	0,0029	0,0017	0,0017	0,0020
	AR t=0			0,0062			
Median	**CAR**	0,0287	0,0166	0,0441	0,0555	0,0995	0,5065
	CAAR	0,0096	0,0033	0,0040	0,0026	0,0024	0,0019
Student T-statistic		2,5871	1,6399	2,8983	2,8983	4,9817	11,6496
N		32	32	32	32	32	32

Cumulative Abnormal Return (CAR) results - Buyer

		(-1,1)	(-2,2)	(-5,5)	(-10,10)	(-20,20)	(-20,M&A)
	AR t=0			-0,0008			
Average	**CAR**	0,0051	0,0366	0,0651	0,0505	0,0430	0,3452
	CAAR	0,0017	0,0073	0,0059	0,0024	0,0010	0,0009
	AR t=0			-0,0033			
Median	**CAR**	0,0085	0,0300	0,0530	0,0193	0,0912	0,3630
	CAAR	0,0028	0,0060	0,0048	0,0009	0,0022	0,0009
Student T-statistic		1,1358	6,1093	2,4862	2,4862	1,6767	3,6396
N		6	6	6	6	6	6

Appendix 9 – Regression output AR t = 0

SUMMARY OUTPUT - 1 day, AR (t = 0)

Regression Statistics	
Multiple R	0,0221
R Square	0,0005
Adjusted R Square	-0,0089
Standard Error	0,0788
Observations	108

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,0003	0,0003	0,0518	0,8205
Residual	106	0,6575	0,0062		
Total	107	0,6578			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0,0041	0,0113	0,3600	0,7195	-0,0184	0,0265	-0,0184	0,0265
1 day	0,0055	0,0244	0,2275	0,8205	-0,0428	0,0539	-0,0428	0,0539

SUMMARY OUTPUT - 1 week, AR (t = 0)

Regression Statistics	
Multiple R	0,0003
R Square	0,0000
Adjusted R Square	-0,0094
Standard Error	0,0787
Observations	108

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,0000	0,0000	0,0000	0,9979
Residual	106	0,6562	0,0062		
Total	107	0,6562			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0,0061	0,0116	0,5307	0,5968	-0,0168	0,0291	-0,0168	0,0291
1 week	-0,0001	0,0233	-0,0026	0,9979	-0,0462	0,0460	-0,0462	0,0460

SUMMARY OUTPUT - 1 month, AR (t = 0)

Regression Statistics	
Multiple R	0,0327
R Square	0,0011
Adjusted R Square	-0,0084
Standard Error	0,0789
Observations	108

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,0007	0,0007	0,1133	0,7371
Residual	106	0,6601	0,0062		
Total	107	0,6608			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0,0080	0,0110	0,7309	0,4665	-0,0137	0,0297	-0,0137	0,0297
4 weeks	-0,0060	0,0179	-0,3365	0,7371	-0,0416	0,0295	-0,0416	0,0295

Appendix 10 – Regression output CAR (-10,10)

SUMMARY OUTPUT - 1 day, CAR (-10,10)

Regression Statistics	
Multiple R	0,0745
R Square	0,0056
Adjusted R Square	-0,0041
Standard Error	0,1672
Observations	105

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,0161	0,0161	0,5752	0,4499
Residual	103	2,8810	0,0280		
Total	104	2,8971			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0,0647	0,0239	2,7032	0,0080	0,0172	0,1121	0,0172	0,1121
X Variable 1	-0,0394	0,0520	-0,7584	0,4499	-0,1424	0,0636	-0,1424	0,0636

SUMMARY OUTPUT - 1 week, CAR (-10,10)

Regression Statistics	
Multiple R	0,1119
R Square	0,0125
Adjusted R Square	0,0029
Standard Error	0,1667
Observations	105

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,0363	0,0363	1,3064	0,2557
Residual	103	2,8608	0,0278		
Total	104	2,8971			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0,0716	0,0240	2,9803	0,0036	0,0240	0,1193	0,0240	0,1193
X Variable 1	-0,0568	0,0497	-1,1430	0,2557	-0,1554	0,0418	-0,1554	0,0418

SUMMARY OUTPUT - 1 month, CAR (-10,10)

Regression Statistics	
Multiple R	0,2547
R Square	0,0649
Adjusted R Square	0,0558
Standard Error	0,1622
Observations	105

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,1880	0,1880	7,1476	0,0087
Residual	103	2,7091	0,0263		
Total	104	2,8971			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0,0942	0,0225	4,1848	0,0001	0,0496	0,1388	0,0496	0,1388
X Variable 1	-0,1045	0,0391	-2,6735	0,0087	-0,1821	-0,0270	-0,1821	-0,0270

Appendix 11 – Regression output CAR (-20,20)

SUMMARY OUTPUT - 1 day, CAR (-20,20)

Regression Statistics	
Multiple R	0,0493
R Square	0,0024
Adjusted R Square	-0,0073
Standard Error	0,2101
Observations	105

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,0111	0,0111	0,2512	0,6173
Residual	103	4,5484	0,0442		
Total	104	4,5594			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0,0714	0,0301	2,3743	0,0194	0,0118	0,1310	0,0118	0,1310
X Variable 1	-0,0327	0,0653	-0,5012	0,6173	-0,1622	0,0968	-0,1622	0,0968

SUMMARY OUTPUT - 1 week, CAR (-20,20)

Regression Statistics	
Multiple R	0,0515
R Square	0,0027
Adjusted R Square	-0,0070
Standard Error	0,2101
Observations	105

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,0121	0,0121	0,2742	0,6017
Residual	103	4,5473	0,0441		
Total	104	4,5594			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0,0720	0,0303	2,3773	0,0193	0,0119	0,1321	0,0119	0,1321
X Variable 1	-0,0328	0,0627	-0,5236	0,6017	-0,1571	0,0915	-0,1571	0,0915

SUMMARY OUTPUT - 1 month, CAR (-20,20)

Regression Statistics	
Multiple R	0,1932
R Square	0,0373
Adjusted R Square	0,0280
Standard Error	0,2064
Observations	105

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,1701	0,1701	3,9927	0,0483
Residual	103	4,3893	0,0426		
Total	104	4,5594			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0,1011	0,0287	3,5275	0,0006	0,0442	0,1579	0,0442	0,1579
X Variable 1	-0,0994	0,0498	-1,9982	0,0483	-0,1981	-0,0007	-0,1981	-0,0007