Abnormal Returns of Target Companies' Stock Prices Prior to Public Takeover Announcements

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Abstract

This study examines the (Cumulative) Average Abnormal Returns ($\overline{CAR}$ / $\overline{AR}$) of 171 NASDAQ Composite Index listed takeover targets in the period 2009-2018 to investigate whether abnormal returns are being made prior to the public takeover announcement, which could possibly indicate the presence of insider trading. To research this subject, an event study is performed. The estimation window starts at t = -130 and ends at t = -30, the event window starts at t = -30 till t = 10. In order to calculate the $\overline{CAR}$ and $\overline{AR}$ in STATA, the market model is used as the normal return model. The results from this study show that the $\overline{AR}$ and test-statistics are consistently positive from t = -15 till t = -1, in which the $\overline{AR}$ in the period of four days prior to the official public announcement date are significant at the 0.10 level. The final day prior to the event date is even significant at the 0.005 level. The $\overline{CAR}$ become positive from t = -41 and indicate that approximately a quarter of the run-up takes place before the event date. Evidence is found that average abnormal returns are being made prior to the public takeover announcement. Unfortunately, the significant $\overline{AR}$ cannot be attributed to the leakage of or trading on insider information since other ways of legal trading cannot be ruled out. A second hypothesis is constructed to test whether the method of payment in an acquisition could explain the cumulative abnormal returns prior to a takeover announcement. Due to insignificant positive results, hypothesis 2 must be rejected.

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1. Introduction

Much research has been done on the valuation and prediction of stock prices. Kendall (1953) is one of the first statisticians to investigate stock prices and tried to find recurring patterns in order to predict them. He could not find any predictable patterns and therefore his study's conclusion was that stock prices evolve randomly and cannot be predicted. One explanation for the results of Kendall's study is the fact that any information which can be used to predict the future performance of the stock should already be reflected in the current stock prices. Once there is information that a stock is undervalued, indicating a possible profitable opportunity, investors instantly buy the stock and bid up its price to the fair level. At this level only normal returns can be expected. This indicates that if prices are always bid up to fair levels, given all available information, they only increase or decrease due to new information. But how can investors be sure that all information is incorporated in the stock's price?

In 1970, Fama presented his view on the theory of efficient markets and he came up with a hypothesis: the Efficient Market Hypothesis (EMH). With this hypothesis he wanted to indicate to what extend a market could be considered efficient. In his view a market is considered 'efficient' if that market fully reflects all available information (Fama, 1970). Fama states that there are three forms of market efficiency: the weak form, the semi-strong form and the strong form. Evidence from Jensen (1978) and Borges (2010) suggests that markets are at least weak form efficient and this indicates that at least all historical information is incorporated in the current stock price. Groenewold & Kang (1993), Hussin, Ahmed and Ying (2010) and Khan & Ikram (2010) found evidence of semi-strong form efficiency of markets, which indicates that not only all historical information, but also all publicly available information is incorporated in the current stock price. Despite the fact that much research has been done on the strong form of the EMH, there is no consensus whether insider information is always incorporated in the current stock price. Meulbroek (1991) and Jarrel & Poulson (1989) found evidence that price run-ups in the targets' stock price happen before an official takeover announcement is made public. This could suggest that there is some kind of leakage of insider information which is traded on by investors. Sanders & Zdanowicz (1992) and Keown & Pinkerton (1981) found evidence of abnormal returns prior to the official takeover announcement, which could also indicate possible insider trading.

It is very hard to present concrete evidence that both price run-ups and abnormal returns are due to insider trading. The U.S. Securities and Exchange Commission (SEC) is very clear: insider trading is illegal. The SEC states that: "*Because insider trading undermines investor confidence in the fairness and integrity of the securities markets, the SEC has treated the detection and prosecution of insider trading violations as one of its enforcement priorities*." (U.S. Securities and Exchange Commission, 2019). Since the previously mentioned literature does find evidence of abnormal returns, which could indicate illegal insider trading, further investigating the subject of abnormal returns is highly relevant.

Looking at the previously mentioned studies by Jarrel & Poulson (1989), Sanders & Zdanowicz (1992) and Keown & Pinkerton (1981) it is remarkable that all studies use datasets of targets listed at the New York Stock Exchange (NYSE) and the American Stock Exchange (AMEX), while not considering targets listed at the NASDAQ. Especially since Agrawal & Nasser (2012) found evidence in their research that targets listed on NASDAQ experience greater abnormal returns in comparison to targets listed at NYSE or AMEX. Furthermore, the NASDAQ Composite Index holds mostly stocks of tech-companies (NASDAQ, 2019b). Due to a market consolidation in the tech-sector a lot of takeovers have taken place in the last two decades. The Institute for Mergers, Acquisitions and Alliances (IMAA) (2019) looked at all announced mergers and acquisitions in the United States by sector during 2000-2018 and found that 19.9% of total 38,350 merger and acquisition deals are deals in the technology sector. Meulbroek (1991) used a dataset which includes NASDAQ listed stocks, but those targets were only 29% of the total sample, the rest consists of NYSE (54%) and AMEX (17%) listed stocks. More recent studies by Wu, Lin & Yang (2018) and Dai et al. (2017) did include the NASDAQ listed targets in their sample, but no recent (2015-Now) literature is solely using NASDAQ listed targets as a sample. Taking into account the results from the studies investigating abnormal returns at the NYSE and AMEX, there is no reason to expect that this subject is not relevant and that it cannot be applied to targets listed at the NASDAQ. While the NYSE is the world's largest stock exchange, looking at total global market capitalization, with over $28.5 trillion (New York Stock Exchange, 2018), NASDAQ is the world's second largest stock exchange with a market capitalization of over $13 trillion (NASDAQ, 2019a). Due to the fact that there has not been any recent literature solely focussing on this subject, using the world's second largest stock exchange, makes a study focussing on the NASDAQ Composite Index very relevant. This study will fill the gap of missing literature regarding abnormal returns prior to the takeover of targets which's stock is listed at the NASDAQ. This research will also specifically shed light on the subject of abnormal returns in the technological sector, since most NASDAQ Composite Index listed stocks are technological companies. To my knowledge, this has not been done before in the period of 2009-2018.

The aim of this study is to investigate whether there are abnormal returns achieved by trading in the targets' stock prior to the official public takeover announcement looking at the NASDAQ Composite Index. To do so, a dataset of NASDAQ Composite Index' takeover targets in the period of 2009-2018 will be constructed and an analysis using Average Abnormal Returns ($\overline{AR}$) and Cumulative Average Abnormal Returns ($\overline{CAR}$) will be conducted.

The following research question will be investigated using the previously mentioned properties:

To what extend do target companies' stock prices experience abnormal returns prior to the publication of the takeover announcement, indicating the presence of insider trading?

The abnormal returns will be calculated using an event study which has an estimation window of 100 trading days prior to the event window. The event window starts at 30 days before the official public announcement of the takeover and ends 10 days after. The Market Model (MM) will be used as a benchmark for the market return. Furthermore, the $\overline{AR}$ will be calculated in combination with the test-statistic and the $\overline{CAR}$ will be based on these results. The $\overline{AR}$ and the $\overline{CAR}$ should be fluctuating around zero. An indication that abnormal returns are achieved will be shown by a period of positive $\overline{AR}$, which results in a $\overline{CAR}$ that increases over time.

The results for this study show that the $\overline{AR}$ and test-statistics are consistently positive from t = -15 till t = -1. This means that during this period only positive average abnormal returns are being made. In the period of t = -4 till t = -1 the average abnormal returns are all positively significant on at least the 0.10 level, on t = -1 the returns are even significant at the 0.005 level. This means that in the period of four days prior to the official announcement date consistently significant (0.10 level) average abnormal returns ($\overline{AR}$) are being made by investors, in which the final day prior to the announcement these returns are significant on the highest significance level (0.005 level). Furthermore, the $\overline{CAR}$ is found to remain consistently positive from t = -41 till the end of the sample period, indicating that on average positive cumulative returns are being made during this period. Approximately a quarter of the total increase in $\overline{CAR}$ occurs prior to the announcement date. This means that approximately a quarter of the market's reaction of the takeover announcement happened prior to the official announcement becomes public information.

Unfortunately, the results from the study of the cumulative abnormal returns prior to a takeover announcement cannot be completely attributed to the leakage of or trading on insider information, since legal ways of trading cannot be ruled out. To investigate what independent variables are determinants of the level of cumulative abnormal returns, a study investigating this issue was initiated. From the literature review it became clear that the independent variable 'Method of Payment' could explain a part of the variance of the cumulative abnormal returns. Therefore, a second hypothesis was constructed to test whether the method of payment in an acquisition could explain the cumulative abnormal returns prior to a takeover announcement. In theory an acquisition using only cash as the method of payment leads to higher increasing returns. This is due to the fact that a transaction using cash cannot be tax-deferred by the investor, in contrast to a transaction completed using stock, for which deferred taxation is possible. A multiple regression was performed to test whether the effect of the method of payment on the cumulative abnormal returns is significant. The results from the regression show that there is an insignificant positive effect if the method of payment is cash on the cumulative abnormal returns prior to the takeover announcement. Due to insignificant positive results, the hypothesis regarding this subject must be rejected.

This thesis is divided into six chapters. This introduction is followed by chapter two, which consists of the theoretical background regarding the subject of this thesis. First, stock price behaviour on exchanges (paragraph 2.1) will be elaborated on, followed by random walk theory (paragraph 2.2). In paragraph 2.3, theory regarding efficient market hypothesis will be elaborated on, followed by paragraph 2.4 in which agency theory will be explained. Agency theory will be linked to the existence of insider trading by company insiders. Chapter 2 concludes with a paragraph regarding U.S. insider trading regulation (paragraph 2.5). Chapter three is a literature review regarding EMH in relation to abnormal returns prior to a target's takeover announcements and is followed by a clear definition of the research problem and the development of the first hypothesis. This section is followed with a literature review regarding the possible determinants of abnormal returns prior to a takeover announcement. The literature review ends with the construction of the second hypothesis. Chapter four is the data and methodology chapter. In this chapter the methodologic analysis to answer the research question will be elaborated on. This chapter is divided into two sections, each section focussing on a different hypothesis. Paragraph 4.1 is devoted to hypothesis 1 and consists of several components. First, the selected dataset will be presented (paragraph 4.1.1) which is followed by the elaboration on the research method in the methodology section (paragraph 4.1.2). In this section the event study's estimation window and event window will be determined. Paragraph 4.1.3 consists of an elaboration on the normal return models. In this paragraph statistical models (paragraph 4.1.3.1), economic models (paragraph 4.1.3.2) and a comparison of the mentioned normal return models will be made (paragraph 4.1.3.3). This chapter will conclude with an explanation of and a display of the equations of the (cumulative) average abnormal returns (paragraph 4.1.4). Paragraph 4.2 is devoted to hypothesis 2 and also consists of several components. In paragraph 4.2.1 the dataset and the collection of the data will be elaborated on. Paragraph 4.2.2 explains the methodology which is used to conduct the research regarding this hypothesis. This paragraph is divided into three sections: a section regarding multiple regression analysis (paragraph 4.2.1.1), a section regarding the statistical model (4.2.1.2) and a section elaborating on the independent variables and control variables (paragraph 4.2.1.3). In the fifth chapter the results from testing both hypotheses will be presented. The empirical results from the event study regarding hypothesis 1 will be presented and the hypothesis will either be accepted or rejected (paragraph 5.1). This paragraph is followed by the empirical results regarding hypothesis 2 (paragraph 5.2). In this paragraph the second hypothesis will either be accepted or rejected, and a robustness check will be conducted (paragraph 5.2.2). The sixth chapter consists of a conclusion which includes the answer to the research question (paragraph 6.1), a discussion (paragraph 6.2) and a section mentioning the limitations of this study (paragraph 6.3). Furthermore, a paragraph is devoted to possible future research (paragraph 6.3). Chapter six is followed by the bibliography and the appendices.

2. Theoretical Background

In order to understand what moves stock prices it is necessary to start at the fundamentals of stock price valuation. French & Roll (1986) find a big difference in asset returns between exchange trading hours and non-trading hours. They conclude that this phenomenon can, amongst other explanations, be explained by the fact that the arrival of public information and private information during these trading hours. But how do stock prices behave on stock exchanges? What information is actually incorporated in stock prices? And how does the arrival of new information affect stock prices? Amongst others, these questions will be answered in this chapter. In paragraph 2.1 the stock price behaviour on exchanges will be elaborated on. It becomes clear that stock prices and returns follow a random walk. In paragraph 2.2 the random walk theory will be further explained. In extension of the random walk theory, the efficient market hypothesis by Fama (1970) will be explained in paragraph 2.3. In this paragraph the three forms of market efficiency will be elaborated on to understand what information is actually incorporated in stock prices. Furthermore, it becomes clear that the strong form, regarding insider trading, must be investigated further to answer this thesis' research question. One economic theory which could explain the existence of insider trading is agency theory. This theory will be explained in paragraph 2.4. In paragraph 2.5 the U.S. insider trading regulation imposed and maintained by the SEC will be elaborated on. It becomes clear what, through the eyes of the SEC, insider trading exactly is. Despite a possible prison sentence and a big fine as a result of insider trading, individuals might still be conducting insider trading.

2.1 Stock Price Behaviour on Stock Exchanges

One of the first attempts to predict stock prices using time-series was conducted by statistician Kendall in 1953. To his surprise he did conclude form his research that he could not identify predictable patterns in stock prices. Prices seemed to be evolving randomly. Kendall (1953) concluded from his research that: "*Unless individual stocks behave differently from the average of similar stocks, there is no hope of being able to predict movements on the exchange for a week ahead without extraneous information*" (p.11). Furthermore, he stated that any success from investor seemed to be due i) to chance, ii) to the fact that at certain times all prices rise together, iii) to having inside information, iv) to be able to act very quickly, v) to being able to operate on a very large scale that the transaction costs were not higher than the profits (Kendall, 1953). One can conclude from this research that stock price movements cannot be predicted. One explanation for the results of Kendall's study is the fact that any information which can be used to predict the future performance of the stock should already be reflected in the current stock price. Once there is information that a stock is undervalued, indicating a possible profitable trading opportunity, investors instantly buy the stock and bid up its price to the fair level. At this level only normal returns can be expected. This indicates that if prices are always bid up to fair levels, given all available information, they only increase or decrease in price due to new information. Thus, stock prices that increase or decrease in response to new information automatically must move unpredictably

(Kendall, 1953). This argument is often used to indicate that stock prices follow a random walk, which will be further explained in paragraph 2.2.

2.2 Random Walk Theory

Kendall's observations regarding stock price predictions were not completely new to the economic literature. In 1863, a French economist named Regnault was the first to investigate the issue of random walk theory as he laid the basis for the modern stochastic models of price behaviour (Jovanovic & Le Gall, 2001). Regnault states that: *"L'écart des cours est en raison directe de la racine carrée des temps."* (p.50) which translates to: "*The deviation of prices is directly proportional to the square root of time*" (Regnault, 1863). With this statement he hints to the fact that prices evolve randomly over time and must thus follow a random walk. The fundamentals of the random walk theory of Regnault's work are used by Bachelier (1900), a French mathematician, in his study *The Theory of Speculation* (Jovanovic & Le Gall, 2001). Bachelier (1900) states that there are innumerable influences that determine the movements of a stock exchange. He mentions that past, present and future anticipated events often show no connection to the stock market's fluctuations. Bachelier (1900) states: "*... la Bourse agit sur elle-même et le mouvement actuel est fonction, non seulement des mouvements antérieurs, mais aussi de la position de place.*" (p. 21) which translates to: "*The stock exchange acts on itself and its current movement is a function not only of earlier fluctuations, but also of the present market position.*" Since these mentioned fluctuations are subject to an infinite number of factors, this means that it is impossible to make a mathematically exact forecast of stock prices. This indicates that stock prices cannot be predicted and must follow a random walk.

The previously mentioned reasoning is also used by Fama (1965a). He states that random walk theorists start from the premise that large stock exchanges are examples of 'efficient' markets. Fama (1965a) defines an 'efficient' market as: "*a market where there are large numbers of rational, profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants*" (p.56). In an efficient market, at any point in time, the prices of traded securities already reflect the effects of all currently available information and future information (Fama, 1965a). In other words, in an efficient market the price of a security will, at any point in time, be a good estimate of its intrinsic value. This is due to the fierce competition between market participants. However, intrinsic values of securities can change when new information arrives, which was not anticipated on by market participants. Fama states that the new information is reflected instantaneously in the actual prices in an efficient market. But he also indicates two issues: first, there could be an over adjustment or under adjustment of the intrinsic value by the market. Fama states that this happens equally often. Second, the lag in the complete adjustment of the market prices to the new intrinsic values itself is an independent random variable, in which the adjustment to the actual market prices sometimes happens before the occurrence of an event and sometimes after. Fama (1965a) states that: "*The future path of the price level of a security is no more*

predictable than the path of a series of cumulated random numbers." (p.54). Prices will thus follow a random walk, indicating that Fama agrees to the random walk theory.

In his next work, Fama (1965b) states explicitly that alternative price prediction theories using historical information, such as chartist theories, cannot predict future stock prices. Around the same time Samuelson (1965), independently from Fama, found proof that anticipated prices fluctuate randomly and that markets are informationally efficient. He stated that: "*There is no way of making an expected profit by extrapolating past changes in the futures price, by chart or any other esoteric devices of magic or mathematics*" (p.44). From this point onwards further research was performed regarding efficient markets.

2.3 The Efficient Market Hypothesis

In 1970, Fama further extended and elaborated on his theory regarding efficient markets and he came up with a hypothesis: the Efficient Market Hypothesis (EMH). A market is considered efficient by Fama when security prices at any point in time fully reflect all available information. He mentioned three forms of market efficiency: the weak form, the semi-strong form and the strong form (Fama, 1970). Using these three forms (categories) allows a securities analyst to pinpoint to what level of information the hypothesis breaks down. An important note to make is that a higher level (stronger form) of the EMH always incorporates the requirements of the lower level (weaker form).

The first and lowest level of the EMH is the weak form. This form states that current stock prices reflect all information that can be derived by examining all historical market trading data. This means that information such as past prices, trading volume, or short interest are all reflected in the current price of a stock (Fama, 1970). The second level of the EMH is the semi-strong form. This form states that current stock prices to fully reflect all obviously publicly available information. This means that all information regarding the weak form is also included in the current price. The semi-strong form states that data such as public financial statements, news reports and earnings forecasts are included in the current price (Fama, 1970). The third and highest level of the EMH is the strong form. This form states that not only historical information and publicly available information are fully reflected in the current price, but also all insider information is fully reflected in the current price. Insider information is for example an impeding merger or takeover announcement. In this form all information regarding a firm is incorporated in its stock price (Fama, 1970).

2.4 Agency Theory

From the three forms of market efficiency proposed by Fama (1970), the strong form is the hardest to test. This is due to the fact that insider trading is kind of a grey area, which is hard to provide evidence for. In other words, only indications of insider trading could be perceived, but as Bachelier (1900) noted: there are innumerable influences that determine the movements of a stock on a stock exchange, thus pinpointing what indications are from insider trading remains extremely hard. At the same time the

SEC's insider trading regulation and the possible imposed penalties on violation of this regulation should discourage individuals and entities to conduct insider trading. However, there is economic literature that could explain the plausibleness of insider trading and could thus explain why, in theory, insider trading in targets' stock prior to the announcement of a takeover is happening. This economic theory is called Agency Theory and has its origins in the 1960s and 1970s when economists, amongst others Arrow (1971) and Wilson (1968), dug deeper into risk sharing among individuals and groups (Eisenhardt, 1989). Agency theory broadened the risk-sharing theories by including 'the agency problem' that occurs when the cooperating individuals or groups have different goals and division of labour (Eisenhardt, 1989). Ross (1973) states that an agency relationship occurs between two parties when one party (the agent) acts for, on behalf of, or represents the other party (the principal) in a domain of decision problems. When this is the case, the agent is taking the risks while the principal is bearing the costs. This proposes a certain problem. In agency theory this problem is called moral hazard and usually occurs when the agent has more information regarding a subject than the principal has (Eisenhardt, 1989). This makes it hard for the principal to control the agent and this can be problematic if both interests are not aligned. If the agent abuses his asymmetric information regarding a subject and affects the principal with it, this is called adverse selection (Eisenhardt, 1989). Jensen & Meckling (1976) use the metaphor of a contract to describe the principal-agent relationship. If both parties (the agent and the principal) to the relationship are utility maximisers, there could be reason to believe that the agent will not always act in the best interest of the principal (Jensen & Meckling, 1976). However, there is a solution to this problem. The principal could limit the agent's divergent behaviour from his interest by proposing appropriate incentives for the agent and by incurring monitoring in order to limit the agent's wandering activities (Jensen & Meckling, 1976). Another option could be to use extended bonding in order to guarantee that the agent will not harm the principal or to ensure that the principal will be compensated if the agent acts in such way (Jensen & Meckling, 1976). These options lead to a new type of costs called agency costs. Jensen & Meckling (1976) define agency costs as the sum of: i) the monitoring expenditures by the principal, ii) the bonding expenditures by the agent, and iii) the residual loss. The residual loss is the currency equivalent of reduction in welfare that the principal experiences as a result of the agent's divergent behaviour. Jensen & Meckling (1976) state that agency costs arise in any situation that involves a cooperative effort by two or more people, even if there is no clear principal-agent relationship at first glance.

When agency theory is applied to the possibility of insider trading in listed targets' stock, it is obvious that there is a principal-agent relationship with moral hazard and adverse selection. Corporate insiders (the agents), for example managers, high ranked employees and other supporting staff, who are aware of the future takeover, could act on this information. Since the principal's interest is to keep the information within the company, there is a difference in interest between both parties. According to Jensen & Meckling (1976) if the agents are utility maximisers there is reason to believe that they will

not always act in the best interest of the principal and therefore act on the information. The principal could try to realign the interest of both parties using bonding activities, for example a cash bonus if the deal is completed without leakage. Also, the principal could incur monitoring activities, for example the signing of a non-disclosure agreement. But still the possibility of insider trading remains at a certain level due to the highly appealing amount of returns that could be made using insider information and taking a favourable stock position.

2.5 U.S. Insider Trading Regulation

In this thesis data from takeover targets listed on the NASDAQ Composite Index is investigated. Therefore, the American financial legislation must be applied. It is therefore important to understand who the U.S. legislator dealing with insider trading is, what it exactly defines as insider trading and how it deals with possible cases of insider trading. In America the U.S. Securities and Exchange Commission (SEC) deals with (possible) cases of insider trading. It defines insider trading as follows: "*Illegal insider trading refers generally to buying or selling a security, in breach of a fiduciary duty or other relationship of trust and confidence, on the basis of material, nonpublic information about the security. Insider trading violations may also include "tipping" such information, securities trading by the person "tipped," and securities trading by those who misappropriate such information*." (U.S. Securities and Exchange Commission, 2019). Non-public, or inside, information about a company that is not known to the investing public may include, among other things, strategic plans; significant capital investment plans; negotiations concerning acquisitions or dispositions; major new contracts (or the loss of a major contract); other favourable or unfavourable business or financial developments, projections or prospects; a change in control or a significant change in management; impending securities splits, securities dividends or changes in dividends to be paid; a call of securities for redemption; and, most frequently, financial results. All information about a company is considered non-public information until it is disseminated in a manner calculated to reach the securities marketplace through recognized channels of distribution and public investors have had a reasonable period of time to react to the information. Generally, information which has not been available to the investing public for at least two full business days is considered to be non-public (Securities Exchange Act of 1934).[1] It is noteworthy to emphasize that the non-public information on which is acted must be material. Non-public information is material if it might reasonably be expected to affect the market value of the securities and/or influence investor decisions to buy, sell or hold securities.

Examples of past insider trading cases that were brought by the SEC are: "*Corporate officers, directors, and employees who traded the corporation's securities after learning of significant, confidential corporate developments; friends, business associates, family members, and other "tippees" of such officers, directors, and employees, who traded the securities after receiving such information;*

[1] 17 CFR §240.10b5-1 Trading "on the basis of" material nonpublic information in insider trading cases.

employees of law, banking, brokerage and printing firms who traded based on information they obtained in connection with providing services to the corporation whose securities they traded; government employees who traded based on confidential information they learned because of their employment with the government; political intelligence consultants who may tip or trade based on material, nonpublic information they obtain from government employees; and other persons who misappropriated, and took advantage of, confidential information from their employers, family, friends, and others." (U.S. Securities and Exchange Commission, 2019). Looking at the previous list of examples regarding insider trading, it becomes clear that insider trading happens in many different levels within a firm and through society. The SEC is very determined to detect and prosecute insider trading due to the fact that insider trading undermines investor confidence in the fairness and integrity of the securities markets. The SEC takes insider trading very seriously and violation of the prohibition on insider trading can thus result in a prison sentence and civil and criminal fines for both the individuals who commit the violation and the entity that does commit a violation.

3. Literature Review

This chapter reviews literature regarding abnormal returns in takeover targets prior to the public takeover announcement. Taking into account the EMH by Fama, the literature reviewed is also based upon the three forms of market efficiency that he presented. First, evidence in favour of the weak form and the semi-strong form will be shortly elaborated on. This is due to the fact that a market can only be strong form efficient if it is also weak and semi-strong efficient. Second, literature of abnormal returns in takeover targets prior to the public takeover announcement in the strong form will be reviewed. Third, the literature focussing on the strong form of the EMH and cumulative abnormal returns will be used to formulate hypothesis 1 in accordance with the research question. Finally, literature focussing on the possible determinants of the cumulative abnormal returns will be reviewed and hypothesis 2 will be formulated.

Jensen (1978) states that the EMH has widely been tested and has been found consistent in a wide variety of markets, amongst others, the New York and American Stock Exchanges, the Australian, English, and German stock markets. The EMH is not only found consistent at worldwide stock markets, but also at the option market, various commodity futures markets, the government and corporate bond market and the over-the-counter markets (Jensen, 1978). Yen & Lee (2008) sketch the ongoing debate in the 21th century regarding the EMH in their survey article. They state: "*… the EMH is here to stay and will continue to play an important role in modern finance for years to come.*" (p. 305). This statement is supported by Malkiel (2003) who strengthens his case by indicating that anomalies found in finance regarding the EMH self-destruct in the future, as many of them have already. As an example, Malkiel (2003) mentions the anomaly known as the January effect which has been known to have disappeared since its publication. Jensen's statement regarding the stock market is also supported by Borges (2010) regarding the weak form. She found evidence of weak form market efficiency of stock markets in France, Germany, UK, Greece, Portugal and Spain by performing tests using daily and monthly data from 2003-2007. Borges (2010) found convincing evidence that monthly returns and prices follow random walks in all of the previously mentioned six countries' stock markets.

There is evidence that suggests that stock exchanges are also (specifically) semi-strong form efficient. Groenewold & Kang (1993) found evidence that the Australian stock markets are weak form and semi-strong form efficient. They based their tests regarding the weak form on aggregate share prices indices and used macroeconomic data to test the semi-strong form. The same evidence is found by Hussin, Ahmed and Ying (2010) when they investigated the Malaysian stock exchange. Their study focuses on the announcement effect of both corporate earnings and dividend on stock prices. Hussin, Ahmed and Ying (2010) conclude that the market reaction to both earnings announcements and dividends provide evidence for semi-strong form efficiency of the Malaysian stock market. Khan & Ikram (2010) found evidence of semi-strong efficiency of the Indian capital market. In their study the efficiency is tested in relation to the impact of foreign institutional investors on the Indian capital market.

In line with this thesis' subject, much research has been done on the EMH's strong form, specifically regarding the aspect of using insider information to obtain abnormal returns by trading in stocks of listed takeover targets. Jaffe (1974) investigated registered insiders, in this case corporate insiders with access to special information regarding a listed firm, and the possibility to gain abnormal returns around corporate events. He concludes that registered insiders do in fact possess special information that can yield them superior returns (in this case approximately 5% in the eight months following a corporate event). Jaffe (1974) even found that a trading strategy based on intensive insider trading of registered insiders is able to outperform the market. This means that insider information does have an effect on the returns an investor is able to make. But do investors actually act on this insider information?

Watson & Young (1998) present preliminary evidence that insider trading does occur surrounding takeover announcements in Australia analysing data from January 1996 to June 1998. The researchers found that buy activity, both early in the event window and immediately prior to the takeover announcement, is significant. Watson & Young (1998) state that this result suggests that there is a certain disregard for the regulatory authorities. Their results do also indicate that there is some kind of informational hierarchy, because executive directors tend to trade earlier in the process than non-executives.

Meulbroek (1991) found that, using previously unexplored data from the SEC, the market detects and reacts to the possibility of informed trading in target's stock. She states that on an insider trading day an average of 3% abnormal returns were made. Meulbroek (1991) uses insider trading days which are detected by the SEC, which were subsequently cited in a civil case, to examine excess returns on all days of insider trading. Prior literature uses executive transactions as a definition for an insider trading day. Furthermore, Meulbroek (1991) found evidence that almost half of the stock price run-ups that are observed before the announcement of the actual takeover occur on an insider trading day.

Jarrel & Poulson (1989) investigated 172 American exchange listed targets of successful takeover bids in the period of 1981-1985. They found significant stock price run-ups and volume increases prior to the public announcement date of the bids. Jarrel & Poulson (1989) state that in their dataset about 40% of the eventual takeover premium is anticipated in the pre-bid stock price run-up. This pattern is considered to be consistent over time. The researchers found that the presence of rumours in the news media about an impending bid is the strongest explanatory variable affecting the pre-bid run-up. Another interesting finding by Jarrel & Poulson (1989) is that they found evidence that paid premiums by acquirers are lower when the market did not anticipate the takeover bid. Furthermore, the pre-bid run-up appears to be greater when the acquirer holds a relatively large position of the target's stock at the time of a bid.

Sanders & Zdanowicz (1992) analysed the average abnormal stock returns, the average abnormal trading volume and open market purchases by insiders (the firm's officers, directors and investment advisors)

using private information for a sample of 30 American listed target companies who experienced a change in control during the period of 1978 and 1986 using an event study. Sanders & Zdanowicz (1992) found no evidence of significant average abnormal returns or average abnormal volume in the period before the transactions occur. The researchers argue that the target firm's stock price run-up begins after the start of the insider transactions, but before its official announcement became publicly available. This would mean that a price run-up is happening due to the fact that a shareholder is increasing his/her share ownership before the official public announcement. However, Sanders & Zdanowicz (1992) found, unlike Jarrel & Poulson (1989), no evidence of abnormal trading volume before the official public announcement.

Keown & Pinkerton (1981) investigated one area of possible insider leakage of unannounced merger plans and examined the impact of trading on this insider information prior to the planned takeover announcements. The researchers analysed a sample of 194 acquired target firms prior to their first official public announcement of planned mergers in the period of 1975-1978 by looking at daily stock price movements. The researchers performed an event study and used the Cumulative Abnormal Return (CAR) method.[2] They found evidence that abnormal returns are earned by investors trading in stocks of takeover targets prior to the first public merger announcement. There appears to be a leakage of information at a significant level up to twelve days prior to the first official public announcement of a merger, which could indicate insider trading. Keown & Pinkerton (1981) found evidence that the semi-strong form of the EMH holds due to the fact that the market reacted in full on the availability of public information the day after the announcement.

Agarwal & Singh (2006) performed an event study on the Indian capital market based on a sample of 42 companies of which the merger announcement date was announced in the period of 1996-1999. The researchers performed an event study and used a modified market model to estimate the parameters of the estimation window. Agarwal & Singh (2006) used the calculated average return and the cumulative average return, which are measures of abnormal returns, to examine the pattern of stock prices. Agarwal & Singh (2006) concluded that in six cases possible insider trading happened.

Black (1975) suggested that if informed traders might act on insider information, they may prefer to trade on the option market. One of the advantages of using the option market instead of the stock market is the fact that the possibility to use leverage on the option market increases the profitability of the trades while traders virtually act on risk-free information. Jayaraman, Frye & Sabherwal (2001) found evidence of a significant increase in trading activity of call and put options for companies involved in a takeover prior to a rumour of a merger or acquisition. Furthermore, the increased abnormal trading activity in the option market appears to lead to abnormal trading volume in the stock market.

[2] See paragraph 4.1.4 for a detailed explanation of the Cumulative Abnormal Return (CAR) method.

Clements & Singh (2011) examined target firms in the United States in period of 2001-2006 and found evidence of both informed and contraire trading in the stock market by using abnormal returns and trading volume analysis. They also analysed the option market by using abnormal returns and found evidence of insider trading on this market.

In contrast to the previous studies, Agrawal & Nasser (2012) found no evidence in favour of increased insider trading regarding stock purchases. However, they found evidence that registered insiders do engage in profitable passive insider trading. This means that registered company insiders do act on insider information by, for example, sell less shares as they would have if no takeover was happening. In their study Agrawal & Nasser (2012) examined open market stock trades by registered insiders in 3700 targets of takeovers announced in the period of 1988-2006. The researchers used the difference-in-difference analysis of several insider trading measures using a controlled sample of non-targets. The difference-in-difference analysis calculates the effect of a treatment on an outcome by comparing the average change in the outcome variable over time for the treatment group and compared that outcome to the average change over time for the control group. Agrawal & Nasser (2012) found no evidence of increased stock purchases before takeover announcements.

Another aspect of trading in a target's stock prior to the takeover is an increase in volume of stocks traded. As mentioned before, Jarrel & Poulson (1989) found evidence of increased volume prior to the takeover announcement. Easley & O'hara (1987) presented a model which illustrates that informed (insider) traders prefer to trade large(r) amounts of stocks, which could lead to increased trading volume. Eyssell & Arshadi (1993) also found evidence of pre-takeover volume run-ups which could be explained by increased insider trade volume.

As the previous reviewed literature showed, the strong form of the EMH in relation to abnormal returns prior to a target's takeover announcement remains highly relevant. As Jaffe (1974) showed that acting on insider information is highly profitable, Watson & Young (1998) illustrated that insider trading is actually happening prior to target's takeover announcements to make a profit. This result is supported by Meulbroek (1991) as she found evidence that almost half of the stock price run-ups that are observed before the announcement of the actual takeover occur on an insider trading day. The existence of price run-ups is supported by Jarrel & Poulson (1989) as they found significant stock-price run-ups and volume increases prior to the announcement date of takeover bids. Sanders & Zdanowicz (1992) support Jarrel & Poulson's (1989) finding and state that price run-ups start prior to the announcement date of a takeover. Keown & Pinkerton (1981) also found evidence that abnormal returns are earned by investors trading in stocks of takeover targets prior to the first public announcement, which they attribute to possible leakage of insider information. Agarwal & Singh (2006) found six cases of insider trading in their study, which they reported to the authorities.

From the reviewed literature it became clear that much research has been done on the subject of the strong form of the EMH in relation to abnormal returns. Literature by Meulbroek (1991) and Jarrel & Poulson (1989) showed evidence of stock price run-ups in the period before the official public announcement of a takeover. This observation keeps on returning in future literature of, amongst others, Keown & Pinkerton (1981), Sanders & Zdanowicz (1992), and Agarwal & Singh (2006). It will be very interesting to investigate whether this recurring pattern will be present in recent takeovers in a developed country's stock market, for example an American stock market. Thus, a study on this subject during the period of 2009-2018 of the NASDAQ Composite Index will be relevant. Also, there are studies using NASDAQ listed takeover targets as a component of their study (amongst others Wu, Lin & Yang, 2018; Dai et al., 2017), but there are no recent studies (2015-now) solely focussing on takeovers of listed companies at the NASDAQ Composite Index. This remains strange since Agrawal & Nasser (2012) found evidence in their research that targets listed on NASDAQ experience greater abnormal returns in comparison to targets listed at NYSE or AMEX. Furthermore, the NASDAQ Composite Index holds mostly stocks of tech-companies (NASDAQ, 2019b).[3] Due to a market consolidation in the tech-sector a lot of takeovers have taken place in the last two decades. The Institute for Mergers, Acquisitions and Alliances (IMAA) (2019) looked at all announced mergers and acquisitions in the United States by sector during 2000-2018 and found that 19.9% of total 38,350 merger and acquisition deals are deals in the technology sector. Looking at the combination of the large technology component of the NASDAQ Composite Index and the fact that most of the merger and acquisition deals are actually deals in the technology sector, makes the NASDAQ Composite Index very interesting to investigate.

Taking into account the fact that there is no recent literature solely focussing on the NASDAQ Composite Index, while Agrawal & Nasser's (2012) research found evidence of larger abnormal returns of NASDAQ listed targets in comparison to NYSE and AMEX listed targets and the fact that most takeovers reported in the last two decades are of targets in the technology sector (which is the NASDAQ Composite Index' biggest component) focussing this study regarding abnormal returns and possible insider trading on listed stocks on the NASDAQ Composite Index will be highly relevant and interesting.

In this research the focus will solely be on the targets and not the acquirers. Reason for this focus is the fact that on average firms acquire other firms (targets) at substantial premiums over the market value (Varaiya, 1987). Bradley & Korn (1979) found that in their paper that the average amount paid over the market value was 53% and was between a range of 23% and 115%. This would mean that an acquirer in all cases pays a premium (of at least 23%) over the current market value of a target firm. This means that the premium paid would be a constant factor and this indicates that a price run-up to the takeover bid could always be the case. At the same time, an acquisition of a target by an acquirer might not always

[3] Components on 11-06-2019 are: Technology (45.73%), Consumer Service (21.33%), Health Care (10.35%), Financials (7.73%), Industrials (7.12%), Consumer Goods (5.64%), Telecommunications (0.79%), Oil & Gas (0.51%), Utilities (0.49%) and Basic Materials (0.31%).

be experienced positively by the shareholders of the acquirer. In many cases the acquirer pays a higher premium than it should have. Roll (1986) found that "*... decision makers in acquiring firms pay too much for their targets on average...*" (p. 212). Roll (1986) mentioned in his paper that this might be due to the hubris of the decision maker, hence the hubris hypothesis. Hayward & Hambrick (1997) found evidence of losses in acquiring firms' shareholder wealth following an acquisition. Taking the previous mentioned evidence into account, this study will only focus on NASDAQ Composite Index listed targets.

Taking into account the studies of Meulbroek (1991) and Jarrel & Poulson (1989), who found a price run-up prior to the official takeover announcement, studies by Keown & Pinkerton (1981) and Sanders & Zdanowicz (1992), who found evidence of abnormal returns prior to the official takeover announcement, and the study by Agarwal & Singh (2006), who even found evidence of insider trading in six cases in their dataset, the following hypothesis is constructed:

Hypothesis 1: *NASDAQ Composite Index listed takeover targets experience abnormal returns prior to the official public takeover announcement.*

Hypothesis 1 will be investigated using the methodology presented in chapter four (paragraph 4.1).

Since the literature reviewed in the previous section is completely in favour of the existence and presence of abnormal returns prior to a target's takeover announcement, another question arises: what are the determinants of abnormal returns prior to a target's takeover announcement? Much research has been conducted regarding the possible determinants of abnormal returns prior to a target's takeover announcement. First, a literature review about the subject will be given. Second, a motivation regarding the chosen determinant for further investigation in this study will be given. Finally, hypothesis 2 will be formulated.

Borges & Gairifo (2013) investigated four Euronext stock markets (Belgium, France, The Netherlands and Portugal) during 2001-2007 regarding the effect of acquisition announcements on the stock price of target firms, which leads to an opportunity for insiders to obtain significant abnormal returns. The researchers found pre-announcement price run-ups, which is in line with previously discussed literature. Borges & Gairifo (2013) examined the cumulative abnormal returns in an event window of 60 days prior to the takeover announcement and tested whether: i) the presence of rumours in the media; and ii) the percentage of capital previously owned in the target firm by the acquirer could explain a part of the stock price run-up. The researchers found that, in line with results by Jarrel & Poulson (1989), the presence of rumours in the media prior to the takeover announcement and the percentage of capital previously owned in the target firm by the acquirer prior to the takeover announcement do have explanatory power. Firms which had rumours circulating in the media had a pre-announcement price run-up which was up to 30% higher than other takeover target firms. Furthermore, Borges & Gairifo (2013) found no evidence

of the impact of other factors on the stock price run-up such as: i) the bid being a hostile bid or a friendly bid; ii) recommendations of market analysts and; iii) market-to-book value of the firm.

Ishii & Xuan (2014) investigated the effect of social ties between acquirers and targets on merger performance using data for 539 acquisitions during 1999 and 2007. The researchers found that between-firm social ties have a significantly negative effect on the abnormal returns to the acquirer and to the combined entity upon the merger's announcement. Furthermore, they found that acquirer-target social ties significantly increase the likelihood that the target firm's CEO and a larger fraction of the target firm's pre-acquisition board of directors remain on the board of the combined firm in the post-merger state. Given the significant negative effect on abnormal returns, their results suggest that social ties between the acquirer and the target lead to overall lower value creation for the existing shareholders.

Wansley, Lane & Yang (1983) investigated whether the abnormal returns to acquired firms are affected by type of acquisition and the method of payment. The researchers investigated a sample of 203 firms between 1970 and 1978 and found, in contrary to their initial expectations, that pure conglomerate acquisitions are associated with larger (not significantly larger) abnormal returns than horizontal or vertical takeovers. Furthermore, the researchers found that the target's shareholders in pure cash acquisitions earn on average 33.54% abnormal returns from 40 days prior to the takeover announcement, while target's shareholders in pure stock acquisitions earn on average 17.47% abnormal returns. The difference between the two, which is almost double in size, is attributed by the researchers to a tax effect, regulatory requirements that favour cash as a medium of stock exchange, and an increasing popularity of cash transactions during a period of generally higher premiums across all mergers. The tax effect is an aspect of a transaction which must always be taken into account, since it is determined by the method of payment. A stock transaction, in contrary to a cash transaction, is tax deferred. This would mean that cash offers often have higher returns (and higher abnormal returns) than stock offers to compensate shareholders for the immediate payment of taxes.

Huang & Walkling (1987) investigate whether target abnormal returns associated with takeover announcement are related to the form of payment, the degree of managerial resistance and the type of offer. The researchers investigated 204 (after screening) target firms between April 1977 and September 1982. Their results indicate that interdependence between the investigated characteristics is important. Huang & Walkling (1987) found that, after controlling for the payment method and the degree of managerial resistance, the difference in abnormal returns between tender offers and mergers is insignificant. Furthermore, resisted offers are found to be insignificantly higher than unresisted offers. Finally, abnormal returns in pure cash offers are found to be significantly higher than pure stock offers.

Davidson & Cheng (1997) investigated whether the form of payment affects the abnormal returns of target firms. The investigated sample consisted of 219 targets between 1981 and 1987 listed at the NYSE or AMEX. To research the subject of payment method, control variables were used, such as: i) asset

relatedness; ii) takeover type; iii) multiple bidders; iv) relative size of bidders and targets; v) Tobin Q; and vi) undistributed cash flows. Davidson & Cheng (1997) show that (without controlling for other variables) abnormal returns prior to the takeover announcement are significantly larger when a deal is done using cash, than when a deal is a pure stock deal. These results are consistent with previous literature by Wansley, Lane & Yang (1983) and Huang & Walkling (1987). The researchers also found that target firm shareholders in cash acquisitions receive larger bid premiums than targets in stock acquisitions. This indicates that targets, which are acquired by paying cash, demand and receive larger premiums than targets acquired by paying in stock, which is found consistent with the previously mentioned tax explanation.

Burch, Nanda & Silveri (2012) investigated shareholders' preference regarding the method of payment and premiums in acquisitions. The researchers investigated 1,881 mergers announced during 1981 and 2006, in which both targets and acquirer are listed on the NYSE, AMEX or NASDAQ. They left out regulated utilities and firms in the financial services industry. Burch, Nanda & Silveri (2012) found that bid premiums in stock offers are negatively and jointly related to the targets' shareholders' tax liabilities and are dependent on the targets' shareholders' willingness to hold the acquirer's stock.

Examining the previously reviewed literature, it becomes clear that there are many possible determinants of abnormal returns in target firms prior to the public takeover announcement. However, one determinant which tend to have a consistent effect amongst all studies is: the method of payment. The method of payment relates to the way the acquirer pays for the ownership of the targets' stock. There are three possible ways of payment that are considered. First of all, an acquirer could propose to buy all the targets' shares for cash. This means that the acquirer simply buys all the outstanding shares from the shareholders directly with money. Second, an acquirer could propose a deal in which the payment completely takes place in stock. In this structure, the targets' shareholders 'trade in' their target's stock for the stock of the acquirer or the new established entity after the merger or takeover. Third, the acquirer proposes a deal which is a combination of the previously two mentioned structure. In this case the target's shareholders will receive one part cash and one part of stock of the acquirer or the new established entity after the merger or takeover.

Choosing which method of payment is used has a lot of consequences for the target's shareholders. Huang & Walkling (1987) state that factors that may influence the choice of payment method include taxes, accounting treatment, compensation effects, regulatory requirements and agency problems. The most important influence is considered to be the tax issue. The taxability of gains to target shareholders is in a large way determined by the method of payment. In general, an acquisition could be tax-deffered, but then a target's shareholder is required to continue ownership in the new combined firm after the transaction. If a transaction takes place using cash, there is an exchange of ownership for cash, which makes the transaction directly taxable. According to these issues regarding tax arguments, cash offers

often have higher returns than stock offers have. This is due to the fact that target's shareholders who are offered a cash offer are compensated for the immediate payment of taxes. The theoretical higher offer could lead to relatively higher cumulative abnormal returns.

It would be very interesting to investigate whether the method of payment has an effect on the cumulative abnormal returns observed in this study. This study would add to existing literature due to the fact that targets listed on the NASDAQ Composite Index during 2009-2018 will be investigated, which has not been done before, using this dataset. Given the reviewed literature, this study expects that there is an effect of the chosen method of payment on the abnormal returns prior to the takeover announcement of a target. The abnormal returns in a pure cash transaction appear to be higher than in a pure stock transaction or a transaction of consisting of a combination of cash and stock. The most important explanation for this phenomenon is the taxability of cash gains. The following hypothesis is constructed:

Hypothesis 2: *NASDAQ Composite Index listed takeover targets experience relatively larger abnormal returns prior to the takeover announcement if the proposed method of payment is completely in cash.*

Hypothesis 2 will be investigated using the methodology presented in chapter four (paragraph 4.2).

4. Data and Methodology

In this chapter the data(set) used in this research and the methodology used to conduct this research will be elaborated on. Paragraph 4.1 is devoted to the data and methodology regarding hypothesis 1. In paragraph 4.1.1 the data selection process of the selected target firms will be given. Paragraph 4.1.2 elaborates on the method used to conduct this research, namely the event study. Paragraph 4.1.3 gives an overview of frequently used normal return models regarding the event study. This paragraph concludes with a comparison and selection of the most suitable normal return model. In paragraph 4.1.4 the (cumulative) average abnormal returns and the equations of these returns will be given. Paragraph 4.2 is devoted to the data and methodology regarding hypothesis 2. In paragraph 4.2.1 the data selection process of the selected target firms will be given. Paragraph 4.2.2 elaborates on the method used to conduct this research.

4.1 Data and Methodology - Hypothesis 1

4.1.1 Data

The first step in the analysis, to test the previously mentioned first hypothesis, is to collect the necessary data. The data includes a list of all the NASDAQ Composite Index listed firms which were a takeover target during the period of 2009-2018 and their public takeover announcement date. The deals data is collected from FactSet. In order to filter the dataset, some criteria are selected. First, the announcement date is set to the period 01/01/2009-12/31/2018. Second, the deal type is specified to 'acquisition/merger'. Third, the transaction status is selected to 'Complete' and 'Pending'. The transaction status 'Pending' is also added in the sample, since this thesis focusses on the pre-announcement price run-up and abnormal returns. If a transaction is pending, it did already pass the event date, the public takeover announcement, which indicates that it is past the event window and can thus be investigated regarding this thesis' subject. Fourth, in order to make sure that only public listed companies enter the dataset the target ownership type is specified to 'Public Company'. Fifth, since this thesis focusses on NASDAQ Composite Index listed takeovers the target stock exchange is specified to 'NASDAQ'. Sixth, the percentage of target shares owned at completion is set to 100%. Finally, to make sure that only deals with decent size (NASDAQ's mid-cap and up) enter the dataset the transaction value is set to 2 billion U.S. dollars. One reason to set the transaction value at this level is for comparability reasons. A minimum level of 2 billion U.S. dollars ensures that relatively small transactions do not mix in with the larger ones, relatively levelling the observation's playing field, while at the same time remaining at the number of observations which is consistent with the reviewed literature. Taking into account all the above-mentioned filters, a dataset of 171 takeover targets is obtained.[4] A dataset of this size is in line with the reviewed literature regarding this subject. Furthermore, the takeover target's daily stock data and returns before the takeover announcement and shortly after have to be obtained, as well

[4] A complete list of all target firms can be found in Appendix A.

as the daily NASDAQ Composite Index's returns. This data is collected from Eikon - Thomson Reuters (Datastream) and paired with the deals data from FactSet. This last step results in a complete dataset which is ready for the analysis in STATA.

4.1.2 Methodology

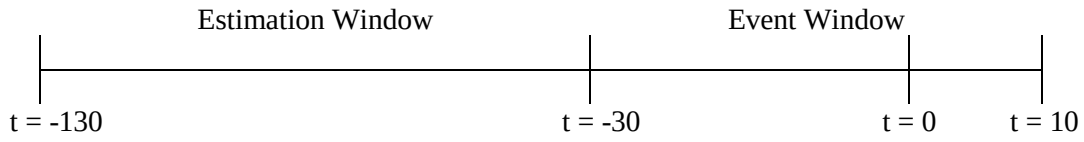
The second step in the process is to set the parameters for the analysis. In accordance with the research method presented by Fama et al. (1969) an event study will be performed to test both hypotheses. The choice for an event study is based on the fact that it is the standard method to investigate such topics. Binder (1998) states that: "*The event study methodology has, in fact, become the standard method of measuring security price reaction to some announcement or event."* (p.111). To correctly perform the event study all the event dates, in this case the official public announcement dates, must be collected, as well as the stock returns of all the companies in the dataset around the event.

First, the event window must be determined. The event window is at least the day of the announcement itself (MacKinlay, 1997). However, to capture the price effects of the announcement which occur after the stock market closes the next day should be included in the event window as well (MacKinlay, 1997). Armitage (1995) states that: "*Two day event windows are common if the event date can be determined with precision, supplemented with cumulative abnormal returns for longer periods before and after*." (p.34). Since in this analysis the event date is known with great precision, the event window could be set to two days: the announcement date plus the day after. However, since this thesis focussed on abnormal returns prior to the announcement date of the takeover indicating possible insider trading, there is the issue of information leakage that must be addressed. Reason for this is the fact that the leaked information shall be acted on immediately indicating that there will be abnormal returns prior to the official announcement. There is no consensus regarding the length of the event window in the literature. Keown & Pinkerton (1981) used an event window of 60 trading days before and 10 trading days after, while Sanders & Zdanowicz (1992) use an event window of 60 trading days prior to the announcement and 60 trading days after the announcement. Vega (2006) only uses two trading days as the event window. Due to the inconsistencies regarding the event window in the relevant literature, an event window of 30 trading days before the announcement date and 10 trading days after the announcement date is used to test hypothesis 1. This event date is longer than Vega's (2006) two trading days, but shorter than Keown & Pinkerton's (1981) and Sanders & Zdanowicz's (1992) event window. Looking at the results from the literature there is an effect of increasing $\overline{AR}$ and $\overline{CAR}$ within the 30 trading days prior to the event date and not in the period 60-30 trading days prior to the event date. Therefore, this study uses an event window of 30 trading days prior to the event date and 10 trading days after the event date. This event window is long enough to spot an increase in the cumulative average abnormal returns prior to the announcement date (on average a month and a half of trading days) and the stock's price reaction after the announcement (on average a week and a half). Furthermore, since this study focusses on the issue whether there are abnormal returns prior to the event date, the returns' significance will be

calculated for each day separately. This is due to the fact that, using this method, the exact day can be pinpointed at which possible abnormal returns are achieved. This method makes it easier to spot possible periods of abnormal returns and possible increasements of abnormal returns.

Second, the estimation window must be established. Armitage (1995) states that in practice estimation window periods range from 100 to 300 trading days for daily return studies. However, lengthening the estimation window does involve a trade-off between a greater estimation of the coefficients and the fact that the coefficient becoming more 'out of date' (Armitage, 1995). Due to the previously mentioned trade-off and the preciseness of the event window, an estimation window of 100 trading days before the event window will be established for this analysis. This estimation window is in line with Keown & Pinkerton (1981) and Agarwal & Singh (2006), who also used an estimation window of 100 trading days prior to the event window. Figure 1 shows the chosen timeline regarding the event study's estimation window and event window.

Figure 1: Timeline Event Study



4.1.3 Normal Return Models

The third step in the process is the calculation of the normal returns and thus the choosing of a fitting model. In order to appraise the impact of the event, the abnormal returns must be measured (MacKinlay, 1997). MacKinlay (1997) states: *"The abnormal return is the actual ex post return of the security over the event window minus the normal return of the firm over the event window."* (p.15). The normal return of the firm is defined as the expected return without conditioning on the event taking place. In this case the estimation window of the normal return of the firm will be 100 trading days prior to the event date as previously is mentioned. Thereafter, the expected returns around the event date must be adjusted for market performance and risk in order to correctly find the abnormal returns for all firms in the dataset.

There are several models that can be used to calculate the normal returns. MacKinlay (1997) makes a clear distinction between statistical models and economic models to calculate the normal returns. Statistical models follow from statistical assumptions regarding the behaviour of asset returns, they do not depend on any economic arguments. In contrast to statistical models do economic models rely on assumptions regarding the behaviour of the investors and are not solely based on statistical assumptions. In paragraph 4.1.3.1 the statistical models: the index model, the constant mean return model and the market model, will be elaborated on. The economic models will be explained in paragraph 4.1.3.2. In that paragraph the capital asset pricing model and the arbitrage pricing theory will be explained. In paragraph 4.1.3.3 the choice for the model that is used in this thesis will be elaborated on.

4.1.3.1 Statistical Models

Index Model (IM)

There are several statistical models frequently used in event studies. The simplest statistical model is called the Index Model (IM) and assumes that, over any period *t*, a share *i* will earn the market rate of return, R_{mt} (Armitage, 1995). In this case the abnormal returns, AR_{it}, is the actual return R_{it} minus R_{mt} (Armitage, 1995). The IM is used by, amongst others, Lakonishok & Vermaelen (1990) to investigate abnormal returns from selling shares to companies which offer to repurchase them by using a tender offer. Equation 1 shows the IM.

$$AR_{it} = R_{it} - R_{mt} \tag{1}$$

Constant Mean Return Model (CMRM)

Another relatively simple statistical model is the Constant Mean Return Model (CMRM). This model uses μ_i as the mean return for asset *i* and adds a disturbance term ϵ_{it} for asset *i* with the expected value of zero and variance $\sigma^2{}_{\epsilon t}$ (MacKinlay, 1997). Equation 2 shows the CMRM.

$$R_{it} = \mu_i + \sigma^2{}_{\epsilon t} \tag{2}$$

Although the CMRM is considered a relatively simplistic model, Brown & Warner (1980, 1985) find that it often yields results similar to those of more sophisticated models (MacKinlay, 1997). This is due to the fact that the variance of abnormal returns is often not reduces by a lot if one chooses a more sophisticated model (MacKinlay, 1997).

Market Model (MM)

The market model is the most common used statistical model to calculate the normal returns (Armitage, 1995). This model estimates the relationship between a share's returns and the returns on the market by using an ordinary least squares regression. This relationship is used to estimate the expected returns, given the returns on the market (Armitage, 1995).

Equation 3 shows the market model (Armitage, 1995).

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it} \tag{3}$$

Where:

R_{it} = the return of asset *i* over time *t*

α_i = the regression coefficient (the intercept)

β_i = $\frac{Cov(R_i,R_m)}{\sigma^2(R_m)}$ (the slope)

R_{mt} = the market rate of return over time *t*

e_{it} = the error term

If α_i and β_i are calculated with the data from the estimation window, then the returns are given by inserting the estimated values of α_i and β_i together with the actual return on the market (R_{mt}) (Armitage, 1995). To abnormal returns are calculated using equation 4.

Equation 4 shows the abnormal returns using the market model (Armitage, 1995).

$$AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}) \quad (4)$$

4.1.3.2 Economic Models

Two common economic models to estimate normal returns are the Capital Asset Pricing Model (CAPM) by Sharpe (1964) and Lintner (1965) and the Arbitrage Pricing Theory (APT) by Ross (1976). While the CAPM remains the predominant economic model regarding risky assets, the APT by Ross offers a testable alternative to the model (Roll & Ross, 1980). First the CAPM will be elaborated on followed by the APT.

Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM) by Sharpe (1964) and Lintner (1965) is a commonly used economic model to calculate normal returns. This model is based upon the model first presented by Markowitz (1952) regarding portfolio selection. His model assumes that investors are risk averse, and, when they have to choose between portfolios, investors only care about the mean and the variance of their one-period investment return (Fama & French, 2004). The mean-variance model was born. Investors choose mean-variance-efficient portfolios based upon the sense that the portfolio: i) minimizes the variance of the portfolio return, given expected return, and ii) maximizes expected return, given variance (Fama & French, 2004). Sharpe (1964) and Lintner (1965) have added two assumptions to the work of Markowitz. The first assumption that both economists added is the assumption that all investors can borrow or lend at a risk-free rate. The risk-free rate is the same for all investors and does not depend on the amount borrowed or lent. The second assumption is the fact that homogeneity of investors' expectations is assumed. This means that it is assumed that investors agree to the prospects of various investments with regard to the expected values, standard deviations and correlation coefficients. This assumption is also called 'complete agreement' (Fama & French, 2004). The combination of theories forms the basis for the Sharpe-Lintner CAPM equation that is still used in economic literature.[5]

Equation 5 shows the CAPM.

$$E(R_{it}) = R_{ft} + \beta_i(E(R_{mt}) - R_{ft}) \quad (5)$$

[5] Despite the fact that the efficiency of the market portfolio regarding CAPM is based upon many unrealistic assumptions, amongs others, unrestricted risk-free borrowing and lending and complete agreement, the CAPM remains frequently used in economic literature to estimate the cost of equity capital (Fama & French, 2004).

Where: $E(R_{it})$ = the expected return of asset *i* over time.

R_{ft} = the risk-free interest rate over time.

β_i = $\frac{Cov(R_i,R_m)}{\sigma^2(R_m)}$

$E(R_{mt})$= the expected return of the market (*m*) over time.

In other words, this means that the expected return of asset *i* is the risk-free rate, R_{ft}, plus a risk premium. This risk premium is equal to the beta, β, times the premium per unit of beta risk, $E(R_{mt}) - R_{ft}$ (Fama & French, 2004). If the expected returns of the firms are calculated by using the CAPM, the expected return minus the market return (CAPM) yields the abnormal return. Using the CAPM to calculate the abnormal returns gives equation 6 (Armitage, 1995):

$$AR_{it} = E(R_{it}) - (R_{ft} + \beta_i(E(R_{mt}) - R_{ft})) \quad (6)$$

Despite the fact that the CAPM version of Sharpe (1964) and Lintner (1965) was really innovative for its time, it has never been an empirical success (Fama & French, 2004). This lack of success is due to the fact that in the 1970's research began to uncover variables like momentum, size and price ratios which add to the explanation of the average returns which were provided by beta (Fama & French, 2004). These issues were taken so seriously that most of the applications of the CAPM were invalidated (Fama & French, 2004).

Arbitrage Pricing Theory (APT)

The APT is proposed by Ross as an alternative to the mean variance asset pricing model, which was introduces by Sharpe and Lintner (Ross, 1976). The purpose of the APT is to determine the expected rate of return on individual stocks (and portfolios of stocks) using a different approach. The APT implies that the return on a stock or other security can be broken down into two components: expected return and unexpected return, in which the unexpected return is for example a 'news' component (Cuthbertson & Nitzsche, 2005). Furthermore, this 'news' component can be broken down into 'general news', which affects all stocks, and 'specific news', which only affects the particular stock. The APT predicts that 'general news' affects the rate of return on every stock, but by a different level. For example, an unexpected rise in interest rates by 1% might affect the return on stocks of companies that are having relatively high outstanding loans with variable interest rates than a company that has relatively little outstanding loans. Equation 7 shows the APT.

$$R_{it} = R_{ft} + u_{it} \quad (7)$$

In which R_{it} equals the actual rate of return on stock *i* over time (*t*), R_{ft} equals the risk free rate of over time (*t*) and u_{it} equals the unexpected 'news' component. u_{it} can be further subdivided into systematic

or market risk (m_t) and unsystematic risk (idiosyncratic or specific risk) ε_{it}. This equation is given in 8.

$$u_{it} = m_t + \varepsilon_{it} \tag{8}$$

In order to make the APT an operational function the systematic risk (m_t) has to be defined. Equation 9 gives the definition of (m_t) in which economy-wide factors are indicated by F (indexed by *j*) and have a different effect on different securities. This is reflected in the different values for the coefficient β_{it}. In APT it is assumed that investors have homogenous expectations and that the return R_{it} on any stock is linearly related to a set of *k*-factors.

$$m_t = \sum_{j=1}^{k} \beta_{ij} F_{jt} \tag{9}$$

A crucial assumption in the APT is that the idiosyncratic risk ε_{it} is uncorrelated across different securities, which indicates that $cov(\varepsilon_i, \varepsilon_j) = 0$.

Taking into account all definitions and expectations regarding the components of the APT, equation 10 gives the expected returns of asset *i* over time (*t*).

$$E(R_{it}) = R_{ft} + \sum_{j=1}^{k} \beta_{ij} F_{jt} + \varepsilon_{it} \tag{10}$$

The CAPM and the APT

As became clear from the previous two paragraphs, the CAPM and the APT are both models which estimate the equilibrium expected returns based upon different assumptions. The APT is in many cases also named the multifactor model since it takes into account multiple factors regarding (market) risk, as the CAPM only takes into account one factor regarding market risk and could therefore be named a single-factor model (Cuthbertson & Nitzsche, 2005). While the CAPM by Sharpe (1964) and Lintner (1965) suggests that the market is completely efficient, the APT by Ross (1976) does not suggest this level of market efficiency. The APT assumes that sometimes the market misprices securities due to the misinterpretation of factors by the investor, which could lead to possible arbitrage opportunities. A disadvantage from the APT over the CAPM is the fact that the APT model involves some rather subtle arguments, which makes the interpretation of it at an intuitive level pretty hard (Cuthbertson & Nitzsche, 2005). Due to the many factors that investors must determine themselves if they want to use the APT, the CAPM is often preferred due to its relative simplicity.

4.1.3.3 Comparison of Normal Return Models

Having discussed the most commonly used statistical and economic models to calculate normal returns and market returns, it becomes clear that there are certain differences between both options. While statistical models follow from statistical assumptions regarding the behaviour of asset returns, they do not depend on any economic arguments (MacKinlay, 1997). In contrast to statistical models, economic models rely on assumptions regarding the behaviour of the investors and are not solely based on statistical assumptions (MacKinlay, 1997). First, a comparison will be made between statistical models and economic models. This paragraph concludes with a definitive choice for a model.

Comparison of Models

Research by Brown & Warner (1980) shows that the results for the IM and the MM are almost similar while conducting a monthly return research. Brown & Warner (1980) conclude that: "*A 'bottom line' that emerges from our study is this: beyond a simple, onefactor market model, there is no evidence that more complicated methodologies convey any benefit."* (p. 249). Brown & Warner (1985) applied their 1980's findings regarding monthly returns and this confirmed that it also is the case for daily returns. Dyckman, Philbrick & Stephan (1984) report a better performance of the MM (significance level of 5%) than the IM. Thus, in their study the MM is also preferred over the IM. Brenner (1979) conducted tests regarding five models including the MM, IM and CAPM. In his study he looked at stock splits, in the same way as Fama et al. (1969) did. He found that there are relatively small, but statistically significant differences between the cumulative monthly abnormal returns as measured by the IM and the MM compared to the other three. Brenner (1979) also supports the usage of the MM over other models. But at the same time, he states that: "*We conclude this study with a general recommendation for future studies testing the EMH. In tests of the EMH, different market models should be used.*" (p. 927-928). Brick, Statman & Weaver (1989) performed an analysis using five different estimation models among which the IM, MM, CAPM, the Fama-MacBeth model and the average return model. The models tend to produce similar abnormal returns, but they are not significant for the CAPM and the average return model. Thus, Brick, Statman & Weaver's (1989) analysis supports the usage of the MM and disapproves the usage of the CAPM. While Brenner (1979) and Brick, Statman & Weaver (1989) suggest that the usage of multiple models matters more than that Brown & Warner (1980, 1985) and Dyckman, Philbrick & Stephan (1984) suggest, their results are largely consistent. All four studies find that the IM and the MM give similar results, which is not surprising since the IM is a special case of the MM (Armitage, 1995). Regarding the CAPM, both Brenner (1979) and Brick, Statman & Weaver's (1989) report significance differences between the CAPM and the MM (which is not tested by Brown & Warner (1980, 1985) and Dyckman, Philbrick & Stephan (1984)). Dimson & Marsh (1986) and Seyhun (1986) both noted that the MM abnormal returns are much less prone to biases due to the size effect (this has to do with the fact that a share with high returns has a high regression constant). For that reason, they prefer the usage of the MM. Armitage (1995) concludes his study by stating: "*The main conclusions up*

to this point are that the different models produce similar but not identical results and that the market model is the most reliable in the sense that, across each of the range of circumstances tested, it is always at least as powerful as the best alternative" (p. 33).

Choice of Model

While assessing both statistical models and economic models it must be noted that the CAPM used certain assumptions which are not very realistic for real world application. Three of these assumptions are: unrestricted borrowing and lending at the risk-free rate, the fact that homogeneity of investors' expectations is assumed (complete agreement) and unrestricted short selling of risky assets (Fama & French, 2004). Statistical models do not assume these unrealistic assumptions in order to calculate their returns. Strengthened by literature from Brown & Warner (1980, 1985), Dyckman, Philbrick & Stephan (1984), Brenner (1979), Brick, Statman & Weaver's (1989), Dimson & Marsh (1986), Seyhun (1986) and Armitage (1995) who all state that the MM is at least as powerful as the best alternative or superior to the alternative, in this thesis the MM will be used as the normal return model.

4.1.4 (Cumulative) Average Abnormal Returns

The fourth step in the analysis is to test whether abnormal returns are achieved by the targets in the period prior to the event date. Since the dataset consists of 171 listed target firms, the analysis will proceed by means of Average Abnormal Returns ($\overline{AR}$) and Cumulative Average Abnormal Returns ($\overline{CAR}$).

First, the $\overline{AR}$ must be calculated. The $\overline{AR}$ is equal to the summation of all targets' abnormal returns divided by the number of targets. Equation 11 shows the formula for the $\overline{AR}$.

$$\overline{AR}_{it} = \sum_{i=1}^{i=N} \frac{AR_{it}}{N} \tag{11}$$

To test the significance of the $\overline{AR}$, the test statistic for all trading days in relation to the $\overline{AR}$ will be computed. In order to calculate the test statistic, first the standard error (SE) of the $\overline{AR}$ must be calculated. Equation 12 shows the formula for the calculation of the SE ($\overline{AR}$).

$$SE(\overline{AR}_{it}) = \sqrt{\sum_{t=10}^{t=-130} \frac{(AR_{it} - \overline{AR}_{it})^2}{(N-1)}} \tag{12}$$

Finally, now that all components of the test statistic are clear, the test statistic can be calculated. The test-statistic is a calculation which divides the average abnormal return ($\overline{AR}_{it}$) by the standard error ($SE(\overline{AR}_{it})$) and is shown in equation 13 (Brown & Warner, 1985):

$$Test\ statistic = \frac{\overline{AR}_{it}}{SE(\overline{AR}_{it})} \tag{13}$$

The test statistic can be significant at all different kind of levels. In this analysis the four levels that are used are the 0.10, 0.05, 0.02 and the 0.005 significance levels. These significance levels are chosen in line with study of Keown & Pinkerton (1981). If the test statistic is statistically significant at one of these levels, this means that there are actually abnormal returns being made during the investigated period. The t-test will be performed using STATA.

The final step in the analysis is to calculate the Cumulative Average Abnormal Returns ($\overline{CAR}$) using STATA for the whole period. The $\overline{CAR}$ is basically a cumulation of the test-statistic, equation 14 shows the exact calculation of this term.

$$\overline{CAR}_{it} = \overline{AR}_{it} + \overline{CAR}_{it-1} \tag{14}$$

When no abnormal returns are obtained the $\overline{CAR}$ should fluctuate around zero (MacKinlay, 1997). This is due to the fact that the test statistic should fluctuate around zero in a period of normal returns. However, if there is leakage of or trading on insider information prior to the event date, this should show up in the form of positive daily average abnormal returns (Keown & Pinkerton, 1981). If positive abnormal returns are obtained, the $\overline{CAR}$ should run up over time, having its theoretical maximum on the event date or the day after, if the announcement happens after closing time (MacKinlay, 1997). To indicate the presence of insider trading, one would expect to see a non-random pattern of positive $\overline{AR}$ in the days prior to the event date. This would mean that the targets' return is consequently outperforming the market's return. This means automatically that one would expect to see a positive $\overline{CAR}$ in the period prior to the event date, as an indication of a possible leakage of and/or trading on insider information. In chapter five the results from the previously stated methodology will be presented and hypothesis 1 will be tested.

4.2 Data and Methodology - Hypothesis 2

4.2.1 Data

The dataset used to test the second hypothesis is equal to the dataset used in this study to test the first hypothesis. This means that the total dataset used consists of 171 NASDAQ Composite Index listed takeover targets, which were acquired during the period of 2009-2018. The selection process of the data is exactly the same as the process described in paragraph 4.1.1. Since, the second hypothesis focusses on the effect of the method of payment on the size of the cumulative abnormal returns, the dataset must be described in relation to this variable. This means that the independent variable 'Method of Payment' must be collected from a database using the ISIN codes of the previously collected takeover targets.

This variable is collected from FactSet's database. Furthermore, some control variables must be collected as well. The control variables that are collected from FactSet's database are: 'Attitude', 'Tender offer', 'Rumour', 'Industry relatedness' and 'Percentage of shares owned by the acquiring firm'. The choice for these control variables and the control variables itself will be extensive elaborated on in paragraph 4.2.2.3. This dataset regarding the method of payment consists of 118 Cash deals (69.01%), 42 Cash & Stock deals (25.15%) and 10 Stock deals (5.85%). The dataset is not equally distributed in terms of the independent variable method of payment, this could have an effect on the results and will be elaborated on in paragraph 6.3.

4.2.2 Methodology

In order to test hypothesis 2, a different kind of methodology must be applied. The same dataset and methodology regarding the normal return model, which was already described and explained in paragraph 4.1.1 and 4.1.3, can be used to calculate the necessary dependent variable(s). The new independent variables are collected from FactSet's database. This part of the study wants to test the effect of the method of payment on the cumulative abnormal returns per firm. Thus, the first big difference with the previously mentioned methodology is the fact that no longer is looked at the cumulative average abnormal returns $\overline{CAR}$ across the whole dataset, but the cumulative abnormal returns (CAR) for each firm must be calculated separately. The CAR is equal to the sum of the abnormal returns (AR) over the selected event window. The second difference is the fact that no longer the total run-up of abnormal returns is investigated, but that the focus shifts to a smaller event window. This means that, in order to test hypothesis 2, the CAR must be used of the exact days that the cumulative abnormal returns reach their maximum. As was explained in paragraph 4.1.4, the CAR has its theoretical maximum on the event date or the day after (MacKinlay, 1997).

4.2.2.1 Multiple Regression Analysis

To test hypothesis 2, a multiple regression analysis is used to determine the significance of the independent variable, the method of payment, in explaining the dependent variable (CAR (-1, +1)). The regression includes some control variables, which were found to have an effect on the size of abnormal returns in other studies. The exact control variables will be defined more formally in a separate paragraph (4.2.2.3). In order to determine the effect of the method of payment on targets' abnormal returns, the abnormal returns are calculated on an interval of three days. This interval is selected by following the studies of Davidson & Cheng (1997) and Ishii & Xuan (2014), in their selection of the regressions' dependent variable as the three-day cumulative abnormal return (CAR (-1, +1)), starting at t = -1 and ending at t = 1, in which day 0 is defined as the announcement day. By regressing the targets' cumulative abnormal returns against the independent variables measuring the method of payment, the relative relationship between the method of payment and the CAR can be tested. The independent variable which's effect is tested on the size of abnormal returns is the method of payments.

4.2.2.2 Statistical Model

The used statistical model for the multiple regression looks as following:

$$CAR(-1,+1) = \beta_0 + \beta_1 CASH + \beta_2 COMBI + \beta_3 HOSTILE + \beta_4 NEUTRAL + \beta_5 TENDEROFFER + \beta_6 RUMOUR + \beta_7 RELATED + \beta_8 SHARESOWNED + \epsilon$$

Where:

β_0 =	Constant
$\beta_1 CASH$ =	Dummy variable with value 1 if the acquisition's payment is completed using only cash and 0 otherwise.
$\beta_2 COMBI$ =	Dummy variable with the value of 1 if the acquisition's payment is completed using cash & stock and 0 otherwise.
$\beta_3 HOSTILE$ =	Dummy variable with the value of 1 if the bid is viewed as hostile by the market at the announcement date and 0 otherwise.
$\beta_4 NEUTRAL$ =	Dummy variable with the value of 1 if the bid is viewed as neutral by the market at the announcement date and 0 otherwise.
$\beta_5 TENDEROFFER$ =	Dummy variable with the value of 1 if the bid is a tender offer and 0 otherwise.
$\beta_6 RUMOUR$ =	Dummy variable with the value of 1 if there are rumours in the market prior to the announcement and 0 otherwise.
$\beta_7 RELATED$ =	Dummy variable with the value of 1 if the industries of the acquirer and the target are related and 0 otherwise.
$\beta_8 SHARESOWNED$ =	Variable indicating the percentage of shares owned by the acquirer in the target's firm prior to the acquisition.
ϵ =	The model's error term.

4.2.2.3 Independent Variables and Control Variables

Method of Payment – Independent Variable

This study's independent variable is 'Method of Payment'. As became clear from the literature review, this study expects that the abnormal returns of target's stock in pure cash deals are relatively higher to deals by cash & stock and deals solely paying in stocks. The main reason for this difference is the taxation effect of cash deals, which cannot be deferred. Target's shareholders are expected to be compensated for the immediate taxation, which results in larger offers and this results in larger cumulative abnormal returns. The dummy variable CASH is defined with the value of 1 if the acquisition's payment is completed using only cash and 0 otherwise. The dummy variable COMBI is defined with the value of 1 if the acquisition's payment is completed using cash & stock and 0 otherwise.

This dataset consists of 118 Cash deals (69.01%), 42 Cash & Stock deals (25.15%) and 10 Stock deals (5.85%).

Attitude – Control Variable

Morck, Shleifer, & Vishny (1988) state that there are two categories for classification of acquisitions: i) disciplinary takeovers, which's design is to replace managers who are not maximizing shareholder value, and ii) synergistic takeovers, which's design is motivated by the possible benefits that would result from merging two firms. The researchers found that synergistic takeovers tend to be friendly, while disciplinary takeovers tend to be hostile, as they go against the will of the target firm's current managers. If one follows this reasoning, it could be concluded that hostile takeovers generally involve a more aggressive offer, indicating that the cumulative abnormal returns would be higher (Borges & Gairifo, 2013). However, the abnormal returns in a hostile takeover would occur on the event date itself or the following day, instead of during the pre-announcement period. This is due to the fact that hostile takeovers have a higher incentive for secrecy in order to surprise the target firm's management in order to minimize the risk of countermeasures. Thus, hostile takeovers would have a lower pre-announcement run-up of the CAR. Friendly takeovers usually involve negotiation and an exchange of information between two firms before a final offer is made, therefore friendly takeovers generally generate more available information, which could be exploited by insiders and could lead to high pre-announcement cumulative abnormal returns (Borges & Gairifo, 2013). A neutral takeover could be classified between hostile and friendly. Taking into account the previously mentioned reasoning, this study expects relative lower cumulative abnormal returns of hostile takeovers in relation to CAR (-1, +1) compared to friendly and neutral takeovers. The dummy variable HOSTILE is defined with the value of 1 if the bid is viewed as hostile by the market at the announcement date and 0 otherwise. The dummy variable NEUTRAL is defined with the value of 1 if the bid is viewed as neutral by the market at the announcement date and 0 otherwise. This study's dataset consists of 164 friendly takeovers (95.91%), 4 hostile takeovers (2.34%) and 3 neutral takeovers (1.75%).

Tender Offer – Control Variable

Jensen & Ruback (1983) found that targets in tender offers earn 29.1% cumulative abnormal returns, while targets in mergers only earn about 20.2% cumulative abnormal returns. Bradley & Kim (1985) argue that this difference could be explained by looking at the differences in costs which are linked to the 'control premium' that is required by the target's management. In mergers, the payment of this control premium is paid directly to the target's management in the form of possible post-takeover contracts, while in tender offers the control premium goes directly to the shareholders (Bradley & Kim, 1985). This means that in mergers a separate payment of the control premium to the target's managers is allowed, which is not the case in tender offers. Bradley & Kim (1985) state that this implies that target shareholders will earn relatively lower premiums in mergers compared to tender offers. This leads to

relative higher cumulative abnormal returns in tender offers. This study expects relative higher cumulative abnormal returns when the target was acquired using a tender offer. The dummy variable TENDEROFFER is defined with the value of 1 if the bid is a tender offer and 0 otherwise. This study's dataset consists of 48 tender offers (28.07%) and 123 mergers (71.93%).

Rumour – Control Variable

Jarrel & Poulson (1989) presented evidence of the impact of rumours in the media, or press speculation, on the price run-up prior to the takeover announcement. In their study, the press speculation variable is significantly different from zero in 99% of the cases, indicating that there is an effect of this variable. Borger & Gairifo (2013) found evidence that the pre-announcement CAR run-up is higher when rumours are published in the media about a possible upcoming acquisition. The researchers observe a difference in run-up between firms targeted by rumours in comparison to firms which are not targeted by rumours between 32.4% and 37.8%. Theoretically, the high level of premiums paid in acquisitions by acquirers justifies that the media and investors should be alert to identify future takeover target firms. The publication of rumours in the media could therefore be interpreted as an increase of the possibility that a firm will be a takeover target, which triggers the run-up of cumulative abnormal returns prior to the announcement. The dummy RUMOUR is defined with the value of 1 if there are rumours in the market prior to the announcement and 0 otherwise. This study's dataset consists of 69 cases (40.35%) in which rumours were present and 102 cases (59.65%) in which rumours were not present.

Industry Relatedness – Control Variable

The relationship of industry relatedness by acquirers and targets may influence the acquirers returns positively or negatively (Davidson & Cheng, 1997). There are several reasons why an acquirer would invest in a target in a non-related industry. First, managers may attempt to reduce the acquiring firm's risk and human capital risk by diversification (Morck, Shleifer & Vishny, 1990). This would mean that acquirers purchasing a target in an unrelated industry are not operating to maximize shareholders wealth, which means that there could be negative returns for the acquirer for this takeover. This could have a positive effect on the target firm's return if the acquirer pays relatively more. Resulting in the possibility of higher cumulative abnormal returns. Second, Lewellen (1971) argues that takeovers involving firms of whose earnings are less than perfectly correlated result in a reduced probability of bankruptcy. This is due to the fact that one firm's losses can be offset by the other firm's earnings. This could lead to increased equity values for the acquiring firm (Lewellen, 1971). Third, Morck, Shleifer & Vishny (1990) state that when managers of acquiring firms perform poorly, they might have an incentive to diversify into a new industry to improve performance in order to save their jobs. This could lead to the payment of a larger takeover premium, resulting in larger cumulative abnormal returns. The effect of related industries on the cumulative abnormal returns of target's stock yields conflicting results. While Morck, Shleifer & Vishny (1990) find that acquirers lose more (or gain less) if they invest in unrelated industries

than if they invested in a related industry, Seth (1990) present evidence that also acquisitions in unrelated industries lead to gains for the acquirer, since there is still value creation happening. In order to investigate the effect of the industry relatedness by the acquirers and the targets, each pair is classified as related or unrelated. The dummy RELATED is defined with the value of 1 if the industry of the acquirer and the target are related and 0 otherwise. This study's dataset consists of 118 cases (69.01%) in which the firms' industries were related and 53 cases (30.99%) in which the firm's industries were not related.

Percentage of Shares Owned by the Acquirer – Control Variable

Jarrel & Poulson (1989) present findings which support their hypothesis that there is a positive relation between the percentage of target shares owned by the acquiring firm and abnormal returns. This finding is also found by Borges & Gairifo (2013), who present a positive and significant effect at the 0.10 level in their model. This means that there is an effect between the percentage of target shares owned by the acquirer and the increase of the pre-announcement price run-up. One explanation might be that investors who are investigating the target, could know the biggest shareholders in the firm. If a firm's shareholder has a relatively high percentage of stock in the target firm, it could be interpreted that a possible next step is an acquisition of the firm, leading to a price run-up prior to the takeover announcement. This would mean that there is a positive relation between the percentage of target shares owned by the acquirer and the cumulative abnormal returns. The variable SHARESOWNED is used as an independent control variable. This study's dataset consists of 8 firms (4.68%) in which the percentage of the target shares owned by the acquirer is positive and 163 firms (95.32%) in which the percentage of the target shares owned by the acquirer is equal to zero.

In chapter 5 the results from the previously mentioned methodology will be presented and hypothesis 2 will be tested.

5. Results

In this chapter the previously described methodology will be executed using the previously mentioned datasets. In paragraph 5.1 the empirical results of the study regarding hypothesis 1 will be presented and analysed and the hypothesis will either be accepted or rejected. In paragraph 5.2 the empirical results of the study regarding hypothesis 2 will be presented and the hypothesis will either be accepted or rejected. First, the results for the multiple regression will be presented and analysed (paragraph 5.2.1), which is followed by the robustness check regarding the regression method for hypothesis 2 (paragraph 5.2.2).

5.1 Empirical Results - Hypothesis 1

Using the dataset and methodology mentioned in chapter 4, Table 1[6], Figure 2 and Figure 3 are constructed. Table 1 shows the Average Abnormal Returns ($\overline{AR}$), the Test Statistic of $\overline{AR}$ and the Cumulative Average Abnormal Returns ($\overline{CAR}$), all in relation to the days relative to the announcement date. Figure 2 shows the Average Abnormal Returns ($\overline{AR}$) in relation to the days relative to the announcement date. Figure 3 shows the Cumulative Average Abnormal Returns ($\overline{CAR}$) in relation to the days relative to the announcement date.

Examining Table 1 and Figure 2 shows that the $\overline{AR}$ and the test statistic fluctuate around zero for almost the whole period prior to the announcement date. This is in line with the reviewed literature of MacKinlay (1997) regarding the subject. However, from t = -15 till t = -1 the $\overline{AR}$ and test-statistics are consistently positive. This means that during this period only positive average abnormal returns are achieved. In the period of t = -15 till t = -1, 6 out of 17 observations are positively significant on at least the 0.10 level. On t = -11 and t = -8 the observations are positively significant at the 0.02 level. But what is even more remarkable is the fact that from t = -4 till t = -1 the returns are all positively significant on at least the 0.10 level. On t = -1 the returns are even positively significant at the 0.005 level. These returns indicate that prior to the official announcement date consistently significant abnormal returns are being made by investors. This could indicate the leakage of or trading on insider information, but this empirical finding needs more support in order to being able to completely verify leakage of or trading on insider information.

Examining Table 1 and Figure 3 regarding the movement of the $\overline{CAR}$ for the entire sample period there appears to be a downward drift during the t = -113 till t = -46. This seems quite remarkable, but as Brown & Warner (1980) suggest: "*Like any process which follows a random walk, the CAR can easily give the appearance of 'significant' positive or negative drift, when none is present*" (p. 228-229). Therefore, no further investigation regarding this downward drift will be conducted. The $\overline{CAR}$ becomes positive firstly at t = -45 but remains consistently positive from t = -41 till the end of the sample period. The closer the $\overline{CAR}$ gets to the announcement date, the higher it becomes. Approximately a quarter of the total increase

[6] See Appendix B

in $\overline{CAR}$ occurs prior to the announcement date. This means that approximately a quarter of the market's reaction of the takeover announcement happened prior to the official announcement becomes public information.

Concluding from the previous analysis of Table 1, Figure 2 and Figure 3 the results suggest that substantial trading, possibly upon insider information, concerning the future takeover begins approximately 41 trading days prior to the takeover announcement becomes public information (taking into account the $\overline{CAR}$ becoming positive at that time), in which the $\overline{AR}$ becomes consistently positive from t = -15. Taking into account the fact that the $\overline{AR}$ is positively significant on at least the 0.10 level in the last 4 days prior to the announcement date. The $\overline{AR}$ on the final day before the takeover announcement is even positively significant at the 0.005 level, suggesting that insider information could have been abused on this day. Unfortunately, these results do not automatically mean that there was leakage of or trading on insider information in the investigated target's stock. These results do merely indicate that there could have been leakage of or trading on insider information. This issue will be further explained in paragraph 6.2.

The market does appear to adjust immediately to the first public takeover announcement. This is seen from the increase of the $\overline{CAR}$ on t = 0, on which most of the market reaction occurs. The next day an additional smaller reaction of approximately 7.39% occurs in the build-up of the $\overline{CAR}$. The seeming lag in adjustment to the public takeover announcement might be due to the fact that some public takeover announcements are made after the stock market closes. This observation is in line with research from Keown & Pinkerton (1981), who observe a similar kind of small lag in market reaction in their $\overline{CAR}$. The immediate reaction of the market to the takeover announcement indicates that the market is semi-strong form efficient. The new information that became public to the investors was acted on immediately and has led to a new stock price level. At this level the market has interpreted the news and calculated the new 'fair' price level.

Based on the previously presented empirical results, it can now be determined whether hypothesis 1 can be accepted or must be rejected. First, the hypothesis will be given, followed by the interpretation of the empirical results regarding the hypothesis. Concluding, a statement with arguments will be given whether the hypothesis will be accepted or must be rejected.

Hypothesis 1: *NASDAQ Composite Index listed takeover targets experience abnormal returns prior to the official public takeover announcement.*

Interpreting the results presented in Table 1, Figure 2, Figure 3 and the analysis given at paragraph 5.1, the results do suggest that on average the used dataset of NASDAQ Composite Index listed takeover targets do experience abnormal returns prior to the official public takeover announcement. First of all, Figure 2 and Table 1 illustrate that the $\overline{AR}$ and test-statistics are consistently positive from t = -15 till

t = -1. This means that during this period only positive average abnormal returns are being made. This could mean that there is a positive drift going on regarding the $\overline{AR}$. What is even more remarkable is the fact that from t = -4 till t = -1 the returns are all positively significant on at least the 0.10 level, on t = -1 the returns are even significant at the 0.005 level. This means that in the period of four days prior to the official announcement date consistently significant (0.10 level) average abnormal returns are being made by investors, in which the final day prior to the announcement these returns are significant on the highest level (0.005 level). Examining Figure 3 and Table 1 further support the evidence in favour of hypothesis 1. The closer the $\overline{CAR}$ gets to the announcement date, the higher it becomes. The $\overline{CAR}$ remains consistently positive from t = -41 till the end of the sample period, indicating that on average positive cumulative returns are achieved during this period. Approximately a quarter of the total increase in $\overline{CAR}$ occurs prior to the announcement date. This means that approximately a quarter of the market's reaction of the takeover announcement happened prior to the official announcement becomes public information. These findings support hypothesis 1 indicating that the NASDAQ Composite Index listed takeover targets do experience abnormal returns prior to the official public announcement date. Since the significant results from Table 1, Figure 2 and Figure 3 do support hypothesis 1, the conclusion from the analysis is that hypothesis 1 is accepted.

Figure 2

Average Abnormal Returns – Market Model – Entire Sample

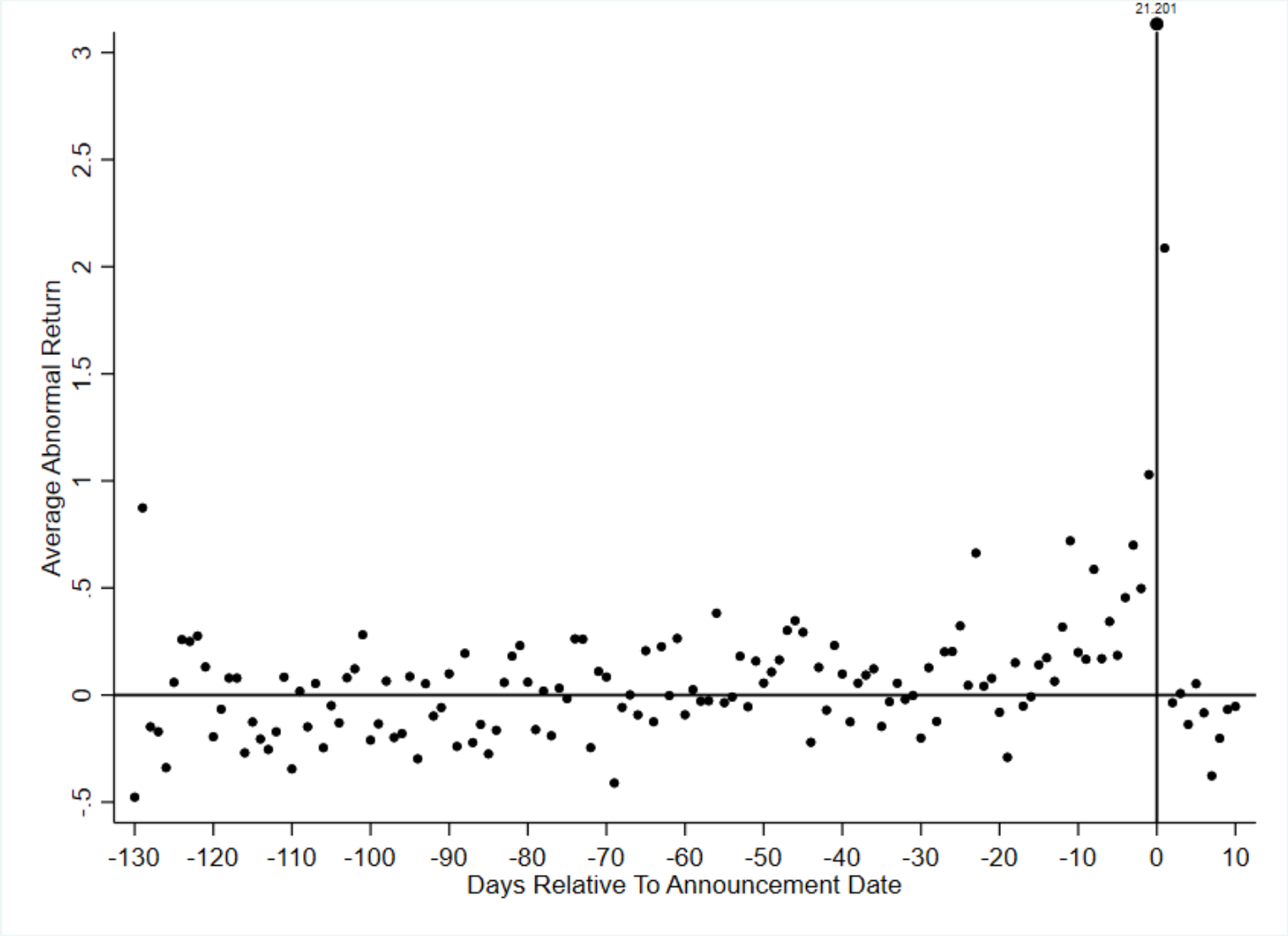
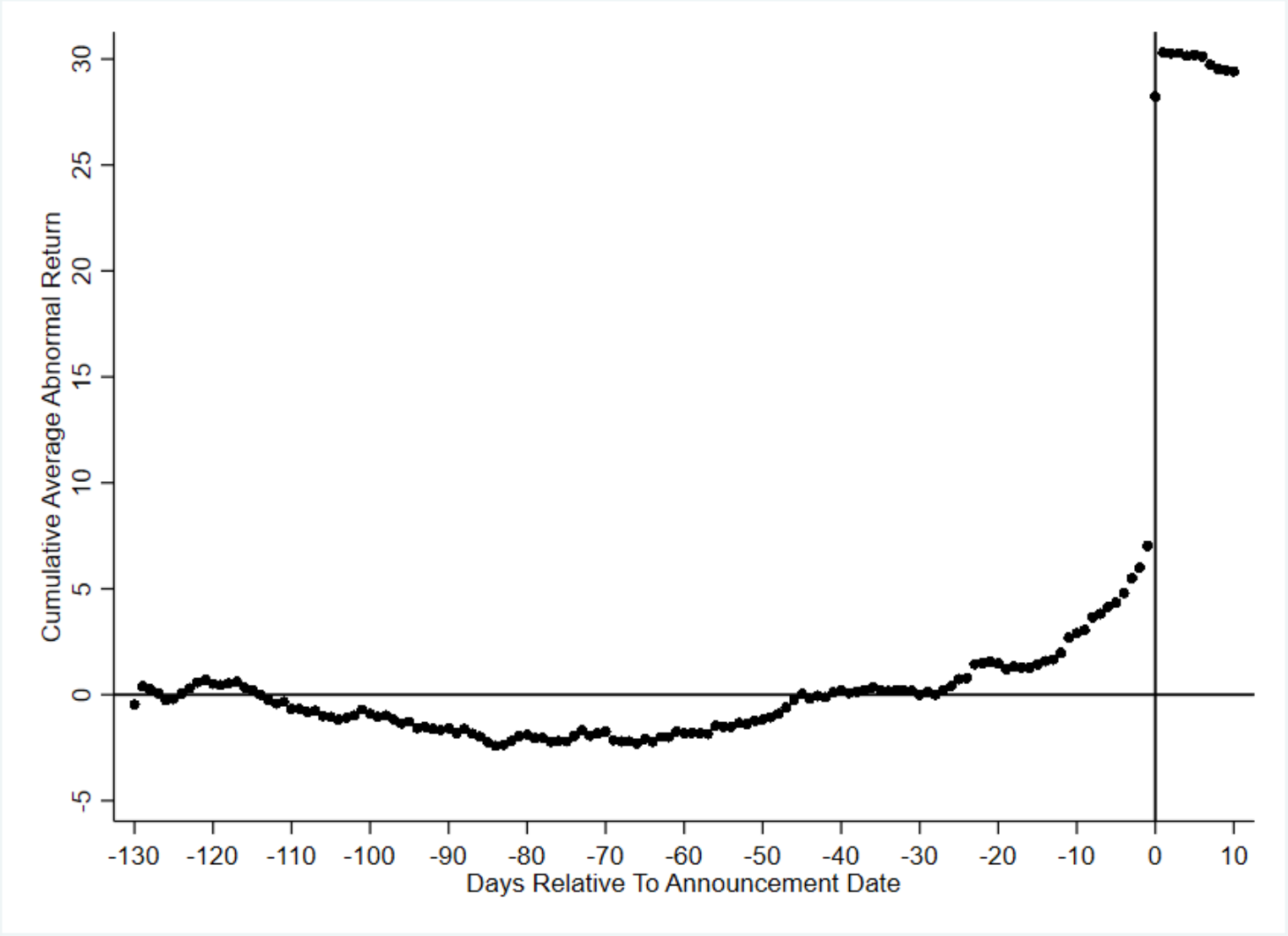


Figure 3

Cumulative Average Abnormal Returns – Market Model – Entire Sample



5.2 Empirical Results - Hypothesis 2

In this paragraph the results from the conducted multiple regression will be presented (paragraph 5.2.1). Furthermore, the robustness check regarding the multiple regression and its results is presented in paragraph 5.2.2.

5.2.1 Multiple Regression Results

The results from the STATA regression are provided in Table 2. Using this output, it is possible to analyse the effect of the method of payment on the abnormal returns prior to the takeover announcement. This study hypothesized that the NASDAQ Composite Index listed takeover targets in the dataset experience a positive effect on the abnormal returns prior to the takeover announcement if the method of payment is completely in cash, relatively to payments in cash & stock or completely in stock. When analysing the regression output of column 2, it becomes clear that there is a positive effect of the method of payment completely in cash relatively to the payment method cash & stock or only stock on the CAR (-1, +1). The dummy variable CASH has a coefficient of 11.14 with a t-value of 1.32. This indicates that the cumulative abnormal returns for NASDAQ Composite Index listed takeover targets in this dataset are higher when the method of payment is cash. However, despite the seemingly positive effect of the method of payment cash on CAR (-1, +1), the results are not significantly positive. The dummy variable COMBI has a coefficient of 0.778 with a t-value of 0.09, this indicates that the effect of the method of payment is cash & stock has a positive effect on CAR (-1, +1), relatively to a payment in stock. The variable COMBI is also not significantly positive. The results from the regression of the method of payments with CAR (-1, +1) are in line with the reviewed literature. Just like Wansley, Lane & Yang (1983), Huang & Walkling (1987) and Davidson & Cheng (1997), this study finds a positive effect of the method of payment of pure cash relatively to cash & stock or pure stock. Unlike the previously mentioned literature, this study does not find significant positive results.

To check whether the effect of the variable method of payment on CAR (-1, +1) is significant, this variable is regressed solely against CAR (-1, +1). When assessing column 1 of Table 2, it becomes clear that there is a positive effect of cash relative to cash & stock and only stock as a method of payment. Again, these positive results are not significant. When looking at the R^2 and the Adjusted R^2, a small positive effect can be seen. The R^2 and the Adjusted R^2 have respective values of 0.04 and 0.02, which indicates that the independent variable method of payment does explain a small part of the variance of the dependent variable CAR (-1, +1).

Furthermore, when assessing the control variables, there are some expected and unexpected results. All of the control variables will be assessed separately. First of all, the dummy variables HOSTILE and NEUTRAL both have positive coefficients in relation to CAR (-1, +1), relative to a friendly takeover. This means that the abnormal returns prior to a takeover announcement are relatively bigger in case of a hostile takeover and a neutral takeover, in comparison to a friendly takeover. The coefficient and t-

value of HOSTILE are respectively 4.409 and 0.34, while these values for NEUTRAL are a lot bigger with 23.90 and 1.66. This means that NEUTRAL is even significant at the 0.10 level. Despite the fact that both dummy variables are positive, only NEUTRAL is significantly positive. Analysing the firm's 'attitude' results, it becomes clear that a neutral deal apparently has the biggest positive effect on the CAR (-1, +1). Dropping the three observations which have a neutral attitude does not impact the outcome of the regression in a way that the dummy variable HOSTILE becomes significant. The results are in line with the reviewed literature from Borges & Gairifo (2013), as the hostile bid, in the smallest event window, is resulting in relatively higher positive abnormal returns compared to a friendly bid. Second, the dummy variable TENDEROFFER is positively significant at the 0.01 level with a coefficient of 19.54 and a t-value of 4.34. This result is completely in line with the reviewed literature of Jensen & Ruback (1983), who found that tender offers have significantly higher cumulative abnormal returns than mergers have. Third, the dummy variable RUMOUR is negatively significant at the 0.01 level. The coefficient and t-value are respectively -17.74 and -4.59. This means that the existence of rumours in the media prior to the takeover announcement has a significantly negative effect on the CAR (-1, +1). This result is not in line with reviewed literature by Borges & Gairifo (2013), who found a significant positive result in their study, indicating that the presence of rumours in the media would lead to bigger cumulative abnormal returns by the target. Fourth, the dummy variable RELATED has a positive coefficient and t-value of respectively 5.051 and 1.19. By reviewing literature regarding this variable, it became clear that the effect of an acquirer acquiring a target in a related industry could have a positive effect on the cumulative abnormal returns (Morck, Shleifer & Vishny, 1990). However, Seth (1990) stated that an acquisition of target in a non-related industry would not automatically have a negative effect on the cumulative abnormal returns. When assessing the results from the regression is becomes clear that in this case an acquisition of target by the acquirer in a related industry has a positive effect on the CAR (-1, +1). However, this effect is not significantly positive. Finally, the variable SHARESOWNED which indicates the percentage of shares owned by the acquirer at the announcement date has a negative coefficient and t-value of respectively -0.338 and -1.24 in relation to CAR (-1, +1). This indicates that there is a very small negative effect on the CAR (-1, +1), but this effect is not significant. This result is not in line with literature reviewed from Jarrel & Poulson (1989), who present findings which support their hypothesis that there is a positive relation between the percentage of target shares owned by the acquiring firm and abnormal returns. Also, the results do not match Borges & Gairifa's (2013) results, who present a positive and significant effect at the 0.10 level in their model.

When assessing the R^2 and the Adjusted R^2, which have respecting values of 0.27 and 0.24, it can be concluded that the independent variables and the control variables explain, to some extent, variance for the dependent variable. However, at the same time these values indicate that there are a possibly a lot of omitted variables which could affect the CAR (-1, +1), but are not taken into account in this regression.

Based on the previously presented empirical results, it can now be determined whether hypothesis 2 can be accepted or must be rejected. First, the hypothesis will be given, followed by the interpretation of the empirical results regarding the hypothesis. Concluding, a statement with arguments will be given whether the hypothesis will be accepted or must be rejected.

Hypothesis 2: *NASDAQ Composite Index listed takeover targets experience relatively larger abnormal returns prior to the takeover announcement if the proposed method of payment is completely in cash.*

Based upon the results from the multiple regression presented in Table 2 its discussion in the previous section, it is concluded that hypothesis 2 must be rejected. This is due to the fact that the results from the regression regarding the method of payment are not significantly positive. The fact that there is a positive relationship between the method of payment being cash and the CAR (-1, +1) is not enough evidence to accept hypothesis 2. There must be a significant positive result to accept hypothesis 2.

5.2.2 Robustness Check

To test for robustness of the results from the regression, several other event windows regarding the CAR, will be selected and tested. This would rule out possible errors regarding the selection of the three-day event window. Three different event windows regarding the CAR, next to CAR (-1, +1), will be used in the regression. The event windows for CAR (-5, +1), CAR (-10, +1) and CAR (-30, +1) will be added to the regression. As can be concluded from Table 2, the results of the variables CASH and COMBI, which indicate the method of payment, do not change significantly when assessing the different event windows. While CASH remains insignificantly positive, COMBI becomes insignificantly negative for the other event windows. However, these changes are relatively small and insignificant. When assessing the variables HOSTILE and NEUTRAL, which indicates the attitude of the takeover, it becomes clear that the results do not significantly change. The variable HOSTILE becomes smaller at CAR (-5, +1), but is higher for CAR (-10, +1) and CAR (-30, +1). The variable NEUTRAL remains relatively stable for the additional event windows. The variable TENDEROFFER remains highly significant for all event windows as there is almost no change in outcomes. The variable RUMOUR slightly decreases for the other event windows but remains significantly negative for all event windows. The variable RELATED remains insignificantly positive for all event windows. The variable SHARESOWNED remains relatively constant at an insignificant negative level. When assessing the R^2 and the Adjusted R^2 a decreasing trend is spotted. The R^2 and the Adjusted R^2 is at the highest level for CAR (-1, +1), which indicates that the most variance of the dependent variable is explained using this event window. When assessing solely the variables of the method of payment on the different CAR's, it becomes clear that there is some difference in the R^2 and the Adjusted R^2. However, these changes are insignificant. It becomes clear from this robustness check that the selected event window CAR (-1, +1) fits the best for analysis, which is in line with literature regarding the selection of the event window for investigating this kind of variable relationships.

Table 2

Regressions for Target Cumulative Abnormal Returns

Variables	(1) CAR(-1,+1)	(2) CAR(-1,+1)	(3) CAR(-5,+1)	(4) CAR(-5,+1)	(5) CAR(-10,+1)	(6) CAR(-10,+1)	(7) CAR(-30,+1)	(8) CAR(-30,+1)
CASH	11.48	11.14	12.29	11.35	11.49	9.95	9.41	6.78
	(1.26)	(1.32)	(1.33)	(1.30)	(1.22)	(1.12)	(0.93)	(0.70)
COMBI	0.16	0.78	-0.90	-0.61	-0.51	-1.01	-4.59	-5.47
	(0.02)	(0.09)	(-0.09)	(-0.07)	(-0.05)	(-0.11)	(-0.43)	(-0.54)
HOSTILE		4.41		1.03		9.66		27.00*
		(0.34)		(0.08)		(0.72)		(1.83)
NEUTRAL		23.90*		24.12		28.22*		31.39*
		(1.66)		(1.62)		(1.86)		(1.90)
TENDEROFFER		19.54***		20.28***		19.98***		19.14***
		(4.34)		(4.34)		(4.20)		(3.69)
RUMOUR		-17.74***		-14.55***		-12.83***		-12.97***
		(-4.59)		(-3.63)		(-3.15)		(-2.91)
RELATED		5.05		6.68		7.95*		4.40
		(1.19)		(1.51)		(1.77)		(0.90)
SHARESOWNED		-0.34		-0.16		-0.27		-0.22
		(-1.24)		(-0.58)		(-0.95)		(-0.72)
Constant	16.35*	14.52*	17.90**	13.80	19.82**	14.70	24.77**	22.73**
	(1.87)	(1.67)	(2.02)	(1.53)	(2.20)	(1.60)	(2.56)	(2.27)
Observations	171	171	171	171	171	171	171	171
R-squared	0.04	0.27	0.05	0.25	0.04	0.24	0.04	0.22
Adjusted R-squared	0.02	0.24	0.03	0.21	0.03	0.21	0.03	0.18

Asterisks denote statistical significance at the 1% (***), 5% (**), or 10% (*) level. Corresponding t-statistics are given in parentheses.
The definition of the variables can be found at paragraph 4.2.2.

6. Conclusion, Discussion, Limitations and Future Research

This final chapter will start with the conclusion of this study (paragraph 6.1). In this paragraph a brief summary of the study will be given regarding the data and methodology, the results and the two hypotheses. Furthermore, the thesis' research question will be answered. Paragraph 6.2 consists of a discussion in which this study's results are compared to the results from similar previously reviewed literature. In paragraph 6.3 some limitations regarding this study are presented. Finally, paragraph 6.4 will give an overview of possible interesting future research regarding this study's subject.

6.1 Conclusion

The purpose of this study was to research to what extend target companies' stock prices experience abnormal returns prior to the publication of the takeover announcement, which could indicate the presence of insider trading. In this study a total of 171 NASDAQ Composite Index listed firms, who were a takeover target during the period of 2009-2018, are part of the dataset. The list of target firms was collected from FactSet and the dataset was collected from Eikon - Thomson Reuters (Datastream).

The following research question was established: *To what extend do target companies' stock prices experience abnormal returns prior to the publication of the takeover announcement, indicating the presence of insider trading?*

In order to investigate this question, hypothesis 1 was constructed:

Hypothesis 1: *NASDAQ Composite Index listed takeover targets experience abnormal returns prior to the official public takeover announcement.*

To check whether hypothesis 1 could be accepted or rejected first an extensive literature review was conducted. This literature review yielded interesting, but inconsistent results. Much research found evidence of price run-ups in the period prior to the official announcement date, but there is no consensus on the timeline when the first abnormal returns are being made. Furthermore, if abnormal returns prior to the official announcement date were observed, there was no consensus whether this could be attributed to leakage of or trading on insider information. To test hypothesis 1 an event study was performed using STATA. In this event study an estimation window was established of 100 days prior to the event window, which consists of 30 days prior to the announcement date and 10 days after the announcement date. This timeline is consistent with the reviewed literature. In the methodology section of this thesis the event study variables were established. After comparing the most frequently used normal return models, a decision was made to use the market model. Using this model, the abnormal returns, cumulative abnormal returns, average abnormal returns and cumulative abnormal returns were calculated using STATA. In this study the average abnormal returns ($\overline{AR}$) and cumulative average abnormal returns ($\overline{CAR}$) were used to answer the research question.

The results illustrate that the $\overline{AR}$ and test-statistics are consistently positive from t = -15 till t = -1. This means that during this period only positive average abnormal returns are being made. This could mean that there is a positive drift going on, regarding the $\overline{AR}$. What is even more remarkable is the fact that from t = -4 till t = -1 the returns are all positively significant on at least the 0.10 level, on t = -1 the returns are even positively significant at the 0.005 level. This means that in the period of four days prior to the official announcement date consistently positive significant (0.10 level) average abnormal returns ($\overline{AR}$) are being made by investors, in which the final day prior to the announcement these returns are positively significant on the highest level (0.005 level). Furthermore, when assessing Figure 3 it shows that the closer the $\overline{CAR}$ gets to the announcement date, the higher it becomes. The $\overline{CAR}$ remains consistently positive from t = -41 till the end of the sample period, indicating that on average positive cumulative returns are being made during this period. Approximately a quarter of the total increase in $\overline{CAR}$ occurs prior to the announcement date. This means that approximately a quarter of the market's reaction of the takeover announcement happened prior to the official announcement becomes public information. Both results regarding the $\overline{AR}$ and the $\overline{CAR}$ support hypothesis 1, which means that hypothesis 1 is accepted.

Furthermore, a brief extension of hypothesis 1 was given, looking at the question whether the observed abnormal returns can be attributed to insider trading. It was explained that the price run-up prior to the official announcement date and the found average abnormal returns cannot be completely attributed to possible leakage of or trading on insider information. There are a couple of legitimate ways which could cause a price run-up prior to the announcement date. These ways are, amongst others, media speculation (which could increase the volume and the price of the stock) and anticipation of arbitrageurs (who anticipate on block trades from the acquiring company in order to establish a certain stake or number of shares in the target company, which could also increase the volume and price of the stock).

Finally, this thesis' research question can be answered. This study found evidence of significant average abnormal returns four days prior to the official announcement date of a takeover of NASDAQ Composite Index listed targets. Furthermore, a clear positive drift of the cumulative average abnormal returns is found from t = 41. The price run-up prior to the official public takeover announcement is equal to approximately 25% of the total price run-up due to the takeover announcement. Unfortunately, it is not possible to attribute these abnormal returns completely to leakage of or trading on insider information. This is partly due to the limited scope of this masters' thesis, but theoretically it is almost impossible to completely attribute a stock market's reaction to one possible factor. This is due to the fact that literature shows that there are unlimited factors that could affect a stock's return.

Because it became clear that, using this thesis's dataset and methodology, it is not possible to attribute the observed abnormal returns prior to the target's takeover announcement, a second hypothesis was formulated which focussed on the determinants of the observes cumulative abnormal returns prior to the

target's takeover announcement. Since, the literature review indicated that prior research found a significantly positive relation between the method of payment being pure cash in the acquisition and the cumulative abnormal returns regarding a transaction, the following hypothesis was formulated:

Hypothesis 2: *NASDAQ Composite Index listed takeover targets experience relatively larger abnormal returns prior to the takeover announcement if the proposed method of payment is completely in cash.*

To investigate the second hypothesis additional data, regarding independent and control variables, was collected from FactSet. This data was used in a multiple regression model to test the second hypothesis.

Based upon the results from the multiple regression presented in Table 2 and the discussion of the results, it was concluded that hypothesis 2 must be rejected. This is due to the fact that the results from the regression regarding the method of payment are not significantly positive. The fact that there is a positive relationship between the method of payment being cash and the CAR (-1, +1) is not enough evidence to accept hypothesis 2.

6.2 Discussion and Limitations

6.2.1 Discussion

When assessing the previously presented results from this research regarding hypothesis 1 and comparing it with the prior literature regarding this subject, many resemblances can be found. This study found, just as Meulbroek (1991), Jarrel & Poulson (1989) and Keown & Pinkerton (1989), price run-ups prior to the first public announcement of the target's takeover. The size of the found price run-up in this research, approximately 25%, is a lot smaller than the size of the price run-ups found by Meulbroek (1991), Jarrel & Poulson (1989) and Keown & Pinkerton (1989). Meulbroek (1991) found evidence of a price run-up of approximately 50%, Jarrel & Poulson (1989) found evidence of a price run-up of approximately 40% and Keown & Pinkerton (1989) who also found evidence of a price run-up of approximately 50% prior to the first public announcement of the target's takeover. One possible explanation for the difference in size of this price run-up could be attributed to the SEC's stricter policy and monitoring regarding possible insider trading nowadays than it did in the time when the prior research was conducted. This would mean that the SEC's policy is effective and decreased the price run-up (possibly due to insider trading) by 50%. Of course, a lot of other possible explanations could be thought of to explain this difference, since in theory there are unlimited factors that could affect a stock's return (Bachelier, 1900).

Furthermore, regarding hypothesis 2, there are a couple of results that do not match with the results from the reviewed literature of Wansley, Lane & Yang (1983), Huang & Walkling (1987) and Davidson & Cheng (1997) regarding this subject. All mentioned researchers found a significant positive effect of the method of payment being cash in relation to the cumulative abnormal returns prior to a takeover announcement. This difference in results might be due to a couple of things. First of all, the used dataset

in this study consists of different companies than the other studies do. Second, the datasets used in prior reviewed literature are relatively old. Wansley, Lane & Yang (1983) used data from 203 target firms between 1970 and 1978, Huang & Walkling (1987) used data from 204 target firms between April 1977 and September 1982, and Davidson & Cheng (1997) used data from 219 targets between 1981 and 1987. It might be the case that the of the method of payment on the cumulative abnormal returns is changed due to regulatory changes, possibly regarding the tax explanation. However, this study's results are positive regarding the method of payment, which is in line with the reviewed literature.

6.2.2 Limitations

Just like any other study conducted in the past, this study also has its limitations. These limitations have their effect on the results of the analysis and therefore also on the conclusion. First of all, the dataset which was used in this study has its limitations. A total of 171 NASDAQ Composite Index listed takeover targets were used. While the number of 171 firms are consistent with the number of firms used by reviewed literature, it remains relatively a small dataset. This means that there could be influencing by outliers, despite the usage of average returns. Another point of discussion could be the fact that all firms of the dataset were listed on the NASDAQ Composite Index. As it was mentioned before in this thesis, this index consists of relatively a lot of technological companies. While, this should not be a problem because this was one of the objectives of the study, it could yield different results compared to other American stock exchanges such as the AMEX or the NYSE. Second, in this study the market model was selected to calculate the normal returns of the stocks in the dataset. While the usage of the MM is consistent with the reviewed literature and is often named the superior model in this kind of research, one could argue that a more sophisticated economic model should be used instead of the used statistical model. This could affect the outcome of the complete study. Third, one could discuss the selection of the estimation window and the event window. Despite the fact that the selection of both windows is in line with reviewed literature, one could argue that a bigger estimation window would yield more accurate results and a larger or smaller event window would be more accurate. This issue was noted and arguments were given in favour of the selected windows, but it could remain subject of discussion. Fourth, this study only looks at the abnormal returns of the listed targets and pays no attention to possible abnormal returns of the acquirer. The reason for this has already extensively been discussed in the literature review.

Furthermore, since significant positive abnormal returns are being made prior to the takeover announcement hypothesis 1 is accepted. However, in order to check whether the observed abnormal returns could be attributed to insider trading remains, unfortunately, impossible in the scope of this master's thesis. The acceptance of hypothesis 1 merely indicates the possibility of the presence of leakage of or trading on insider information, but no concrete evidence can be presented in favour of the explicit leakage of or trading on insider information. First of all, there are in theory unlimited factors that do affect the equity markets, as Bachelier (1900) already noted. It is therefore very hard to exactly

connect the observed abnormal returns to the leakage of or trading on insider information. Jarrel & Poulson (1989) indicate that media speculation concerning a tender offer could lead to a run-up in stock prices of takeover targets. Therefore, they argue that run-up in stock prices of takeover targets cannot be considered reliable evidence of insider trading, if there has been public speculation or rumours presented by the media regarding the possibility that a certain firm might be target of a future takeover (Jarrel & Poulson, 1989). This is due to the fact that if a firm is mentioned in any form of credible speculation as a potential takeover target, it is expected that the trading volume in that stock increases and the abnormal returns for that firm increase. However, since this aspect of media coverage in combination with an increase in volume is not part of this research, we cannot draw any conclusions regarding this issue. Jarrel & Poulson (1989) indicate another possible explanation for the existence of abnormal returns prior to the announcement date. Bidding firms often purchase large amounts of stock in their targets prior to announcing the formal offer, these trades are called block trades. Arbitrageurs could attempt to track such block trades in combination with an increase in volume and predict which firms might be future takeover targets. If the arbitrageurs then act on this information, this could lead to a price run-up, without trading on insider information. Concluding: the abnormal returns observed while testing hypothesis 1 cannot be completely attributed to insider trading. One could make it plausible that a certain proportion of the price run-up and the increase in average abnormal returns are due to leakage of or trading on insider information, but given the methodology in this research, it cannot be ruled out that other factors have their effect on the target stocks' return.

Unfortunately, some additional limitations are present in assessing the second hypothesis. First, the used independent variable has of some analytical limitations. The variable 'Method of Payment' is not equally distributed across the sample. The used dataset consists of 118 Cash deals (69.01%), 42 Cash & Stock deals (25.15%) and 10 Stock deals (5.85%), which might lead to some issues by interpreting the results, since there are relatively a lot cash deals and few stock deals. This might have an effect on the results. Furthermore, when assessing the control variable 'Attitude', the same issue is the observed. The dataset for 'Attitude' consists of 164 friendly takeovers (95.91%), 4 hostile takeovers (2.34%) and 3 neutral takeovers (1.75%), which is also not equally distributed. Another limitation regarding this study is the fact that relatively little variance is explained when looking at the R^2 and the Adjusted R^2. Adding more control variables could help to explain more variance.

6.4 Future Research

This study has given some useful insights regarding the price run-up in average abnormal returns, but it failed to connect this run-up solely to insider trading. Given the scope of this master's thesis, it is not possible to research all possibilities regarding the investigation whether the significant average abnormal returns prior to the official announcement date are actually due to insider trading. Therefore, further research regarding trading volume, media speculation and the arbitrageurs' interpretation of possible block trades (target's stocks bought by the acquirer to acquire an initial stake in the company) could be

done. Furthermore, as Black (1975) already mentioned if informed traders might act on insider information, they may prefer to trade on the option market. One of the advantages of using the option market instead of the stock market is the fact that the possibility to use leverage on the option market increases the profitability of the trades while traders virtually act on risk-free information. Future research regarding the option market using this dataset could shed a light on possible insider trading and could be used to strengthen the conclusion regarding this subject. Another possible extension of this study is to also take the abnormal returns of the acquirer into account. While this study only focusses on the target of the takeover, a similar price run-up could be happening for the acquirer's stock.

Furthermore, this study's second hypothesis focussed on the relationship between cumulative abnormal returns during a small event window and the method of payment that is used in the acquisition. As the literature review already showed, there are a lot of other possible determinants of abnormal returns prior to takeover announcements. Some examples are: social ties between acquirers and targets, the existence of multiple bidders during the acquisition process, and recommendations of market analysts. It would be interesting for future research to incorporate these variables in the study to se if these variables explain some of the variance regarding cumulative abnormal returns prior to a takeover announcement.

Bibliography

Agarwal, M., & Singh, H. (2006). Merger announcements and insider trading activity in India: an empirical investigation.

Agrawal, A., & Nasser, T. (2012). Insider trading in takeover targets. Journal of Corporate Finance, 18(3), 598-625.

Armitage, S. (1995). Event study methods and evidence on their performance. Journal of economic surveys, 9(1), 25-52.

Arrow, K. (1971) Essays in the theory of risk bearing. Chicago: Markham.

Bachelier, L. (1900). Théorie de la spéculation. In Annales scientifiques de l'École normale supérieure (Vol. 17, pp. 21-86).

Binder, J. (1998). The event study methodology since 1969. Review of quantitative Finance and Accounting, 11(2), 111-137.

Black, F. (1975). Fact and Fantasy in the Use of Options. Financial Analysts Journal, 36-72.

Borges, M. R. (2010). Efficient market hypothesis in European stock markets. The European Journal of Finance, 16(7), 711-726.

Borges, M. R., & Gairifo, R. (2013). Abnormal returns before acquisition announcements: Evidence from Europe. Applied Economics, 45(26), 3723-3732.

Bradley, J. W., & Korn, D. H. (1979). Bargains in valuation disparities corporate acquirer versus passive investor. Sloan Management Review (pre-1986), 20(2), 51.

Bradley, M., & Kim, E. H. (1985). The tender offer as a takeover device: its evolution, the free rider problem and the prisoner's dilemma. Unpublished working paper (University of Michigan).

Brenner, M. (1979). The sensitivity of the efficient market hypothesis to alternative specifications of the market model. The Journal of Finance, 34(4), 915-929.

Brick, I. E., Statman, M., & Weaver, D. G. (1989). Event studies and model misspecification: Another look at the benefits of outsiders from public information about insider trading. Journal of Business Finance & Accounting, 16(3), 399-424.

Brown, S. J., & Warner, J. B. (1980). Measuring security price performance. Journal of financial economics, 8(3), 205-258.

Brown, S. J., & Warner, J. B. (1985). Using daily stock returns: The case of event studies. Journal of financial economics, 14(1), 3-31.

Burch, T. R., Nanda, V., & Silveri, S. (2012). Taking stock or cashing in? Shareholder style preferences, premiums and the method of payment. Journal of Empirical Finance, 19(4), 558-582.

Cuthbertson, K., & Nitzsche, D. (2005). Quantitative Financial Economics Stocks, Bonds and Foreign Exchange (2nd ed.). West Sussex, United Kingdom John Wiley & Sons.

Dai, R., Massoud, N., Nandy, D. K., & Saunders, A. (2017). Hedge funds in M&A deals: Is there exploitation of insider information?. Journal of Corporate Finance, 47, 23-45.

Davidson III, W. N., & Cheng, L. T. (1997). Target firm returns: does the form of payment affect abnormal returns?. Journal of Business Finance & Accounting, 24(3), 465-479.

Dimson, E., & Marsh, P. (1986). Event study methodologies and the size effect: The case of UK press recommendations. Journal of financial Economics, 17(1), 113-142.

Dyckman, T., Philbrick, D., & Stephan, J. (1984). A comparison of event study methodologies using daily stock returns: A simulation approach. Journal of Accounting Research, 1-30.

Easley, D., & O'hara, M. (1987). Price, trade size, and information in securities markets. Journal of Financial economics, 19(1), 69-90.

Eisenhardt, K. M. (1989). Agency theory: An assessment and review. Academy of management review, 14(1), 57-74.

Eyssell, T. H., & Arshadi, N. (1993). Insiders, outsiders, or trend chasers?: An investigation of pre-takeover transactions in the shares of target firms. Journal of Financial Research, 16(1), 49-59.

Fama, E. F. (1965a). Random Walks in Stock Market Prices. Financial Analysts Journal 21, 55–59.

Fama, E. F. (1965b). The behavior of stock-market prices. The journal of Business, 38(1), 34-105.

Fama, E. F. (1970). Efficient capital markets; A review of theory and empirical work. The journal of Finance, 25(2), 383-417.

Fama, E. F., & French, K. R. (2004). The capital asset pricing model; Theory and evidence. Journal of economic perspectives, 18(3), 25-46.

Fama, E. F., Fisher, L., Jensen, M. C., & Roll, R. (1969). The adjustment of stock prices to new information. International economic review, 10(1), 1-21.

French, K. R., & Roll, R. (1986). Stock return variances: The arrival of information and the reaction of traders. Journal of financial economics, 17(1), 5-26.

Groenewold, N., & Kang, K. C. (1993). The semi-strong efficiency of the Australian share market. Economic Record, 69(4), 405-410.

Hayward, M. L., & Hambrick, D. C. (1997). Explaining the premiums paid for large acquisitions: Evidence of CEO hubris. Administrative science quarterly, 103-127.

Huang, Y. S., & Walkling, R. A. (1987). Target abnormal returns associated with acquisition announcements: Payment, acquisition form, and managerial resistance. Journal of financial economics, 19(2), 329-349.

Hussin, B. M., Ahmed, A. D., & Ying, T. C. (2010). Semi-Strong Form Efficiency: Market Reaction to Dividend and Earnings Announcements in Malaysian Stock Exchange. IUP Journal of Applied Finance, 16(5).

Jaffe, J. F. (1974). Special information and insider trading. The Journal of Business, 47(3), 410-428.

Jarrell, G. A., & Poulsen, A. B. (1989). Stock trading before the announcement of tender offers: Insider trading or market anticipation. JL Econ. & Org. 5, 225.

Jayaraman, N., Frye, M. B., & Sabherwal, S. (2001). Informed trading around merger announcements: An empirical test using transaction volume and open interest in options market. Financial Review, 36(2), 45-74.

Jensen, M. C. (1978). Some anomalous evidence regarding market efficiency. Journal of financial economics, 6(2/3), 95-101.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. Journal of financial economics, 3(4), 305-360.

Jensen, M. C., & Ruback, R. S. (1983). The market for corporate control: The scientific evidence. Journal of Financial economics, 11(1-4), 5-50.

Jovanovic, F., & Le Gall, P. (2001). Does God practice a random walk? The'financial physics' of a nineteenth-century forerunner, Jules Regnault. European journal of the history of economic thought, 8(3), 332-362.

Kendall, M. G. (1953). The analysis of economic time-series-part i: Prices. Journal of the Royal Statistical Society. Series A (General), 116(1), 11-34.

Keown, A. J., & Pinkerton, J. M. (1981). Merger announcements and insider trading activity An empirical investigation. The journal of finance, 36(4), 855-869.

Khan, A. Q., & Ikram, S. (2010). Testing semi-strong form of efficient market hypothesis in relation to the impact of foreign institutional investors'(FII's) investments on Indian capital market. International Journal of Trade, Economics and Finance, 1(4), 373.

Lakonishok, J., & Vermaelen, T. (1990). Anomalous price behavior around repurchase tender offers. The Journal of Finance, 45(2), 455-477.

Lewellen, W. G. (1971). A pure financial rationale for the conglomerate merger. The journal of Finance, 26(2), 521-537.

Lintner, J. (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. The Review of Economics and Statistics, 13-37.

MacKinlay, A. C. (1997). Event studies in economics and finance. Journal of economic literature, 35(1), 13-39.

Malkiel, B. G. (2003). The efficient market hypothesis and its critics. Journal of economic perspectives, 17(1), 59-82.

Markowitz, H. (1952). Portfolio selection. The journal of finance, 7(1), 77-91.

Meulbroek, L. K. (1992). An empirical analysis of illegal insider trading. The Journal of Finance, 47(5), 1661-1699.

Morck, R., Shleifer, A., & Vishny, R. W. (1988). Alternative mechanisms for corporate control.

Morck, R., Shleifer, A., & Vishny, R. W. (1990). Do managerial objectives drive bad acquisitions?. The Journal of Finance, 45(1), 31-48.

NASDAQ. (2019a). NASDAQ Listings. Retrieved April 4, 2019, from https://business.nasdaq.com/list/index.html

NASDAQ. (2019b). Breakdown for COMP. Retrieved June 11, 2019, from https://indexes.nasdaqomx.com/Index/Breakdown/COMP

New York Stock Exchange. (2018, June 30). NYSE Total Market Cap. Retrieved April 4, 2019, from https://www.nyse.com/market-cap

Regnault, J. (1863). Calcul des chances et philosophie de la bourse. Mallet-Bachelier.

Roll, R. (1986). The hubris hypothesis of corporate takeovers. Journal of business, 197-216.

Roll, R., & Ross, S. A. (1980). An empirical investigation of the arbitrage pricing theory. The Journal of Finance, 35(5), 1073-1103.

Ross, S. A. (1973). The economic theory of agency: The principal's problem. The American economic review, 63(2), 134-139.

Ross, S. A. (1976). The arbitrage theory of capital asset pricing. Journal of Economic Theory, 13(3), 341-360.

Samuelson, P. A. (1965). Proof that properly anticipated prices fluctuate randomly. Industrial management review, 6(2).

Sanders Jr, R. W., & Zdanowicz, J. S. (1992). Target Firm Abnormal Returns and Trading Volume Around the Initiation of Change in Control Transactions. Journal of Financial and Quantitative Analysis, 109-129.

Seth, A. (1990). Sources of value creation in acquisitions: an empirical investigation. Strategic Management Journal, 11(6), 431-446.

Seyhun, H. N. (1986). Insiders' profits, costs of trading, and market efficiency. Journal of financial Economics, 16(2), 189-212.

Sharpe, W. F. (1964). Capital asset prices; A theory of market equilibrium under conditions of risk. The journal of finance, 19(3), 425-442.

The Institute for Mergers, Acquisitions and Alliances (IMAA). (2019). M&A US - Mergers & Acquisitions in the United States. Retrieved June 11, 2019, from https://imaa-institute.org/m-and-a-us-united-states/

U.S. Securities and Exchange Commission. (2019). Insider Trading. Retrieved April 3, 2019, from https://www.investor.gov/additional-resources/general-resources/glossary/insider-trading

Varaiya, N. P. (1987). Determinants of premiums in acquisition transactions. Managerial and Decision Economics, 8(3), 175-184.

Wansley, J. W., Lane, W. R., & Yang, H. C. (1983). Abnormal returns to acquired firms by type of acquisition and method of payment. Financial management, 16-22.

Watson, I., & Young, A. (1998). A preliminary examination of insider trading around takeover announcements in Australia. Working paper, University of Western Australia.

Wilson, R. (1968). The theory of syndicates. Econometrica: journal of the Econometric Society, 119-132.

Worthington, A. C., & Higgs, H. (2004). Random walks and market efficiency in European equity markets. Global Journal of Finance and Economics, 1(1), 59-78.

Wu, C. C., Lin, B. H., & Yang, T. H. (2018). Insider Trading and Institutional Holdings in Mergers and Acquisitions.

Yen, G., & Lee, C. F. (2008). Efficient market hypothesis (EMH): past, present and future. Review of Pacific Basin Financial Markets and Policies, 11(02), 305-329. Ishii, J., & Xuan, Y. (2014). Acquirer-target social ties and merger outcomes. Journal of Financial Economics, 112(3), 344-363.

Appendix A - List of Target Firms Included in the Sample

Acquired firm
3com Megahertz Corp.
A. Schulman, Inc.
Advent Software, Inc.
Alterra Capital Holdings Ltd.
American Realty Capital Healthcare Trust, Inc.
American Realty Capital Trust, Inc.
Ameristar Casinos, Inc.
Anacor Pharmaceuticals, Inc.
ARIAD Pharmaceuticals, Inc.
Ariba, Inc.
ARRIS International Plc
Aruba Networks, Inc.
athenahealth, Inc.
Atheros Communications, Inc.
Atlas Energy, Inc.
Atmel Corp.
Auspex Pharmaceuticals, Inc.
Auxilium Pharmaceuticals LLC
Avanir Pharmaceuticals, Inc.
AveXis, Inc.
B/E Aerospace, Inc.
Bioverativ, Inc.
Blackhawk Network Holdings, Inc.
Blue Buffalo Pet Products, Inc.
BMC Software, Inc.
Brigham Exploration Co.
Broadcom Corp.
Brocade Communications Systems LLC
Bucyrus International, Inc.
Buffalo Wild Wings, Inc.
CA, Inc.
Caesars Acquisition Co.
Callidus Software, Inc.
Capital Bank Financial Corp.
Catalyst Health Solutions, Inc.

Acquired firm
Catamaran Corp.
Cavium, Inc.
Cephalon, Inc.
Cepheid
Chattem, Inc.
Clearwire Corp.
Compuware Corp.
Concur Technologies, Inc.
Conversant, Inc.
Copano Energy LLC
Cubist Pharmaceuticals, Inc.
Cymer, Inc.
Dealertrack Technologies, Inc.
Dell, Inc.
Dionex Corp.
DIRECTV
DreamWorks Animation SKG, Inc.
Dyax Corp.
eBay Enterprise Marketing Solutions, Inc.
ev3, Inc.
Express Scripts Holding Co.
Fairchild Semiconductor International, Inc.
FEI Co.
Financial Engines, Inc.
First Niagara Financial Group, Inc.
FirstMerit Corp.
Foster Wheeler AG
Foundation Medicine, Inc.
G&K Services LLC
Gen-Probe, Inc.
Genzyme Corp.
Global Crossing Ltd.
HomeAway, Inc.
Hudson City Bancorp, Inc.
Human Genome Sciences, Inc.

Acquired firm
Idenix Pharmaceuticals LLC
IGATE Corp.
ILG, Inc.
Informatica LLC
Integrated Device Technology, Inc.
InterMune, Inc.
Intersil Corp.
Isilon Systems, Inc.
Juno Therapeutics, Inc.
Keurig Green Mountain, Inc.
Kite Pharma, Inc.
KLX, Inc.
Leap Wireless International, Inc.
Life Technologies Corp.
LifePoint Health, Inc.
Lincare Holdings, Inc.
Linear Technology Corp.
LSI Corp.
Lufkin Industries, Inc.
Mattress Firm Holding Corp.
MB Financial, Inc.
MedAssets, Inc.
Mediacom Communications Corp.
Medivation, Inc.
Memorial Resource Development Corp.
Mentor Graphics Corp.
MICROS Systems, Inc.
Microsemi Corp.
Molex LLC
MTGE Investment Corp.
MWI Veterinary Supply, Inc.
NetLogic Microsystems, Inc.
Nortek, Inc.
Novellus Systems, Inc.
NPS Pharmaceuticals, Inc.
Ocean Rig UDW, Inc.
Onyx Pharmaceuticals, Inc.

Acquired firm
OpenTable, Inc.
Orbotech Ltd.
OSI Pharmaceuticals, Inc.
PAETEC HOLDING CORP. /US/
Panera Bread Co.
PAREXEL International Corp.
PetSmart, Inc.
Pharmaceutical Product Development LLC
Pharmacyclics, Inc.
Pharmasset, Inc.
Pinnacle Entertainment, Inc.
PMC-Sierra, Inc.
PrivateBancorp, Inc.
Psychiatric Solutions, Inc.
Qlik Technologies, Inc.
Quest Software, Inc. /Old/
Questcor Pharmaceuticals, Inc.
Receptos, Inc.
Riverbed Technology, Inc.
Rosetta Resources, Inc.
Salix Pharmaceuticals Ltd.
SanDisk Corp.
Sapient Corp.
SAVVIS, Inc.
Scripps Networks Interactive, Inc.
Select Income REIT
Sepracor, Inc.
Sigma-Aldrich Corp.
Sirona Dental Systems, Inc.
Snyder's-Lance, Inc.
SodaStream International Ltd.
Sonic Corp.
Sourcefire, Inc
Staples, Inc.
Starent Networks Corp
Starz
Sun Microsystems, Inc.

Acquired firm
Surgical Care Affiliates, Inc.
Susquehanna Bancshares, Inc.
Synageva BioPharma Corp.
Syntel, Inc.
Talecris Biotherapeutics Holdings Corp.
TESARO, Inc.
Tesla Energy Operations, Inc.
The Advisory Board Co.
Thoratec Corp.
TIBCO Software, Inc.
Towers Watson & Co.
tw telecom, Inc.
Twenty-First Century Fox, Inc.
Varian Semiconductor Equipment Associates, Inc.

Acquired firm
VCA, Inc.
Virgin America, Inc.
Virgin Media, Inc.
ViroPharma, Inc.
VWR Corp.
Warner Chilcott Plc
Web.com Group, Inc.
WebMD Health Corp.
West Corp.
Whole Foods Market, Inc.
ZELTIQ Aesthetics, Inc.
ZS Pharma, Inc.
zulily, Inc.

Appendix B - Table 1

Table 1

Market Model Statistics for Data Sample over Period *t = -60 to t = 10*

Day	$\overline{AR}$	T-Statistic[a]	$\overline{CAR}$
-60	-0.09	-0.62	-1.82
-59	0.02	0.14	-1.80
-58	-0.03	-0.14	-1.83
-57	-0.03	-0.12	-1.85
-56	0.38	0.73	-1.47
-55	-0.04	-0.21	-1.51
-54	-0.01	-0.05	-1.52
-53	0.18	1.12	-1.33
-52	-0.05	-0.33	-1.39
-51	0.16	1.18	-1.23
-50	0.06	0.43	-1.18
-49	0.11	0.72	-1.07
-48	0.16	0.80	-0.90
-47	0.30	0.67	-0.60
-46	0.35	1.41	-0.26
-45	0.29	1.29	0.04
-44	-0.22	-1.19	-0.18
-43	0.13	0.73	-0.05
-42	-0.07	-0.43	-0.13
-41	0.23	0.83	0.11
-40	0.10	0.61	0.20
-39	-0.13	-0.90	0.08
-38	0.06	0.32	0.13
-37	0.09	0.52	0.23
-36	0.12	0.92	0.35
-35	-0.15	-0.80	0.20
-34	-0.03	-0.18	0.17
-33	0.06	0.37	0.23
-32	-0.02	-0.13	0.20
-31	0.00	-0.02	0.20
-30	-0.20	-0.87	0.00
-29	0.13	0.82	0.13
-28	-0.12	-0.60	0.01
-27	0.20	1.03	0.21
-26	0.20	1.14	0.41
-25	0.323*	1.710*	0.73
-24	0.05	0.26	0.78
-23	0.66	1.28	1.44
-22	0.04	0.24	1.48
-21	0.08	0.49	1.56

-20	-0.08	-0.58	1.48
-19	-0.291*	-1.730*	1.19
-18	0.15	0.93	1.34
-17	-0.05	-0.34	1.29
-16	-0.01	-0.04	1.28
-15	0.14	0.70	1.42
-14	0.17	0.94	1.59
-13	0.06	0.32	1.66
-12	0.32	1.53	1.98
-11	0.720***	2.637***	2.70
-10	0.20	0.77	2.89
-9	0.17	0.62	3.06
-8	0.587***	2.582***	3.65
-7	0.17	0.88	3.82
-6	0.34	1.51	4.16
-5	0.19	0.96	4.35
-4	0.455**	2.213**	4.80
-3	0.699*	1.851*	5.50
-2	0.497*	1.935*	6.00
-1	1.029****	3.103****	7.03
0	21.201****	10.080****	28.23
1	2.087***	2.561***	30.31
2	-0.04	-0.34	30.28
3	0.01	0.06	30.28
4	-0.14	-1.43	30.15
5	0.05	0.47	30.20
6	-0.08	-0.94	30.12
7	-0.377****	-3.791****	29.74
8	-0.202*	-1.830*	29.54
9	-0.07	-0.97	29.47
10	-0.05	-0.58	29.42

[a] T-Statistic = $\sum_{i=1}^{i=N} \frac{AR_{it}}{N} / \sqrt{\sum_{t=10}^{t=-130} \frac{(AR_{it}-\overline{AR}_{it})^2}{(N-1)}}$

* Daily Average Abnormal Return ($\overline{AR}$) is significant at the 0.10 level.

** Daily Average Abnormal Return ($\overline{AR}$) is significant at the 0.05 level.

*** Daily Average Abnormal Return $\overline{AR}$) is significant at the 0.02 level.

**** Daily Average Abnormal Return ($\overline{AR}$) is significant at the 0.005 level.