Stock Splits and the Impact on Abnormal Return

- A Quantitative Research on Nasdaq Stockholm

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Abstract

Throughout history stock splits have only been seen as a cosmetic change on how a firm express its market value of equity. This study investigates if abnormal return occurs in connection with stock split announcements on Nasdaq Stockholm and how the variations may be explained by selected factors. An event study is performed on 83 stock splits during the time period 2010-2020 to establish if abnormal return is present. With a multivariate linear regression, split quota, firm size and trading volume are the selected factors which may explain the variations in abnormal return. The results from the event study establish abnormal return one day prior to the announcement and the event day itself. Further, the regression confirms at a statistically significant level the negative relationship between firm size and abnormal return. For trading volume, the regression finds no statistically significant result and thereby it does not explain the variations in abnormal return. As for split quota, no conclusion can be drawn whether it affects abnormal return or not. The study concludes the occurrence of abnormal return in connection with stock split announcements on Nasdaq Stockholm and firm size as one of the factors explaining the variations.

Key words: stock splits announcements, abnormal return, split quota, firm size, trading volume, event study, multivariate linear regression

1.0 Introduction

1.1 Background

For almost half a century, stock splits have been widely analyzed in an attempt to quantify its value to the issuing firms, to potential stockholders, and to existing stockholders (Reilly & Drzycimski, 1981). It is generally believed that stock splits are purely cosmetic, since the firms' cash flows are unaffected. Therefore, each shareholder retains their proportionate ownership, and the claims of other classes of security holders are unaltered (Brennan & Copeland, 1988). Even though there is no real change following a stock split, the event sends positive signals to the market and can create a positive abnormal return (Lamoureux & Poon, 1987). When firms perform stock splits new shares are issued and a lower current market price is achieved. If a firm is trading at 1000 SEK prior to a 2-for-1 split, the result after the split will be a stock price of 500 SEK. The investor who holds the stock will then have twice the amount of the original number of shares pre-split. (Nasdaq, 2021).

Besides a regular stock split, there are also reverse stock splits, instead of splitting one share into two or any other number, which decreases the overall stock price. The reverse stock split makes two shares or any other number into one share, thus increasing the overall stock price (Han, 1995).

Stock splits have been heavily covered and studied throughout its existence. The motives for a firm to perform a stock split are many and one is not better supported by data than others (Lakonishok & Lev, 1987). One reason that is widely accepted and often mentioned is to lower the share price and to keep it within an optimal trading range (Baker & Gallagher, 1980). There are several reasons to keep the share price at a certain level, the most important one is to keep the share attractive to different investors and thereby keeping a broad ownership base (Baker & Gallagher, 1980).

Though stock splits are only a cosmetic change to the companies performing them, the market reacts to the changes. A regular stock split sends signals to the market that there are future increased earnings and hence an increased stock price, thereby creating an abnormal return (McNichols & Dravid, 1990). This contradicts the fact that stock splits only are a cosmetic change. Furthermore, the efficient market hypothesis presented by Fama (1970), concludes that markets are efficient and there are no possibilities for abnormal return, therefore, contradicting the fact that stock splits create abnormal return.

1.2 Problem Discussion

The case of stock splits is especially interesting due to the strong contradiction between earlier and later empirical findings. Fama et al (1969) find no abnormal return following the announcement of stock splits, whereas both Grinblatt et al (1984) and Brennan & Copeland (1988) report abnormal return. Furthermore, there are plenty of more recent studies which finds support for the latter such as Ikenberry et al (1996) and Hu et al (2017). On the other hand, the explaining factors behind abnormal return and its variation, is something there is no consensus about. Abnormal return is described as the excess return which cannot solely be explained by the expected market return (MacKinlay, 1997).

Prior studies on the US stock market have shown that the variations in abnormal return can be explained by several factors. One factor is the choice of split quota by the company. Depending on the chosen split quota, it gives the market different signals on future earnings. A higher split quota signals higher future earnings and respectively a higher abnormal return (McNichols & Dravid, 1990). An additional factor that has been studied is the share price; where the dominant theory is to keep the trading price at an optimal range (Baker & Gallagher, 1980; Angel, 1997). Moreover, it has been concluded that the returns of stocks with high trading volume lead returns of stocks with low trading volume, primarily because the high-volume stocks adjust faster to market wide information. This is in accordance with the speed of adjustment hypothesis. Consequently, trading volume plays an important role in the distribution of market wide information. (Chordia & Swaminathan, 2000).

Most of the research around the chosen subject is conducted on the US market, whilst this study is made on the Swedish market. The conclusions drawn for the US market cannot be directly applied on the Swedish market, and there are several reasons for this. First and foremost, how the markets are structured, regulated and situated in different countries. For example, under the tax laws in Sweden a private investor can trade using an ISK portfolio only taxed at 0,375%. This will affect how much a single person is willing to trade on the market. Secondly, the market size between the two countries differs considerably. The US market is significantly larger, contains more firms, analyzed at a greater extent and it has a bigger international participation. Lastly, there is the structuring of firms with different share types being traded on the market. These factors affect how the sample size, the selection and delimitation process which further affects the results.

For the Swedish market, there is limited research regarding stock splits and their effects. However, there are some studies on the Swedish stock market which concludes that managers in Swedish companies perform stock splits for the main reason to keep their share price at a certain desired level (Burnie & de Ridder, 2011). For example, if the share price gets too high for their preference, they perform a stock split to drive down the price and repeats the process if needed. An additional effect to the event of a

stock split is the creation of abnormal return. This effect seems to be regarded as a bonus, not the main objective for company managers. One of few studies on the Swedish stock market with regards to stock splits and abnormal return indicates the relationship between stock split announcements and significant positive price reactions (Liljeblom, 1989). Since the paper is published in 1989 it is interesting to investigate the phenomena on more recent data. This thesis therefore investigates, firstly, do stock splits create abnormal return on the Swedish stock market and secondly, if there are some factors that can explain the variations in abnormal return. Hence, the following research questions:

1) *Do announcements of stock splits generate positive abnormal return on the Swedish stock market?*
2) *Can split quota, firm size and trading volume explain the variations in abnormal return?*

1.3 Research Design

The chosen approach for the research is deductive and quantitative. By performing a deductive approach, theory about the subject is gathered and then hypotheses are formulated. Secondly, data is collected and then analysed. In conclusion, the hypotheses can either be confirmed or rejected as a result of the tests. The chosen sample consists of all listed stocks on the Nasdaq Stockholm stock exchange, also called OMX Stockholm PI. The collected data will first be analyzed with an event study to test whether there is positive abnormal return with stock split announcements. Then a multivariate linear regression will be performed to test if split quota, firm size and trading volume can explain the variations in abnormal return.

1.4 Aim and Knowledge Contribution

The intention of this thesis is to contribute to the research area of stock splits announcements and to establish whether abnormal return is present in the Swedish stock market. Therefore, the aim is to broaden the knowledge of abnormal return with regard to stock split announcements on the Swedish stock market. There is an abundance of research on stock splits on the US market but relatively few studies have been made on the Swedish market. Further, the variations in the eventual abnormal return will be examined with the selected variables: split quota, firm size and trading volume. The research and contributions will be for the time period, 2010-2020.

1.5 Limitations

This study is limited to companies listed on Nasdaq Stockholm, announcing stock splits from 1 January 2010 to 31 December 2020. Further, this paper analyses theories concluded on older data and mostly the US market to see if they are still applicable on recent data as well as on the Swedish market. This further implies that the data sample is considerably smaller than other previous studies to examine the occurrence of abnormal return. Additional limitations to this study are the number of factors that can be mentioned and examined, which may affect the variations in abnormal return. Existing research presents a large number of factors that can affect the variations, this study will only mention three of them.

1.6 Outline

The rest of the paper is divided into six parts and arranged in the following way:

Chapter 2.0 focuses on previous research, their methods and conclusions. From the previous research, hypothesizes are formed with reference to the research questions.

Chapter 3.0 introduces the chosen research methods and their design. The selection of data with its research methods will be motivated. Lastly, a critical review of the methods will be presented.

Chapter 4.0 presents the findings from the empirical research whereas chapter 5.0 analyzes the findings and are discussed with regards to the presented theories and the formed hypothesis.

Chapter 6.0 concludes the findings, the answers to the research questions and suggestions for additional research.

Chapter 7.0 discusses the study limitations in terms of the chosen methods, included factors and the chosen sample.

2.0 Literature Review

2.1 Introduction

The following parts are divided in accordance with how the study is performed. First, the efficient market hypothesis is presented. It will give some insight to how financial markets are believed to act. Then, other research will be presented which concludes that announcements of stock splits create abnormal return, which deviates from the fact that financial markets are efficient. Lastly, prior studies and their theories are examined which may explain some of the variations in the abnormal return.

In this study, special focus will be given to the selected factors: split quota, firm size and trading volume. Split quota and firm size are both widely used variables by academics when investigating the variations in the abnormal return due to their strong empirical findings (See Beladi et al., 2016; Ford et al., 2012; Hu et al., 2017; Ikenberry et al., 1996; McNichols & Dravid, 1990; Brennan & Copeland, 1988; Grinblatt et al., 1984). However, regarding the third variable, trading volume, the literature is rather scarce with different definitions of its measure and contradictory empirical findings with no consensus about its contribution. Hence, this article intends to broaden the understanding of this variable with a unique construction of the measurement definition, which may explain some of the variations in the abnormal return. Thus, adding valuable information which later studies ought to reflect upon.

Furthermore, there is an abundance of different factors which may be applied to analyze the variations in the abnormal return such as volatility, liquidity, book-to-market ratio and P/E ratio (See Grullon et al., 2012; Conroy & Harris, 1990; Beladi et al., 2016; Kelly et al., 2008). Since these factors are not as deeply rooted in the academic literature as split quota and firm size and too many variables in the regression alters the results, they will not be further analyzed.

2.2 Theoretical Framework

2.2.1 Efficient Market Hypothesis

The efficient market hypothesis suggests that at all times, all available information is fully reflected in the prices on financial markets. The model is divided into three parts of market efficiency: *weak, semi-strong* and *strong form of efficiency*. These three classes of market efficiency are created to examine at which level of available information the market is efficient. The weak form defines that the current available information is reflected in the stock price, the semi-strong form includes historical prices and other publicly available information whilst the strong form of efficiency states that all information is included, even inside information that is only available to a limited number of people (Fama, 1970). Further, only the semi-strong form of market hypothesis will be presented more in depth, discussed and analyzed. Announcements and related information about the stock split announcement is considered to

be other publicly available information in coherence with the semi-strong form of efficient market. One way to test whether the market is efficient, and if new information is absorbed into the prices, is to study corporate events where new information is presented to the market and analyze whether new information is adjusted efficiently into the prices. If some abnormal return is found, then the market is not efficient. Hence, the actual return cannot be explained by the market return. Fama et al (1969) find that over longer periods around corporate events there is no abnormal return.

Moreover, Fama (1970) states that the semi-strong form considers all historical prices and additional publicly available information reflects the prices on financial markets. Other publicly available information is corporate announcements and events such as stock splits, financial reports and issues of new securities. Regarding stock splits, Fama (1970) refers to his previous study (Fama et al., 1969), which concludes that a stock split is only to multiply the number of shares per share holder and no change in real assets. Further, they test the returns by analyzing a large number of stock splits. The cumulative average residuals in returns and the cumulative market model average residuals are compared. The study concludes that from the period of 29 months prior to the announcement and 30 months after the announcement there is no significant change in cumulative average return between the stock splitting firms and the market (Fama et al., 1969). On this basis Fama (1970) implicates that the semi-strong market hypothesis holds. Continuing, Fama (1970) strengthens his arguments by analyzing other types of public announcements by firms and concludes that the semi-strong form holds.

2.3 Literature Survey and Development of Hypotheses

2.3.1 Abnormal Return and Announcement of Stock Splits

The pioneering study of Fama et al (1969) concludes that stock splits have very often been associated with substantial dividend increases. The evidence presented by the authors indicates that the market realizes this and uses the announcement to re-evaluate the stream of expected income from the shares (Fama et al., 1969). Moreover, the study finds no evidence that the announcement of stock splits would yield an abnormal return. However, the latter has been criticized by more recent studies such as Grinblatt et al (1984), Brennan & Copeland (1988), and Ikenberry et al (1996), whom all find evidence to support that the announcement of stock splits yield a positive abnormal return. Grinblatt et al (1984) further suggest that stock splits are associated with a firm's future cash flows, rather than with expected dividend increases as presented by Fama et al (1969). They also find that the average two-day abnormal return on the announcement day and subsequent trading day is 4,3% for firms listed on New York Stock Exchange and American Stock Exchange (Grinblatt et al., 1984). Brennan & Copeland (1988) provide the academic literature with additional empirical evidence surrounding the occurrence of abnormal return in relation to the announcement of stock splits. They present a model, where management is able to communicate its private information about the firm's prospects to investors by means of stock split

announcements, because the cost of trading depends on the stock price. Thus, the firm's announced number of shares acts as a costly signal of its value. Furthermore, the authors derive a positive average abnormal return of 2,9% in connection with the announcement of stock splits. (Brennan & Copeland, 1988).

In addition, Ikenberry et al (1996) examines a sample of 1275 2:1 stock splits announced by New York Stock Exchange and Amman Stock Exchange between the years 1975 and 1990. They find that stock splits generally occur when stocks trade at higher prices. In the month preceding the split announcement, almost four out of five sample firms traded at prices at or above the 80th percentile in comparison to firms of comparable size. Moreover, the authors give evidence of a positive abnormal five-day announcement return of 3,38%, which confirms prior academic research that stock splits convey favorable information to the market. (Ikenberry et al., 1996). On the basis of the presented theories and empirical results, this study anticipates to observe the following hypothesis:

Hypothesis 1: Announcement of stock splits will generate positive abnormal return on the Swedish stock market.

2.3.2 Abnormal Return and Split Quota

Announcement by firms covers both the stock and split quota; the choice of split quota, lower or higher, will affect the abnormal return. Three hypotheses will be presented that can partially explain the choice of different split quotas. The first hypothesis is the *Trading Range Hypothesis*. It states that stock splits are performed to keep the stock price within a specific trading range, either within a market average or an industry average (Baker & Gallagher, 1980). Before the announcement, the specific firm has experienced a larger than average growth and to keep the stock attractive to a large number of investors some measures are applied, which will be presented. Firstly, the intended belief among practitioners, is that stock splits are performed just to keep the stock price at normal levels, hence creating a balance between smaller and larger investors. A lower price will enable smaller investors to buy the stocks. If the price raises to higher levels, smaller investors might not be able to afford a single stock or deem it too risky with such a hefty investment. Secondly, as opposed to what has been previously stated, if the stock price becomes too low, it will not be as attractive for wealthy or institutional investors. This is a consequence of the fixed per-share transaction cost component, which enables these investors to save brokerage fees if securities are priced high. With this information, the stock splits are performed to keep the stock attractive for both small and large investors. When a firm desires a specific trading range it is important to choose the correspondent split quota that will result in the desired share price. (Lakonishok & Lev, 1987).

The second hypothesis is the *Signaling Hypothesis,* which states that when a firm decides to do a stock split and choses the split quota, the size of split quota will signal to the market its level of future earnings (McNichols & Dravid, 1990). As stated above, firms who perform a stock split have previous to the announcement experienced an above average increase in their share price. Subsequently, when firms perform a stock split to lower their share price and chooses a split quota according to the trading range hypothesis, optimal range is achieved. The signaling hypothesis adds that it is not only the new share price that will affect the firm's chosen split quota, the split quota is also based on the private information the firm have about its future earnings. When a firm chooses its split quota, it signals to the market about its private information concerning earnings forecasts. A higher split quota will give signals of higher future earnings, thus resulting in a larger abnormal return on the specific stock (McNichols & Dravid, 1990).

The third hypothesis is the *Self Selection Hypothesis,* which is based on both the trading range hypothesis and signaling hypothesis. The management chooses split quota based on the optimal trading range but conditions the choice based on forecasts about future earnings. They are aware of that if a split quota is high and the forecasts of future earnings are higher than actual earnings it will then lead to a share price being too low, therefore guiding the share price outside the optimal trading range. (Ikenberry et al., 1996).

This implies that there is a positive relationship between the chosen split quota and abnormal return on stock split announcements according to the signal hypothesis. For instance, a higher split quota will lead to higher abnormal return on the announcement day. Firms are aware that if the split quota is too high the share price will fall outside the trading range and the split will not have the desired effect of restoring the share price to an optimal level, which is aligned with the self-selection hypothesis.

The study performed by McNichols & Dravid (1990) concludes that the abnormal return increases by 1,6% with an increase of one in split quota. Later studies have shown that companies performing stock splits have experienced higher abnormal return with a higher chosen split quota. Beladi et al (2016) present that if the split quota increases with one, instead of one share becoming two, one share becomes three, then the abnormal return increases with 1,37%. Ford et al (2012) conclude that the abnormal return increases between 1,30-1,37% when split quota increases with one. On the basis of the presented theories and empirical results, this study anticipates to observe the following hypothesis:

Hypothesis 2: There is a positive relationship between split quota and abnormal return on the Swedish stock market.

2.3.3 Abnormal Return and Firm Size

Firm size contributes to the variations in abnormal return with regards to announcements of stock splits. Large firms are usually more exposed and followed by equity analysts and therefore exposed to a larger political and public attention, which contributes to further monitoring compared to smaller firms on the market (Watts & Zimmerman, 1990; Brennan & Hughes, 1991). Another peer-reviewed academical article is the one written by Ford et al (2012), which investigates how abnormal return is affected by announcement of stock splits and further how it is affected by analysts monitoring, which varies reliant to firm size. The authors detect that firms which are monitored to a greater extent generates lower abnormal return, but also that the negative relation is stronger for larger firms than smaller firms (Ford et al., 2012). Firms that engage in stock splits are generally larger than the average, hence implying that stock splits happens when stock prices are too high (Lakonishok & Lev, 1987).

Brennan & Copeland (1988) state in their study that the variables target price and firm value contribute to 15-16% of the variance in announcement returns. They also mention that the coefficient of the firm value is negative, which would suggest a lower abnormal return the larger the firm value. The reason for this can be explained by small firms not publishing new information to the same extent as the larger firms do in financial press, which contributes to a greater market interest compared to the larger firms (Grinblatt et al.,1984). Ikenberry et al (1996) validates the result above by ranking firms into deciles depending on if they are small firms (decile 1, 2, 3) or larger firms (decile 10). The result concludes that small firms have an abnormal return of 10,04% and the larger firms have an abnormal return of only 1,01% (Ikenberry et al., 1996). Ikenberry et al (1996) also mention that this result is consistent with the evidence reported by Grinblatt et al (1984) and Brennan & Copeland (1988). Further, recent studies show that small firms usually generate higher abnormal return with regard to announcements of stock splits compared to larger firms, since firm value has an inverted relationship to abnormal return (Beladi et al., 2016). On the basis of the presented theories and empirical results, this study anticipates to observe the following hypothesis:

Hypothesis 3: There is a negative relationship between firm size and abnormal return on the Swedish stock market.

2.3.4 Abnormal Return and Trading Volume

The analysis of trading volume ought to provide insights to the impact of the information given to the public. Furthermore, it is essential to consider daily data rather than monthly, as it is possible that result with monthly data could display that while stock prices adjust before the end of the month, there could be numerous profit opportunities for investors who are able to trade during the days surrounding the announcement. Hence, the announcement date is the relevant point for further analysis to test profit opportunities for aggressive investors, rather than the split date that comes several weeks later. (Reilly

& Drzycimski, 1981). Further, the results of the study regarding trading volume indicates a slight increase prior to the split announcement, a major spike on the day of the public announcement, then a drop on the subsequent day and generally declining volume thereafter (Ibid). From Reilly & Drzycimski (1981) exhibit 2, it is observed that there is a 57% increase in mean volume relative to the New York Stock Exchange volume from the day prior to the announcement and the subsequent public announcement day. However, the direct effects that stock split announcements have on trading volume are much disputed, with studies such as Conroy et al (1990) and Ikenberry et al (1996), whom report that splits increase the number of stockholders and the number of trades. Although, there is little evidence that splits lead to increased trading volume (Ikenberry et al., 1996).

Lakonishok & Lev (1987) find that compared with the peak volume during the eight to twelve months preceding the split announcement, the post-announcement volume is lower, however, this peak volume is obviously abnormal for the firms conducting a split, reflecting their unusual operational performance. As stated by Morse (1981), there is ample evidence suggesting that trade volume increases abnormally (relative to past "normal" volume) around the announcement of unexpectedly large earnings and subsides thereafter. This is also supported by the findings of Lakonishok & Lev (1987) whom concludes that splitting firms experienced particularly large earning increases during the year preceding the split announcement. Thus, the findings support the *signaling hypothesis* which conveys that the choice of split factor signals positive future earnings, hence affecting the abnormal return at the announcement day (McNichols & Dravid, 1990). However, abstracting from the data presented by Lakonishok & Lev (1987), the abnormal volume (approximately 12 months preceding the announcement), it is clear that the splitting firms' average post-announcement volume (roughly 4%) is very similar to the post-split average volume for the control firms. Thus, stock splits do not seem to transmit a permanent effect on the volume of trade.

Moreover, Chordia & Swaminathan (2000) find that daily or weekly return of stocks with high trading volume lead daily or weekly return of stocks with low trading volume. Additional tests specify that this effect is related to the tendency of high-volume stocks to respond swiftly, whereas low volume stocks to respond slowly to market-wide information. Further, this is coherent with the speed of adjustment hypothesis. Hence, trading volume plays a key role in the dissemination of market-wide information. (Chordia & Swaminathan, 2000). On the basis of the presented theories and empirical results, this study anticipates to observe the following hypothesis:

Hypothesis 4: There is a positive relationship between trading volume and abnormal return on the Swedish stock market.

2.3.5 Criticism of Sources

When conducting research regarding abnormal return and the announcement of stock splits, event studies have been used in the majority of the academic articles and some modifications to the event definition itself has been observed. Fama et al (1969) used a large event window, 29 months prior and 30 months subsequent to the public announcement. Later studies by Grinblatt et al (1984) and Brennan & Copeland (1988) used a shorter event window; 10 days prior and 16 days following the announcement. The most recent studies by Ikenberry et al (1996), Ford et al (2012) and Beladi et al (2016) used an even shorter event window, only five days before to five days after the announcement. The use of different event windows has led to different results. A longer event window as applied by Fama et al (1969) will contain more corporate events than only the stock split announcement and therefore exogenous factors may influence the results, furthermore, the study did not find any abnormal return. Applying a shorter event window as later studies have done allows the stock split event itself to be more isolated and less influenced by other corporate and external events (Grinblatt et al., 1984; Ikenberry et al., 1996). Both Grinblatt et al (1984) and Ikenberry et al (1996) find empirical evidence of abnormal return, in contrast to Fama et al (1969). The shorter event window can be criticized since it only focusses on eleven days and in that short span abnormal return may often be observed. By shortening the event window, it seems that the likelihood of abnormal return increases. Becoming even more extreme and only examining the public announcement day of the stock split, abnormal return will most likely be observed (See Grinblatt et al., 1984; Brennan & Copeland, 1988; Ikenberry et al., 1996; Fort et al., 2012; Beladi et al., 2016). However, it seems that the short window of five days subsequent and five days prior to the event is generally accepted and is continuously used in academic articles when conducting an event study (see Ford et al., 2012; Beladi et al., 2016; Li et al., 2013).

2.4 Conclusion

Firstly, two conflicting theories regarding stock split announcements are presented. The first one is the efficient market hypothesis which states that in an efficient market there are no abnormal return, only the market return, even when there are corporate events that conveys new information to the market. The efficient market hypothesis is then criticized by later studies who find abnormal return in the days surrounding the announcement of a stock split. Secondly, evidence is presented that can explain the variations in the observed abnormal return. The first factor that can affect the abnormal return is the choice of split quota, in connection with split quota there are three main hypothesizes that tries to explain the choice: *Trading Range Hypothesis, Signaling Hypothesis and Self Selection Hypothesis.* The second factor that can explain the variations in abnormal return is the firm size. Theory within firm size is that, depending on the size, firms publish information in different extent. Trading volume is the third and last factor to be examined. Depending on the volume, prices adjust at different speeds when new information is published. These theoretical dictums, mostly conducted on the US market, presents support for the

mentioned theories and hypotheses, however, by investigating the scarcely analyzed Swedish market, this paper intends to broaden the understanding of stock split announcements and its possible effects.

3.0 Research Design

3.1 Problem, Purpose and Contribution

The purpose of this thesis is to investigate whether the announcements of stock splits on the Swedish stock market has any effect on abnormal return and further if split quota, firm size and trading volume have an impact on the variations in abnormal return. From an investors' point of view, it is relevant to examine if positive abnormal return can be proven to exist on the Swedish stock market. Then investors could apply this strategy to generate positive returns based only on stock splits announcements. This thesis will contribute to previous research both by investigating the most recent time period, 2010-2020, but also by only researching the Swedish market since most of the previous research is international.

3.2 Scientific Perspective

This thesis scientific perspective is quantitative in addition to a deductive and positivistic approach. A quantitative research starts with particular theories which leads to specific hypotheses and lastly using numerical data to further verify the hypotheses (Holton & Burnett, 2005). The existence of abnormal return with regard to stock splits announcements is investigated by examining historical data such as share price and testing the significance using a statistical test, a clear illustration of a quantitative research method. A deductive research process aims to test a theory by collecting data and testing whether the data can confirm or deny the theory. The advantage of the deductive approach is that, if properly conducted, it will assure content validity. (Holton & Burnett, 2005). Lastly, positivism assumes that the world is objective and that researchers seek out facts in terms of relationships among variables (Holton & Burnett, 2005).

3.3 Data Selection

The aim of this study is to investigate stock splits on the Swedish stock market and for that quantitative data on the number of stock splits, dates of announcements, split factors and historical stock prices are needed. The data used in this study is retrieved from the database Thomson Reuters Eikon. The dates for stock splits announcements and split factors for all listed companies on Nasdaq Nordic Sweden are obtained through the tool for advanced event searches in Eikon. Daily closing prices for shares, market values the day before the announcement and closing prices for the OMXSPI index are retrieved from Eikon Datastream. Daily data is used as it improves the precision and quality in measurements of how

stock splits affect share prices (Kothari & Warner, 2007). A total of 119 stock splits are included during the period 2010-2020, before selection and delimitation.

3.4 Selection and Delimitation

To avoid skewness in the result, the selection of observations is made according to certain predetermined criteria. The basis criteria is that all observations must have complete data about announcements of stock splits and announced split quota used. Zero stock splits lacked complete data and are therefore excluded from the sample. In the sample, some shares were listed on the Stockholm Stock Exchange, but they are traded on other trading markets as well. These observations are excluded from the study as it only examines stock splits on the Stockholm Stock Exchange, a total of 11 observations are removed.

This study only intends to examine stock splits of firms' ordinary shares as previous studies (see Ford et al., 2012; Beladi et al., 2016; Hu et al., 2017), which leads to excluding preference stocks from the sample. Preference stocks do not affect the firm's market value as it is constituted by the total value of all ordinary shares. A total of one stock split of preference stocks are removed. Some companies also have different types of shares outstanding on the market in the form of A and B stocks. The major difference between these types of stocks is how the voting rights are distributed, where A stocks usually have more voting rights in the company (Bolagsverket, 2019). The 20 observations where a company has announced a stock split for both the A and B stock on the same day will be excluded from the sample, as they in the event study would be observed as two different events when in reality, they are only one. If these stocks are included, there is a risk of distorting the result, as only a few companies are counted twice. Finally, the stock splits that did not have complete return data were also excluded, which in total were two observations. After the selection, 83 observations for stock splits remain in the sample during the period 2010-2020. The methodology for the selection is summarized in Table 1.

Table 1. Summary of the selected data

	Removed observations	Remaining observations
Obtained observations (2010-2020)		117
Incomplete observations	0	117
Stocks traded on other markets	11	106
Preference shares	1	105
A and B stocks	20	85
Incomplete return data	2	83
Final selections		**83**

Source: Own calculations of data from Thomson Reuters DataStream.

The time period for the study is 2010-2020. Since 2020 was affected by the Covid-19 pandemic, this year will be divided later on in this study. The number of stock splits on the Stockholm Stock Exchange sorted by year, split quota and share type are presented below in Table 2. For a more complete overview of the sample see Appendix 1.

Table 2. Number of share splits after final selections divided per year, split quota and share type.

Years	# obs	Split Quota				Share type	
		2:1	*3:1*	*4:1*	*5:1 or >*	*A-stocks*	*B-stocks*
2010	2	2	-	-	-	-	2
2011	3	1	2	-	-	-	3
2012	2	1	1	-	-	-	2
2013	1	1	-	-	-	-	1
2014	4	3	1	-	-	-	4
2015	14	7	2	2	3	1	13
2016	10	7	1	1	1	-	10
2017	11	6	1	3	1	1	10
2018	16	10	3	1	2	1	15
2019	14	9	1	1	3	1	13
2020	6	3	1	2	-	-	6
Total	83	50	13	10	10	4	79

Source: Own calculations of data from Thomson Reuters DataStream.

As Table 2 shows, the distribution of observations over the time period is uneven, since the majority of all stock splits are announced during the period 2015-2020. Furthermore, there is a clear majority regarding stock splits with a split quota of 2:1, which is the most common on the Stockholm Stock Exchange. Lastly, the distribution of stock splits between A and B stocks are not the same, since B stocks are in clear majority.

3.5 Event Study

To measure the occurrence of abnormal return in connection with announcements of stock splits on Nasdaq Stockholm and test hypothesis 1, a quantitative approach will be used in the form of an event study. Event studies observe the behavior of firms' stock prices around chosen corporate events. As presented by Kothari & Warner (2007), the usefulness of event studies ascends from the fact that the magnitude of abnormal performance at the time of an event provides a measure of the unanticipated impact this specific type of event has on the wealth of the firms' shareholders. Consequently, event studies focusing on announcement effects for a short time horizon around an event provides relevant

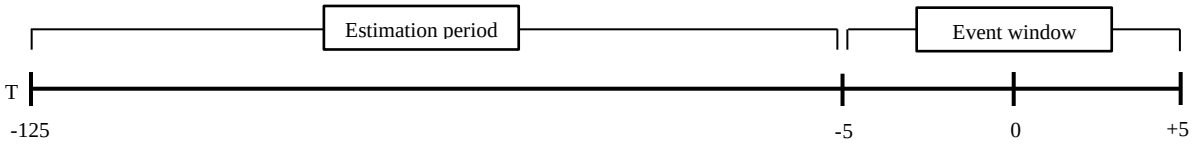
support for understanding corporate policy actions (Kothari & Warner, 2007). Moreover, the chosen method also serves a decisive purpose in capital market research as a way of testing market efficiency, as systematic nonzero abnormal stock return that occurs after a particular corporate event are inconsistent with market efficiency (Ibid). Within the research of how stock splits affect share prices, event studies are commonly used and well cited (Ibid). With regards to previous research (See Beladi et al., 2016; Li et al., 2013; Ford et al., 2012; Ikenberry et al., 1996) whom all perform event studies when analyzing stock splits, thus this study will be coherent in the choice of method.

3.5.1 Estimation Window and Event Window

The initial task of an event study is to define the estimation window and the event window. The latter is the time period over which the security prices of the chosen firms in the event will be examined, which in this case is the return on individual stocks. The event window is often defined to be larger than the specific period of interest, thus enabling examination of the periods surrounding the event. In practice, the period of interest is commonly expanded to multiple days before and after the announcement. The estimation window is the period prior to the event window which is used to estimate the normal return which would be expected given that the event did not take place. The estimation period occurs before the event window and contains a much larger time period because the expected normal return demands more observations in order for the estimation to be as accurate as possible. Lastly, the event window is not included in the estimation period, this is to prevent the event itself from influencing the estimates of the normal performance model. (MacKinlay, 1997).

The event study intends to analyze the short-term abnormal return, which in this case is assumed to be five trading days subsequent to the stock split announcement. A period consisting of five trading days prior to the event is also added to examine whether there are any factors that may impact the return of the security before the event has taken place. This definition of the event window is made accordingly to Li et al (2013). T is the time over which this study will be conducted and the date of announcement of the stock split is defined as (T = 0), where time is expressed in the number of trading days. Thus, the event window that will be examined is defined as (T = -5) to (T = +5) and including the event day itself consists of eleven trading days. The estimation period for the study can be observed as (T = -125) to (T = -5) which in total is 120 trading days. The specific set of days contained in the estimation period is set in respect to MacKinlay (1997). The timeline for the event study is in total 131 trading days and is illustrated in figure 1.

Figure 1. Illustration of estimation period and event window



3.5.2 Calculation Formulas Abnormal Return

This study will conduct all calculations for the event study in accordance with MacKinlay (1997). Appraisal of the announcement of stock splits impact requires a measure for the abnormal return, which is conducted by subtracting the normal return of the firm over the event window from the observed return of the security over the same period. Further, the normal return is defined as the expected return given that the event did not take place. This is expressed in equation (1),

$$AR_{iT} = R_{iT} - E(R_{iT}|X_T) \quad (1)$$

AR_{iT} is the abnormal return for firm *i* during the time period *T*. R_{iT}, and $E(R_{iT}|X_T)$ are the observed return for firm *i* over the time period *T*, the actual return over the same period, and the normal return given that the event did not take place respectively. Thus, the normal return needs to be estimated in order to calculate the abnormal return.

There is an abundance of choices for modeling the normal return, however this study will apply the *Market Model* where X_T is the market return. The model is well cited and used in numerous academic literatures (see Beladi et al., 2016; Ford et al., 2012; Li et al., 2013 Kothari & Warner, 2007; Ikenberry et al., 1996), which makes it suitable for this kind of study. Moreover, the market model as presented by MacKinlay (1997) is a statistical model which relates the return of any given stock to the return of the market portfolio. The model's linear specification follows from the assumed joint normality of security returns, thus giving the estimates $E(\varepsilon_{it} = 0)$ and $var(\varepsilon_{it}) = \sigma_{\varepsilon_t}^2$, which when rearranged gives equation (2),

$$\sigma^2(AR_{iT}) = \sigma_{\varepsilon_i}^2 \quad (2)$$

$\sigma^2(AR_{iT})$ is the variance in abnormal return for stock *i* during time *T*. $\sigma_{\varepsilon_i}^2$ is the variance for the error term for stock *i*.

Given the assumptions in the *Market Model*, the returns for stock *i* can be estimated for time period *T*. In accordance with MacKinlay (1997) the use of the market model for normal returns stated in the following equation (3),

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (3)$$

R_{it} is the return for the period *t* for stock *i*, R_{mt} is the market return under the period *t* and ε_{it} is the model's error term. The parameters α_i and β_i are measures of non-systematic risk for stock *i*. As a proxy for the market portfolio the index OMXSPI is used.

When the normal return has been calculated for the stocks in the sample with regard to the event window abnormal return can be calculated in accordance with equation (4),

$$AR_{it} = R_{it} - \widehat{\alpha_i} - \widehat{\beta_i} R_{mt} \qquad (4)$$

$AR_{it}$is abnormal return, R_{it} is the return for the period *t* for stock *i* and $\widehat{\alpha_i} - \widehat{\beta_i} R_{mt}$ is normal return for stock *i* under period *t*.

When abnormal return is calculated for all the stocks under the event window, AAR is calculated in accordance with equation (5),

$$AAR_t = \frac{1}{N} \sum_{i=1}^{N} AR_{it} \qquad (5)$$

AAR_{it} is average abnormal return under period *t* for stock *i*, AR_{it} is abnormal return for stock *i* under period t, and *N* is the number of observations.

Lastly, it is required to calculate *CAAR* to be able to draw inferences regarding stock splits and abnormal return, as an individual observation does not depict the general relationship (MacKinlay, 1997). This is described in equation (6),

$$CAAR_{(t1,t2)} = \sum_{t=t1}^{t2} AAR_t \qquad (6)$$

$CAAR_{(t1,t2)}$ is the cumulative average abnormal return from period *t1* to *t2* and AAR_t is average abnormal return under period *t*.

3.5.3 Significance Test

The announcement of stock splits on the Stockholm Stock Exchange has a positive effect on abnormal return in the short term. This hypothesis is tested by performing a t-test in accordance with MacKinlay (1997). This test makes it possible to statistically confirm whether the cumulative average abnormal

return is significantly different from 0. The null hypothesis is that there is no abnormal return under the investigated event and the hypothesis is rejected if the significance test reaches a critical value, depending on the level of significance used (Kothari & Warner, 2007). The t-test in MacKinlay (1997) requires that the variance for AAR is calculated, which is done in accordance with equation (7), then CAAR is calculated with equation (8), and finally the t-value with equation (9).

$$var(AAR_t) = \frac{1}{N^2}\sum_{i=1}^{N}\sigma_{\varepsilon i}^2 \quad (7)$$

$$var(CAAR_{t1,t2}) = \sum_{t=t1}^{t2} var(AAR_t) \quad (8)$$

$$\theta_1 = \frac{CAAR_{(t1,t2)}}{var(CAAR_{(t1,t2)})^{1/2}} \sim N(0,1) \quad (9)$$

$Var(AAR_t)$ is the variance in average abnormal return for period *t*, $\sigma_{\varepsilon i}^2$ is the variance in abnormal return under the estimation period for stock *i* and *N* is the number of observations. $Var(CAAR_{t1,t2})$ is the variance in cumulative average abnormal return from period *t1* to *t2*. θ_1 is the t-value.

3.6 Multivariate Regression

The conducted event study is only able to tell whether there is abnormal return or not when firms announce a stock split. To test the variations in the abnormal return with regards to split quota, firm size and trading volume, a multivariate regression will be performed. The multivariate regression will be performed similar to previous studies (See Ikenberry et al., 1996; Beladi et al., 2016; Hu et al., 2017). With the help of the multivariate regression, the above-mentioned factors will be examined and tested to see if the variations in abnormal return is explainable. With the multivariate regression hypotheses 2, 3 and 4 are tested. The method will be the ordinary least squares (OLS) with a linear model, since prior research has concluded that return on stocks is of a linear character (Beladi et al., 2016). First, the linear regression will be made independently of each other, only having the dependent variable and one of the explaining variables. Then the model will be tested as a whole, stated below:

$$AR_{i,-2,+2} = \alpha_0 + \beta_1 SplQ_i + \beta_2 \ln(Size_i) + \beta_3 \ln(Vol_i) + \beta_4 Type + \beta_5 D_{(2020)} + \beta_6 D_{(2019-2015)} + \varepsilon_{it} \quad (10)$$

AR_{it}, the dependent variable, is the average abnormal return for two days before to two days after the announcement for stock split *i.* The independent variables: $SplQ_i$ is the split quota chosen by the firm *i,* $\ln(Size_i)$ is the natural logarithm of the firm *i* size on the day before the announcement and $\ln(Vol_i)$ is the natural logarithm of the average trading volume two days before to two days after the

announcement. The first control variable, $Type$ is a control variable for A-type or B-type stocks. $D_{(2020)}$, $D_{(2019-2015)}$ are control variables for each period times when the stock splits were announced. The last term ε_{it}, is the model error term.

3.6.1 Construction of the Dependent Variable

In the model the dependent variable will be the abnormal return received from the event study. The average will be taken from two days prior to the announcement to two days after the announcement. This is according to prior studies, for instance Ikenberry et al (1996) who uses this method to minimize the effects of extreme values and more recent studies which have conducted it similarly (Beladi et al., 2016; Hu et al., 2017).

3.6.2 Construction of the Independent Variables

The independent variables in the model will be the factors that can help to explain the variations in the abnormal return. The first one is the split quota; it will be constructed in the same way as prior studies. The motives behind the way it is constructed are that it will get the same value as the number of new shares per already existing share (Hu et al., 2017). This means that a 2:1 split will get the value one and a 3:1 split will get the value two and so forth. The second factor that will be tested is firm size. The firm value will be collected from the day prior to the stock split announcement. The collected firm values will be transformed with the natural logarithm as prior studies have done (Brennan & Copeland, 1988; Beladi et al., 2016). The use of the natural logarithm to transform the data is to remove any skewness towards the larger values (Brennan & Copeland, 1988). Firm value is considerably larger than the values from split quota and will affect the regression in an undesirable way if not transformed. The third and final factor that will be tested is trading volume, the volume will be collected during the same time period as the abnormal return. The average of two days prior till two days after the announcement will contribute to a total of five observations for each stock splitting firm. The average trading volume will then also be transformed with the natural logarithm. It is motivated by keeping the numerical value in a similar range as the other independent variables to avoid any skewness towards larger or smaller values.

3.6.3 Construction of the Control Variables

Control variables will also be included for different share types and for different time periods. The control variables are dummy variables and will either take the value 1 or 0. The control variable for share type is created with regards to the different share types that exist on the Swedish market. The dummy variable will take value 1 if it is a type-A share and 0 otherwise. The motives behind this selection are that type-A shares typically trade at higher ranges than B-shares due to the fact of greater voting power (Levy, 1983). The variable will tell if there are any differences between a split of type-A

or -B shares. The time periods will be split into five years each, except the last time period which is only one year. The reason for this is that the data can be clustered in certain time periods and skew the data in undesired ways. The first period is used as the base and will not have its own dummy variable, it will be the reference level for the other time periods (Ikenberry et al., 1996). A separate variable will be created for the year 2020, due to the market being heavily affected by the Covid-19 pandemic. The market experienced a large drop early in the year and up until the end of the year it had recovered remarkably well (TradingView, 2021). By including the control variable for 2020, it will identify if the pandemic has influenced the variations in abnormal return. This is performed accordingly to studies done for the financial crisis in 2008 (Afonso et al., 2010). If the stock splitting firm is in the time period noted by the variable it will be assigned a 1 and if not, it will be assigned a 0. In order to better understand the variables, table 3 is constructed.

Table 3. Explanation of the variables in the regression model

Variables	Description	
AR	Dependent	Average Abnormal Return for stocks two days before to two days after announcement of stock split.
SplQ	Independent	Announced split quota, defined as number of additional stocks from existing stocks.
ln*(Size)*	Independent	The natural logarithm of the market value on equity the day before the stock split announcement.
ln(Vol)	Independent	The natural logarithm of average trading volume from two days before till two days after the announcement
Type	Control	A dummy variable that takes the value 1 if the share is of type A, otherwise 0.
$D_{(2020)}$	Control	A dummy variable that takes the value 1 if the announcement of a stock split carried out during the year 2020, otherwise 0.
$D_{(2019\text{-}2015)}$	Control	A dummy variable that takes the value 1 if the announcement of a stock split carried out during the period 2015-2019, otherwise 0.

3.7 Method Evaluation

3.7.1 Event Study

One issue that still remains when using an event study to analyze data is the joint-test problem. It indicates that any inference on the basis of abnormal return hinges on the validity of the assumption that event firms differ from the otherwise similar nonevent firms, only in the aspect that they experienced the event. The authors further state that since corporate events themselves are rarely to be random occurrences, in other words, they are unlikely to be exogenous with reverence to past performance and expected return. Thus, there is a menace that the event and nonevent samples diverge systematically in

their expected returns, notwithstanding the matching on certain firm characteristics. This could further imply that the occurrence of exogenous factors beyond the announcement of stock splits could explain the abnormal return over the event window. (Kothari & Warner, 2007).

MacKinlay (1997) presents in his academical article several issues that arise when conducting an event study. The first is the sampling interval, where intervals of one day is not the shortest interval possible. However, the benefit is unclear as some complications are introduced. The second issue is event uncertainty, where the market cannot be certain that the event announcement appears in the paper prior to the close for the day. MacKinlay (1997) refers to the results conducted by Ball and Torous (1988) indicating that the informal procedure works well and that there is little to gain from more elaborate estimation framework. The third issue is robustness, where without the normality assumption all the results would be asymptotic. However, this is not a problem for event studies because the test statistics, convergence to the asymptotic distributions is relatively quick. Lastly, nonsynchronous trading can introduce a bias. This issue arises when prices are taken to be recorded at time intervals of one length when in fact, they are recorded at time intervals of other possibly irregular lengths. For instance, "closing" prices generally do not occur at the same time each day, they are therefore not equally spaced at 24-hour intervals. (MacKinlay, 1997).

Furthermore, using test statistics brings two types of inference errors. A Type I error, which occurs when the null hypothesis is falsely rejected and a Type II error, which occurs when the null is falsely accepted. To hamper Type I errors a correctly specified test statistics yields a probability equal to the assumed size of the test. (Kothari & Warner, 2007).

3.7.2 Multivariate Regression

Using a multivariate linear regression can imply several problems, the most important ones will be brought up to attention. The impacts of the mentioned problems will be evaluated. The first issue is that the collected data is not of a linear characteristic. The use of a linear model on nonlinear data will heavily affect the result (Liang & Zeger, 1986). However, the collected data will be of a linear character which has been concluded by previous studies (Beladi et al., 2016). The second issue that arises is the presence of multicollinearity between the independent and dummy variables (Mason & Perreault, 1991). When using more than one independent variable, multicollinearity may appear. However, using only one independent variable will lead to a vague explanation to the variations in abnormal return. The same issue goes for the use of several dummy variables. Further, the use of three independent and dummy variables for the different time periods is motivated by prior studies which have examined the same phenomena (Ikenberry et al., 1996; Beladi et al., 2016). The presence of multicollinearity will be tested, and conclusions will be drawn from the results with caution.

3.8 Reliability and Validity

Since this study utilizes historical price data and all the companies are traded in the same currency and stock market, the results will be stable over time and anyone who replicates the study will get the same results, hence, this study is considered reliable. As for validity, this study intends to measure abnormal return and which factors may explain their variations. The chosen method to test the existence of abnormal return is with an event study. Further, to test the variations in abnormal return a linear regression will be performed with three chosen variables. Both the choice of an event study and linear regression have been motivated by previous studies. The chosen variables for the linear regression have also been motivated by earlier academic research.

4.0 Empirical Results

The following chapter presents the empirical results from the event study and the regression analysis. Further, the hypothesizes of the study will be tested and observe if they are in accordance with the theories and academic predictions.

4.1 Descriptive statistics

4.1.1 Event Study

Table 4 illustrates the average abnormal return for the stocks listed on Nasdaq Stockholm at the time of the event window. In the final results two stocks have been removed in order to reduce the influence of skewness, since the abnormal return for these stocks were on extreme levels (See Appendix 2). Hence, a total number of 81 observations will be included in the event study.

Table 4. Average Abnormal Return with regard to stock split announcements on Nasdaq Stockholm

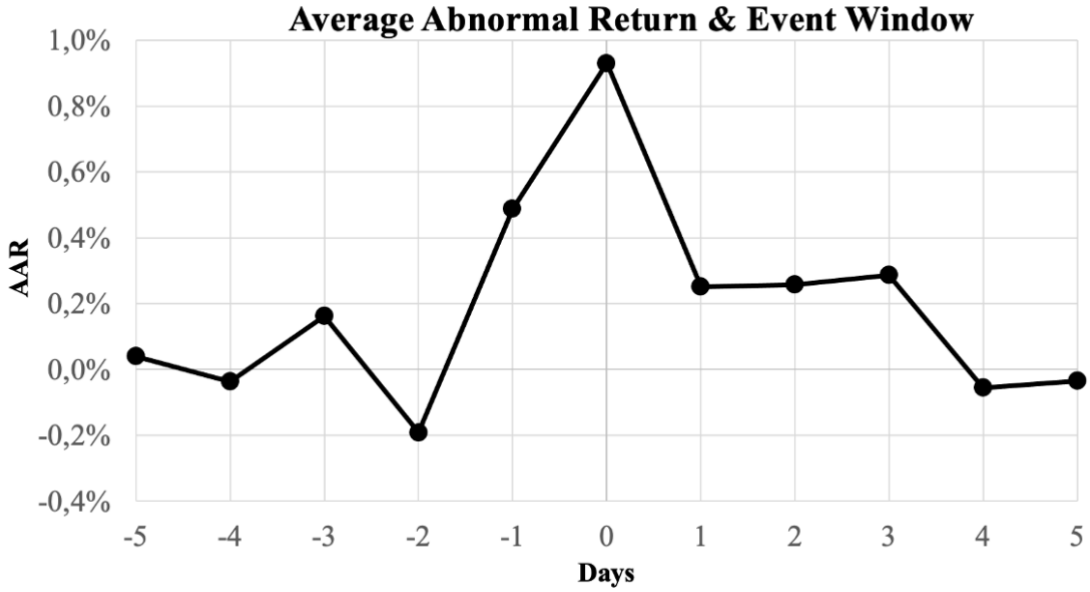
Days	AAR	T Ratio AAR	Significance level
-5	0,04%	0,172	
-4	-0,04%	-0,161	
-3	0,16%	0,715	
-2	-0,19%	-0,844	
-1	0,49%	2,142	5%
0	0,93%	4,089	1%
1	0,25%	1,102	
2	0,26%	1,133	
3	0,29%	1,260	
4	-0,06%	-0,244	
5	-0,03%	-0,154	

Source: Own calculations of data from Thomson Reuters DataStream.

Table 4 displays the average abnormal return for the chosen firms under the event window, consisting of eleven days in total. It is observed that the average abnormal return on the public announcement of the stock split (day 0) is measured at 0,93%. This result is statistically significant on a 1% significance level. Further, the day prior to the announcement (day -1) is statistically significant on a 5% significance level with an abnormal return of 0,49%. However, directly after the announcement day (day 1) the abnormal return decreases and no statistical significance can be found. The same results can be drawn by observing the first four days and their T-ratios in the event window, they present no evidence for statistical significance.

The average abnormal return in percent during the event window is illustrated in figure 2.

Figure 2. Average Abnormal Return with regard to stock split announcements on Nasdaq Stockholm



Source: Own calculations of data from Thomson Reuters DataStream.

As the figure illustrates, the average abnormal return increases from two days prior to the event and the announcement day itself. Between the mentioned span consisting of three trading days, we find the largest increase of abnormal return which is measured from -0,19% to 0,93%, a positive difference of 0,74 percentage points. It is also observed that the day after the announcement (day 1) has the steepest decline from 0,93% to 0,25%, a negative difference of 0,68 percentage points. To summarize, the figure indicates that abnormal return increases from two days prior to the event until the announcement day and afterwards it slowly decreases to normal market levels.

4.1.2 Multivariate Linear Regression

In the final results for the regression analysis six observations have been removed to reduce the impact of skewness and kurtosis, due to their extreme values. Three observations from SplQ and three from Trading Volume (See Appendix 3 & 4). Thus, a total number of 75 observations are included in the regression analysis.

Table 5. Descriptive statistic

Variable	# Obs	Average	Sd	Min	Max	Skewness	Excess Kurtosis
AR	75	0,004	0,013	-0,021	0,053	0,866	1,636
SplQ	75	1,667	0,991	1	4	1,233	0,201
ln(Size)	75	22,432	1,383	19,348	26,493	0,255	0,316
ln(Vol)	75	11,780	1,578	8,476	15,312	0,290	-0,636
Type	75	0,053	0,226	0	1	4,057	14,857
$D_{(2020)}$	75	0,080	0,273	0	1	3,160	8,203
$D_{(2019\text{-}2015)}$	75	0,760	0,430	0	1	-1,243	-0,469

Source: Own calculations of data from Thomson Reuters DataStream.

The table above presents a summary of the descriptive statistics for the multivariate linear regression. The dependent variable AR, is the average abnormal return for two days before till two days after the announcement. The independent variables included are the split quota (SplQ), firm size (ln(Size)) and trading volume (ln(Vol)). The included control variables are share type (Type), time period 2020 and time period 2019-2015. For all of the variables the average value, standard deviation, minimum and maximum values, skewness and kurtosis are included. AR have all acceptable numbers except for the kurtosis which means the observations are centered around the mean and fewer observations are in the tails. For SplQ skewness is positive, meaning a long right tail which is related to the most observed split quotas, 2:1. For the other two independent variables ln(Size) and ln(Vol) all of the presented statistics are within acceptable ranges. As for the first control variable, Type, it is observed that only 5,3% of the observations are A-type share as indicated by the value 1 (See appendix 5). Hence, both skewness and kurtosis results in extreme values. The control variable 2020 gives the same result as the control variable Type. Only 8% of the observations occurred in this time period, which result in extreme values for skewness and kurtosis (See appendix 8). The dummy variable 2019-2015 includes 76% of the observations. This provides an acceptable value for kurtosis and less negative skewness, meaning it is still left tailed.

To investigate the correlation between the models' variables a correlation matrix is constructed. Table 6 shows the correlation between all variables in the regression model.

Table 6. Correlation Matrix

	AR	*SplQ*	*ln(Size)*	*ln(Vol)*	*Type*	$D_{(2020)}$	$D_{(2019\text{-}2015)}$
AR	1						
SplQ	-0,112	1					
ln(Size)	-0,246**	0,088	1				
ln(Vol)	-0,100	-0,059	0,506	1			
Type	-0,060	0,080	0,023	-0,080	1		
$D_{(2020)}$	-0,007	0,050	0,115	0,039	-0,070	1	
$D_{(2019\text{-}2015)}$	0,037	0,095	-0,139	-0,029	0,133	-0,525	1

Source: Own calculations of data from Thomson Reuters DataStream.

Note: **p<0,05

As the table depicts, only ln(Size) presents a statistical ensured correlation with abnormal return, which is -0,246. This implies that when the value of ln(Size) increases, the value of AR decreases by 0,246.

To further investigate the presence of multicollinearity in the regression model a VIF test is performed. The results of the VIF test are presented in Table 7.

Table 7. VIF-test on regression

Variable	**VIF**	**1/VIF**
Split Quota	1,016	0,984
Firm Size	1,065	0,939
Trading Volume	1,012	0,988
Share Type	1,006	0,994
$D_{(2020)}$	1,000	1,000
$D_{(2019\text{-}2015)}$	1,001	0,999
Average	1,017	0,984

Source: Own calculations of data from Thomson Reuters DataStream.

The table illustrates that none of the variables for the regression model shows signs of multicollinearity. This is because all of the variance inflation factors have values around 1. Values of 1 indicate that the specific variable has no correlation to multicollinearity.

4.2 Empirical Results

4.2.1 Event Study

By extracting the data from table 4, we can observe that the results from Nasdaq Stockholm Stock Exchange indicate the presence of an average abnormal return for the day prior to the announcement (day -1) and the public announcement day itself (day 0). Furthermore, on the basis of these empirical findings and to explicitly test hypothesis one, the cumulative average abnormal return for eight chosen time periods under the event window is tested in table 8.

Table 8. Cumulative Average Abnormal Return with regard to stock split announcements on Nasdaq Stockholm

Period	CAAR	T Ratio CAAR	Significance level
[-5,5]	2,09%	2,777	1%
[-5,-1]	0,46%	0,905	
[-2,2]	1,73%	3,409	1%
[-2,0]	1,22%	3,110	1%
[-1,0]	1,42%	4,406	1%
[-1,1]	1,67%	4,234	1%
[0,1]	1,18%	3,671	1%
[1,5]	0,70%	1,386	

Source: Own calculations of data from Thomson Reuters DataStream.

Table 8 illustrates the cumulative average abnormal return in connection with stock split announcements for different time periods. By observing the entire event window, consisting of five days prior and five days subsequent to the public announcement of a stock split, the cumulative average abnormal return is measured at 2,09% with a T-ratio of 2,777; which makes it statistically significant at 1% significance level. However, the time period before the announcement day (day -5 to -1) and the days following the event (day 1 to 5) have an abnormal return of 0,46% and 0,70% respectively, but none of these results are statistically significant. The results for the time periods (day -2 to 2), (day -2 to 0), (day -1 to 0), (day -1 to 1) and (day 0 to 1) are all statistically significant at 1% significance level, since all their T-ratios are greater than 2,576. Moreover, the previously mentioned time periods have a measured cumulative abnormal return of 1,73%, 1,22%, 1,42%, 1,67% and 1,18%. On the basis of these empirical results support for hypothesis one is found, hence there exists positive abnormal return in connection with the announcement of stock splits.

4.2.2 Multivariate Linear Regression

To test hypothesis 2, 3 and 4 a regression of abnormal return is performed according to the model presented in section 3.6. In Table 9 results of the regression analysis are presented.

Table 9. Regression of Abnormal Return

Variables	(1) AR	(2) AR	(3) AR	(4) AR	(5) AR
SplQ	-0,002				-0,001
p-value	*(0,318)*				*(0,446)*
ln(Size)		-0,002**			-0,002*
p-value		*(0,038)*			*(0,087)*
Vol			-0,001		0,000
p-value			*(0,402)*		*(0,927)*
Type				-0,004	-0,003
p-value				*(0,579)*	*(0,681)*
$D_{(2020)}$	0,002	0,001	0,001	0,001	0,002
p-value	*(0,811)*	*(0,819)*	*(0,885)*	*(0,903)*	*(0,756)*
$D_{(2019-2015)}$	0,002	0,001	0,001	0,002	0,001
p-value	*(0,637)*	*(0,887)*	*(0,747)*	*(0,695)*	*(0,767)*
Intercept	0,005	0,056**	0,013	0,003	0,055**
p-value	*(0,257)*	*(0,030)*	*(0,303)*	*(0,456)*	*(0,035)*
Observations	75	75	75	75	75
R^2	0,016	0,061	0,012	0,006	0,073
Adjusted R^2	-0,026	0,021	-0,030	-0,036	-0,009

Source: Own calculations of data from Thomson Reuters DataStream.

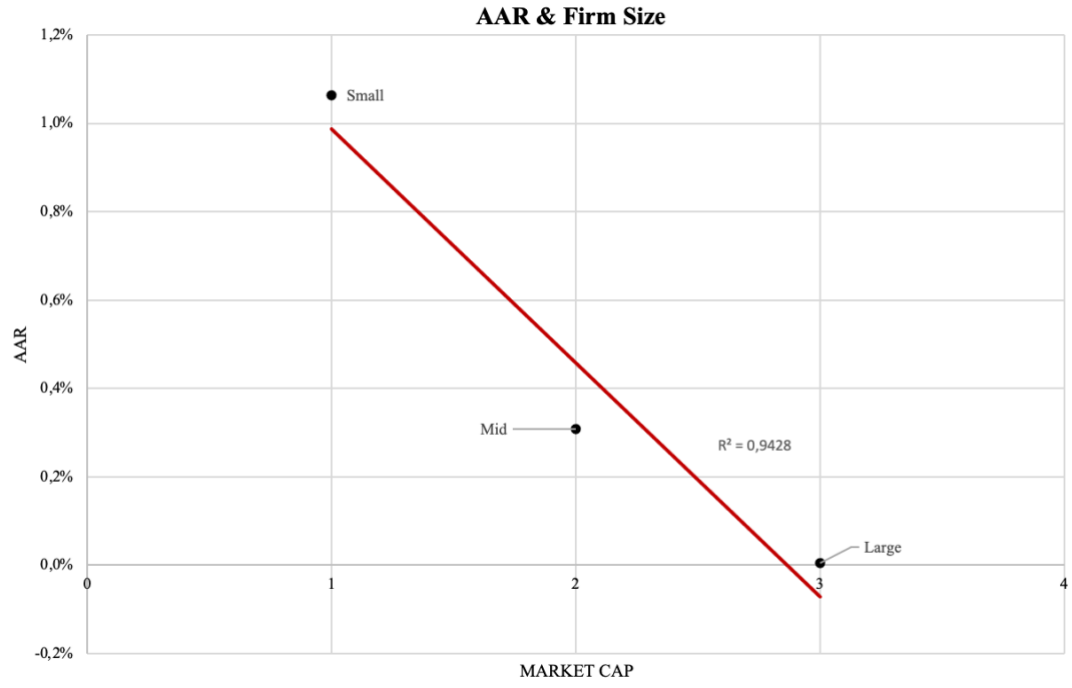
Note: The sample consists of a total of 75 observations after correction for extreme values. ***p<0,01, **p<0,05, *p<0,1.

Table 9 presents the coefficients for each of the tested variables and their respective regression model, model 1 through 4, then model 5 where all variables are included. The numbers in the parenthesis under each coefficient is their respective p-value. As for the first model (1) testing if split quota can explain the variations in abnormal return a coefficient of -0,002 was derived from the regression, with a p-value of 0,318. Thereby, no evidence is found to support hypothesis two at any level. Even if the coefficient were to be supported it would have been a negative relationship, contradictory to the stated hypothesis. For model (2) testing for firm size the regression output for the coefficient was -0,002 and a p-value of 0,038, thereby hypothesis 3 is supported at a 5% significance level, hence, firm size can explain the variations in abnormal return. From the empirical results, larger firms will generate a lower abnormal return when announcing a stock split. Testing model (3) and trading volume the regression generated a

coefficient of -0,001 and a p-value of 0,402. With no empirical results, hypothesis four can thereby not be supported at any significance level, but even if it was supported it would be a negative relationship, contradictory to the stated hypothesis. To test if there are any differences between splitting A- or B-type shares, model (4), is constructed and tested, however, the observed coefficient of -0,004 and its p-value 0,579 indicates no difference between the share types. For model (5), the coefficient firm size is -0,002 with a p-value of 0,087, which is the only factor that presents statistical support for the model. The economic interpretation of this empirical result is that if a firm becomes 2,72 times larger, with regards to market value, it leads to 0,2% less abnormal return. The difference for instance, between a 10 million and 27,2 million SEK market valued company is 0,2% lower abnormal return for the larger firm. To summarize, all of the other factors in the model cannot be supported nor explain the variations in abnormal return. The control variables for the different time periods, 2020 and 2019-2015 were included to detect any differences in abnormal return over time. The presented results indicate no difference over time in any of the tested models, all the p-values are higher than the stated significance level. Moreover, the intercept coefficient can be accepted for model (2) and model (5) both at a 5% significance level. Lastly, the coefficient of determination (R^2) for model (5) and (2) are 7,3% and 6,1% respectively.

To better understand how firm size affect average abnormal return, figure 3 is made where firms are divided by market capitalization.

Figure 3. Average Abnormal Return and Firm Size divided in Small, Mid and Large Cap



Source: Own calculations of data from Thomson Reuters DataStream.

Table 10. Descriptive data for figure 3

	# of firms	Category	Range ln(Size)		Range MSEK	
Large cap	27	3	23,09	26,49	10 000	∞
Mid cap	39	2	21,19	23,01	1 500	10 000
Small cap	15	1	19,35	21,12	0	1 500

Source: Own calculations of data from Thomson Reuters DataStream and ranges from Nordnet.

Definitions and criteria of market capitalization are retrieved from Nordnet (2021). In order to be included in the small cap in Sweden a firm should have a market valuation of 1 500 MSEK or lower. Whilst mid cap has the range of 1 500 MSEK up to 10 000 MSEK and large cap over 10 000 MSEK, these divisions are made similarly to Ikenberry et al (1996). Table 10 illustrates that 33% of the sample was included as large cap firms, 48% as mid cap and lastly 19% as small cap firms. The average abnormal return for the firms included in the small cap is 1,063%, whilst mid and large cap only have 0,308% and 0,004%. The averages for each category have a linear trendline with a coefficient of determination (R^2) of 94,28%.

5.0 Discussion and Critical Reflection

5.1 Event Study

Firstly, the results of the empirical analysis, as presented in table 4, indicates the presence of abnormal return in connection with the announcement of stock splits. By observing the day prior to the event (day -1) and the announcement day (day 0), we find the average abnormal return to be 0,49% and 0,93% respectively and both are statistically significant. These findings are in accordance with earlier and later academic studies conducted on the US market (See Ford et al., 2012; Li et al., 2013; Beladi et al., 2016). Secondly, on the basis of these results, and to explicitly test hypothesis one we estimated the cumulative average abnormal return for eight chosen time periods in order to detect evidence which support or deny the hypothesis. As illustrated by table 8, we find evidence of abnormal return for the whole event window (day -5 to 5) at a significance level of 1%. However, in the time period prior to the event (day -5 to -1) and the days following the event (day 1 to 5) no evidence of statistical significance could be detected. On the other hand, the time periods in close connection to the announcement day (day 0), five out of five periods indicate evidence of abnormal return on the 1% significance level. On the basis of these empirical findings, hypothesis one is supported, thus there exists positive abnormal return in connection with the announcement of stock splits. Furthermore, this conclusion is in accordance with other academic studies performed on the subject (See Beladi et al., 2017; Brennan & Copeland, 1988; Ford et al., 2012; Grinblatt et al., 1984; Hu et al., 2017; Liljeblom, 1989).

As presented by the empirical findings, it is possible to conclude that stock splits are not purely of cosmetic character, but associated with an anomaly when seen from the perspective of efficient markets as stated by Grinblatt et al (1984), even on the Swedish market. Since there is evidence of abnormal return on Nasdaq Stockholm Stock Exchange, it is not a perfect efficient market in accordance with the *Efficient Market Hypothesis*. On the other hand, it is interesting to observe that the abnormal return seems to be in close connection with the announcement day (day 0) and the prior and subsequent trading days (day -1 and 1). The high significance level of the announcement day, displayed by table 4, most definitely affects the cumulative average abnormal return in table 8, since it is observed that all time periods which includes the announcement day are statistically significant. However, the days prior to the announcement indicates no sign of abnormal return and in the subsequent days to the event, the returns adjust rapidly to normal market levels. The previously mentioned findings are in line with earlier North American studies such as Fama et al (1969), Grinblatt et al (1984) and Brennan & Copeland (1988). An explanation for the presences of abnormal return in connection with the announcement of stock splits, is in accordance with the *Signaling Hypothesis*, which conveys that the market reacts favorably to the announcement as a signal of increased earnings and solid prospects. Furthermore, as

stated by the *Self Selection Hypothesis*, the decision of a stock split is made only if the management of the company is optimistic about the future, which could explain the market reaction.

Moreover, when comparing the magnitude of the abnormal return of this study to earlier academic articles we find differences. Firstly, Grinblatt et al (1984) conclude the average two-day abnormal return, consisting of the announcement day and the following trading day to be 4,3% for firms listed on the New York Stock Exchange and American Stock Exchange. Whereas Brennan & Copeland (1988) observe the abnormal return to be 2,9% for the same time period (day 0 to 1) and market, though the latter includes more recent data in relation to the time of its publication. These results should be compared to the abnormal return of 1,18% that we find on the Swedish market which is less than a third of that observed by Grinblatt et al (1984). Furthermore, Ikenberry et al (1996) estimates the average five-day announcement return, containing two days prior and two days subsequent to the event to be 3,38%, which should be set against our findings of 1,73% for the period (day -2 to 2). To summarize, the abnormal return of this study is smaller than earlier academic articles (See Ginblatt et al., 1984; Brennan & Copeland, 1988; Ikenberry et al., 1996). However, this result is in accordance with the prediction of Ikenberry et al (1996), who reaches the conclusion that abnormal return in connection with stock split announcements in average have decreased over time. Since the majority of this study's stock split announcements occurred between the years 2015 to 2019, 71 out of the total 83 observations, we conclude that the prediction of Ikenberry et al (1996) seems to be correct. The abnormal return in connection with stock split announcements has decreased compared to the earlier empirical findings, at least in our research on the Swedish market, and it may continue to do so in the future. It is important to emphasize that the result for the periods 2010-2014, 2015-2019 and 2020 are not statistically reliable, which makes it difficult to empirically prove that this trend is on average correct. Further, it is beyond this paper's boundaries and range to explicitly prove the reasons for this declining trend.

5.2 Regression Analysis

The results for explaining the variations in abnormal return on the Swedish stock market contradicts to some extent the previous findings. The empirical findings did not find any support for the hypothesis, that a higher split quota yields a higher abnormal return. The high skewness for the variable affects the result in undesirable ways, hence no robust conclusion may be stated. Previous research finds that an increase in split quota by one increases the abnormal return with 1,6% (McNichols & Dravid, 1990). Ford et al (2012) find an increase of 1,37% in abnormal return when the split quota increased by one, whilst Beladi et al (2017) find an increase of 1,30-1,37%. The reasons for different results can depend on many factors, such as stock market and sample characteristics. From the data on the Swedish stock market, it is observed that 62,67% of the observations are 2:1 splits, which is supported by the measured skewness in table 9 of the split quota data. Further, the number of observations can affect the result

where only 75 observations were included in the regression. Both these factors are a reflection of the Swedish stock market being significantly smaller than the US market. If the data sample consisted of split quotas in equal parts, a different result might have been obtained and supported the presented theories.

For firm size the result finds support for the stated hypothesis of a negative relationship between firm size and abnormal return, meaning a larger firm will yield a lower abnormal return when announcing a stock split. Figure 3 illustrates that the larger the firm size, measured in market value million SEK, the lower the average abnormal return. This negative relationship is supported by empirical findings in table 5 and it is in accordance with recent and earlier academic studies (Beladi et al., 2016; Ikenberry et al., 1996). It is therefore possible to conclude that the results and theories from previous studies on the US market holds for the Swedish market. From the figure it seems that announcing a stock split is the better strategy for creating an average abnormal return if the company is included in the small market capitalization. The observed effect on the US market is 10,04% in abnormal return for small firms and 1,01% for large firms (Ikenberry et al., 1996). Compared to the result from the US market the effect of firm size and abnormal return is smaller on the Swedish market. Further, the descriptive statistics for firm size in table 5 are all in acceptable ranges, which makes the t-test robust. Additionally, the result for firm size is not driven by multicollinearity, as supported by the VIF test performed for all of the variables (see table 7). To summarize, firm size can explain the variations in abnormal return on the Swedish stock market.

As for trading volume the results find no proof for the variations in abnormal return, hence no findings were observed to support hypothesis four. Previous research states that a higher trading volume will lead to a higher abnormal return since it will adjust the price faster to the new market wide information (Lakonishok & Lev, 1987; Morse 1981; Chordia & Swaminathan, 2000). The mentioned theory does not hold for the Swedish market. The measured values for trading volume in the descriptive statistics (table 5) are within acceptable ranges, making the t-test robust. Hence, sample characteristics does not affect the result in any way. In previous studies, no general accepted way of constructing and measuring trading volume was found. Thereby, the variable trading volume in this study is a mixture of several previous studies. The way the variable is constructed can in some way explain the different result, but it should be noted that caution was taken in the construction process and the numerical values were in suitable ranges compared to the other constructed and measured variables. Thus, it should not affect the empirical result in any undesired way since the numerical values are not larger nor smaller than the values for the other variables. The obtained result should not only highlight the differences in the markets, but also that the theories based on the US market are not applicable on the Swedish market.

The control variables in the regression model were included to detect any differences in abnormal return, first for different share types and then for the different time periods. The result did not find any differences between splitting A- or B-type stocks. This result can be explained by the fact that only 4 out of the 75 observations (5,3%) were A-type stocks. The uneven distribution of share types can be explained from the skewness and kurtosis measurements in table 5. With those extreme values, no conclusion can be made on how different share types yield higher or lower abnormal return. To better test if there is a difference between A- and B-shares, a sample of equally many A- and B-type stock splits need to be analyzed.

The control variables 2020 and 2019-2015 did not find any support of different abnormal return for separate time periods. The variable for 2020 has the same problem as the control variable for share type. Only six observations were made in this time period which yields extreme measurements for skewness and kurtosis found in table 5. Thereby, no conclusion can be drawn if there was any difference in abnormal return for the year 2020. For the time period, 2019-2015, there was no evidence for any differences in abnormal return. This result is more accurate since the measured skewness and kurtosis are lower than the other dummy variables, which can be explained by the fact that 76% of the observations were in this time period. However, the skewness is considered to be high, which requires precaution when drawing conclusions. The inconclusive results can be improved by a sample with a more normal distribution between the different time periods. A sample with equal allocation between the time periods should give a better result and more robust conclusions.

As a whole model (5), the only factor that can explain the variations in abnormal return at a statistically significant level is firm size. The model has a coefficient of determination (R^2) of 7,3%. Compared to previous studies their models as a whole generated an R^2 value of 19,15% (Ikenberry et al., 1996) and 5,4% (Ford et al., 2012). Even though all the included variables cannot be proven statistically to explain the variations, the model as a whole still explains some of the variations in abnormal return for stock splitting firms, but it cannot be pinpointed to the included factors except firm size.

5.3 Knowledge Contribution

This thesis' main knowledge contribution is the finding of a negative relationship between firm size and average abnormal return on the Swedish stock market. Larger firms will generate lower average abnormal return when performing a stock split which is in accordance with previous research conducted on the US market. The second knowledge contribution is that trading volume does not affect the variations in average abnormal return for the Swedish stock market; contradictory to previous research on the US market. These two findings are based on stock splitting firms on Nasdaq Stockholm during the time period 2010-2020. When examining firm size further, the study concludes how much small,

mid and large cap firms on average will generate abnormal return when splitting their stocks with none of the other factors included.

In order to explain the variations in average abnormal return, it first has to be determined if there exist abnormal return in connection with stock split announcements. The performed event study on stock splitting firms between the years 2010-2020 on the Swedish stock market finds the presence of abnormal return and thereby enabling additional examination of the variations within those abnormal return and its contributing factors.

5.4 Critical Reflection

As presented by the empirical findings, it is important to be cautious when examining the cumulative average abnormal return for the chosen time periods and their significance levels. Since the average abnormal return for the announcement day (day 0), compared to the other days in the event window, has a greater statistical inference. Thus, including the public announcement day in a time period, it may distort the statistical findings, and one can conclude a cumulative average abnormal return. This implication seems to be correct as all time periods which include the event day itself has detected an abnormal return. However, by investigating the abnormal return during the period prior to the event (day -5 to -1) and the subsequent days of the announcement (day 1 to 5) no abnormal return could be observed on a statistical level. Therefore, it is important to be careful when evaluating the time period where abnormal return is statistically present, as it seems to be concentrated to the announcement day rather than the days before or after.

To perform the statistical test for the linear regression, the data is assumed to be normally distributed. As seen in table 5, this assumption does not hold for every included variable, some of the different distributions exhibit large values for skewness and kurtosis. It should be noted that the sample size is fairly large and should tend towards a normal distribution, thereby it is motivated to use the t-test. The large values for skewness and kurtosis may affect the accuracy of the significance test and the robustness, but caution has been taken when drawing conclusion on the samples with extreme values for skewness and kurtosis.

6.0 Conclusions

This thesis aims to investigate if there exists abnormal return in connection with stock split announcements on Nasdaq Stockholm Stock Exchange and how split quota, firm size and trading volume contribute to explain the variations in the possible return. On the basis of previous research and theories (See Fama et al., 1969; Brennan & Copeland, 1988; McNichols & Dravid, 1990; Ford et al., 2012; Lakonishok & Lev, 1987; Chordia & Swaminathan, 2000) four hypothesizes are formulated:

(1) *Announcement of stock splits will generate positive abnormal return on the Swedish stock market*

(2) *There is a positive relationship between split quota and abnormal return on the Swedish stock market*

(3) *There is a negative relationship between firm size and abnormal return on the Swedish stock market*

(4) *There is a positive relationship between trading volume and abnormal return on the Swedish stock market*

The paper examines the phenomena of abnormal return in two steps. Firstly, an event study is performed in order to ensure the presence of abnormal return on the Swedish stock market. Secondly, a multivariate regression analysis is deducted to assist in the clarification of how the chosen factors affect the abnormal return. Both methods are based on data from Thomson Reuters DataStream, where the final sample consists of 83 stocks during the time period 2010-2020. The empirical results from the event study indicates the presence of positive abnormal return in connection with stock split announcements on statistically significant levels. Hence, support for hypothesis (1) is detected which is in accordance with earlier academic articles (See Liljeblom, 1989; Grinblatt et al., 1984; Brennan & Copeland, 1988; Ford et al., 2012; Beladi et al., 2017). Furthermore, on the basis of the regression analysis, hypothesis (2) presents ambiguous results due to high skewness for the variable, thus no clear conclusion may be stated. Hypothesis (4) conveys sufficient data, but no support can be established at any significance levels. Moreover, hypothesis (3) is supported at the 5% significance level. Thus, this study concludes with statistical reliability that there is a negative relationship between firm size and abnormal return on the Swedish stock market.

The empirical results from the event study indicates positive abnormal return in connection with stock split announcements on Nasdaq Stockholm Stock Exchange, but only for a short period of time, which is in line with earlier North American studies (See Grinblatt et al., 1984; Ikenberry et al., 1996; Ford et al., 2012; Beladi et al., 2017). Even if Nasdaq Stockholm is not a perfectly efficient stock market, it is apparent that new public information is rapidly reflected in the stock prices, which is in accordance with Fama (1970) and his efficient market hypothesis. However, the regression analysis illustrates the difficulties of trying to explain this anomaly in abnormal return. We find no evidence that a higher split quota would yield a higher abnormal return on Nasdaq Stockholm, but the sample characteristics for

this factor are skewed, thus no robust conclusions can be acquired. Additionally, this study does not find empirical support for the link between high trading volume and positive abnormal return, hence no evidence for hypothesis (4) can be presented at any significance levels. Similar to the previously mentioned subjects, there are no empirical evidence which enables this study to conclude that different share types or time periods would yield a higher or lower abnormal return. This is most certainly due to bad samples and high values for kurtosis and skewness for the dummy variables. On the other hand, by observing the empirical findings, it is possible to establish the occurrence of a negative relationship between firm size and abnormal return in connection with stock split announcements on Nasdaq Stockholm, which is in accordance with other academic articles (See Beladi et al., 2017; Brennan & Copeland, 1988; Li et al., 2017).

To summarize, it is interesting to observe that many of the North American theories regarding stock split announcements and their impact on abnormal return does not seem to be applicable on the Swedish stock market. However, there is an abundance of factors that may influence these results, but it nonetheless acts as an indication that the chosen subject of investigation requires further analysis in order to establish more concrete and robust results.

6.1 Future Research

Since the study only found most of the observations to be a 2:1 stock split it would be interesting to investigate average abnormal return with equal parts of different split quotas. This would allow for less skewness and kurtosis in the event study. Further, it would be interesting to limit the event study to split quotas of 4:1 or lower, since 92% of the observation were in that range (See Appendix 5).

To improve the robustness of the results we believe that it is necessary to adjust the sample with equal parts of splits and share types in the different time periods. Since Nasdaq Stockholm gave only a few number of observations it is therefore interesting to measure the whole Nordic market, which includes: Sweden, Norway, Denmark, Finland and Iceland. This allows the study to have more observations and better distribution between time periods and share type.

This study has found firm size to be the only underlying factor explaining variations in abnormal return, therefore it is interesting to investigate further why small firms have bigger impact compared to the larger firms. The last suggestion for future research is to investigate further if there are any theories and variables that can explain the variations in abnormal return.

7.0 Limitations

The research performed in this thesis is limited to firms announcing a stock split on Nasdaq Stockholm during the time period 2010-2020. Problems arising with this limitation is the possible sample size and its characteristics. The Stockholm stock exchange is a small market and collecting data only from this market yields a small sample size compared to the US market. Thus, this implies a poor distribution between the number of different split quotas, share types and time periods which limits the possible conclusions. Secondly, it has been stated earlier that there are many possible factors which may explain the variations in abnormal return. This thesis only covers three of those factors and thereby several other factors have been excluded. The factors that have been excluded could possibly explain the variations to a better extent than the included factors and create a better model for the variations in abnormal return. The reason for only choosing three factors is due to the problems with multicollinearity in the linear regression when the number of independent variables increases and thereby incorrect conclusion could possibly be drawn. Further, an event study requires an event window of a certain size. A short event window limits the results since it will only investigate a few number of days before and after the announcement. Increasing the event window creates difficulties with isolating the stock split announcement and other economic events can influence the result. The chosen methods of an event study and a linear regression assumes linear returns on the stock market and uses this assumption, if the returns are not linear it may influence the result. However, this assumption is generally accepted and supported by previous studies and should not influence the result (Ikenberry et al., 1996; Beladi et al., 2016).

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Appendix

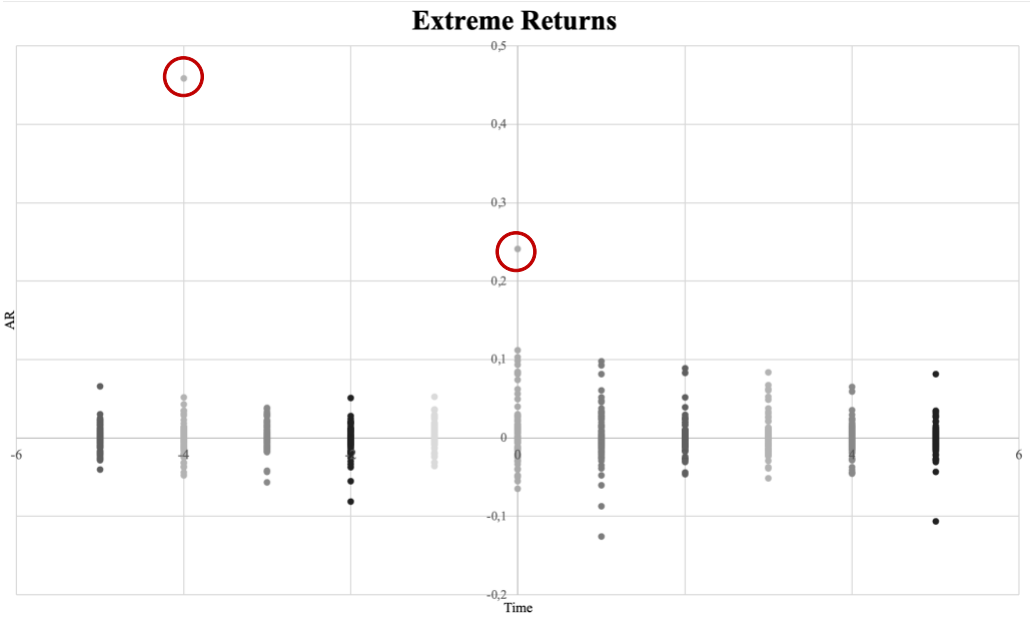
Appendix 1. The sample of stock split announcements on Nasdaq Stockholm Stock Exchange

Announcement Date	*Ticker*	*Firm*
2020-08-06	SECTb.ST	SECTRA B
2020-07-17	LAGRb.ST	LAGERCRANTZ GROUP B
2020-07-14	ADDTb.ST	ADDTECH B
2020-05-13	TETY.ST	TETHYS OIL
2020-05-12	BETSb.ST	BETSSON B
2020-02-06	ALIFb.ST	ADDLIFE B
2019-12-19	CLNKb.ST	CELLINK B
2019-09-30	MBPH.ST	MOBERG PHARMA
2019-05-28	SECTb.ST	SECTRA B
2019-05-14	TROAX.ST	TROAX GROUP
2019-05-09	HEBAb.ST	HEBA FASTIGHETS B
~~2019-04-09~~	~~XANOb.ST~~	~~XANO INDUSTRI B~~
2019-03-27	IRLABa.ST	IRLAB THERAPEUTICS
2019-03-27	EVOG.ST	EVOLUTION GAMING GROUP
2019-02-22	BORG.ST	BJORN BORG
2019-02-15	AVANZ.ST	AVANZA BANK HOLDING
2019-02-14	BETSb.ST	BETSSON B
2019-02-13	BOL.ST	BOLIDEN ORD SHS
~~2019-02-12~~	~~TETY.ST~~	~~TETHYS OIL~~
2019-01-28	VNVsdb.ST^F20	VNV GLOBAL SDR
~~2018-12-06~~	~~STRAX.ST~~	~~STRAX~~
2018-11-13	SKISb.ST	SKISTAR B
2018-05-29	SECTb.ST	SECTRA B
2018-03-21	WIHL.ST	WIHLBORGS FASTIGHETER
2018-03-20	VITR.ST	VITROLIFE
~~2018-03-14~~	~~NMAN.ST~~	~~NEDERMAN HOLDING~~
2018-03-07	FABG.ST	FABEGE
2018-03-05	BEIJb.ST	BEIJER REF B

2018-02-23	BORG.ST	BJORN BORG
2018-02-16	BOUL.ST	BOULE DIAGNOSTICS
2018-02-15	FPARa.ST	FAST PARTNER A
2018-02-15	BEIAb.ST	BEIJER ALMA B
2018-02-14	BOL.ST	BOLIDEN ORD SHS
2018-02-13	TETY.ST	TETHYS OIL
2018-02-08	BETSb.ST	BETSSON B
~~2018-02-05~~	~~AAK.ST~~	~~AAK~~
2017-08-23	RAILG.ST	RAILCARE GROUP
2017-05-30	SECTb.ST	SECTRA B
2017-04-11	BETSb.ST	BETSSON B
2017-04-06	BORG.ST	BJORN BORG
2017-04-05	XANOb.ST	XANO INDUSTRI B
2017-04-03	NGSG.ST	NGS NEXT GENERATION SYS.
2017-03-29	HMSN.ST	HMS NETWORKS
2017-03-28	LATOb.ST	LATOUR INVESTMENT B
2017-02-21	FAG.ST	FAGERHULT
2017-02-14	BILIa.ST	BILIA A
2017-02-09	ENEA.ST	ENEA
2016-09-21	TETY.ST	TETHYS OIL
2016-05-31	SECTb.ST	SECTRA B
2016-05-11	ITABb.ST	ITAB SHOP CONCEPT B
2016-04-13	BETSb.ST	BETSSON B
2016-04-11	NIBEb.ST	NIBE INDUSTRIER B
2016-02-29	ORES.ST	ORESUND INVESTMENT
2016-02-19	BORG.ST	BJORN BORG
2016-02-11	ENEA.ST	ENEA
~~2016-02-04~~	~~FINGb.ST~~	~~FINGERPRINT CARDS B~~
2016-01-15	STRAX.ST	STRAX
2015-11-10	VITb.ST	VITEC SOFTWARE GROUP B
~~2015-11-03~~	~~KINDsdb.ST~~	~~KINDRED GROUP SDR~~
2015-07-17	LAGRb.ST	LAGERCRANTZ GROUP B
2015-06-03	SECTb.ST	SECTRA B
2015-04-28	EOLUb.ST	EOLUS VIND B
2015-04-14	TETY.ST	TETHYS OIL
~~2015-03-30~~	~~HPOLb.ST~~	~~HEXPOL B~~

2015-02-19	BORG.ST	BJORN BORG
2015-02-18	WALLb.ST	WALLENSTAM 'B'
2015-02-12	ENEA.ST	ENEA
2015-02-10	AXFO.ST	AXFOOD
2015-02-06	BETSb.ST	BETSSON B
2015-02-06	BILIa.ST	BILIA A
2015-02-05	ASSAb.ST	ASSA ABLOY B
2014-05-27	SECTb.ST	SECTRA B
2014-04-07	ITABb.ST	ITAB SHOP CONCEPT B
2014-02-13	FAG.ST	FAGERHULT
2014-02-11	AFb.ST	AF POYRY BB
2013-08-28	ADDTb.ST	ADDTECH B
2012-06-05	EKTAb.ST	ELEKTA B
2012-02-09	BEIJb.ST	BEIJER REF B
2011-02-23	WALLb.ST	WALLENSTAM 'B'
2011-02-10	BELE.ST	BEIJER ELECTRONICS GROUP
2011-02-08	WIHL.ST	WIHLBORGS FASTIGHETER
2010-03-03	HMb.ST	HENNES & MAURITZ B
2010-02-17	AFb.ST	AF POYRY B

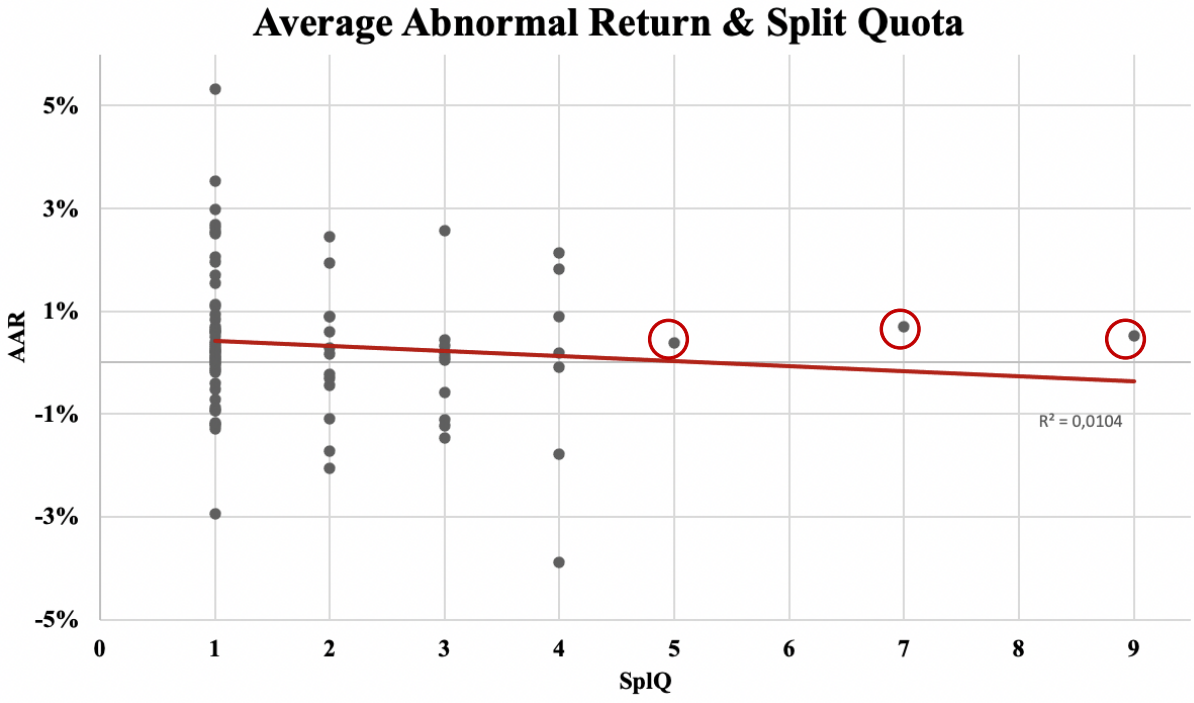
Appendix 2. Scatter plot containing all abnormal return for the event window & extreme values



Source: Own calculations of data from Thomson Reuters DataStream.

Appendix 2 shows abnormal return for all the firms in the sample after selection and delimitation. The observations marked with a red circle differs strongly and are thus considered as extreme values. In this case a total of two observations. These are excluded before calculating AAR in order to reduce the risk of a distorted result.

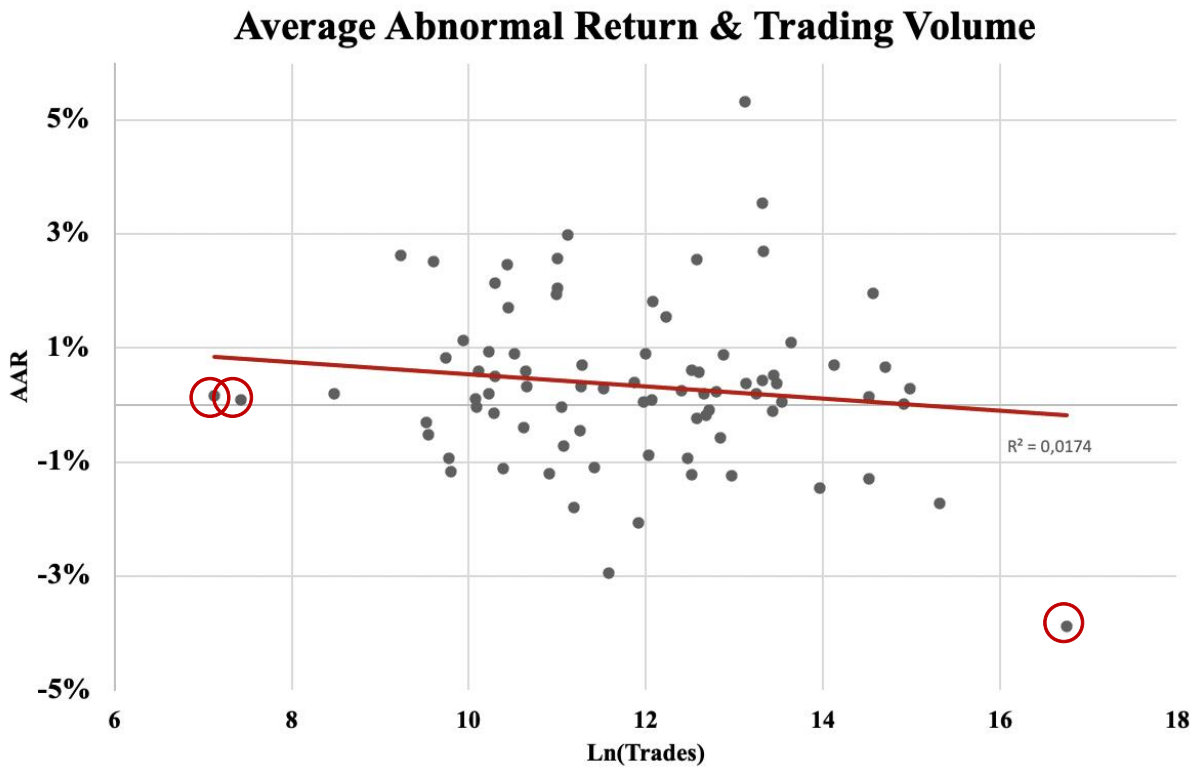
Appendix 3. Scatter plot of average abnormal return and split quota



Source: Own calculations of data from Thomson Reuters DataStream.

Appendix 3 shows the average abnormal return corresponding to split quotas. A total of three observations were extreme values and therefore not considered in the regression model. This in order to reduce the risk of distorted results.

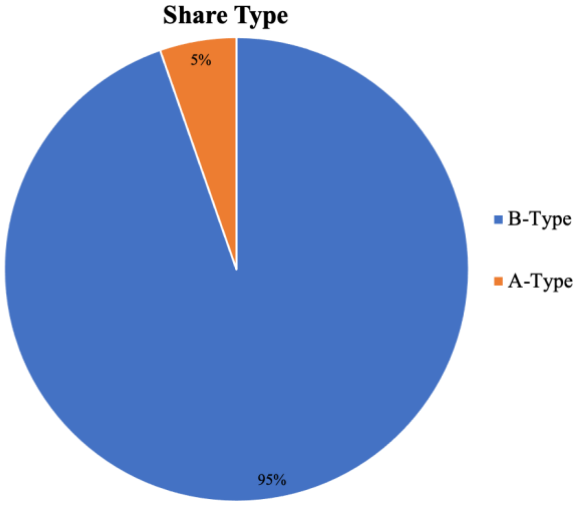
Appendix 4. Scatter plot on average abnormal return and trading volume



Source: Own calculations of data from Thomson Reuters DataStream.

Appendix 4 shows the average abnormal return corresponding to trading volume. A total of three observations were extreme values and therefore not considered in the regression model. This in order to reduce the risk of distorted results.

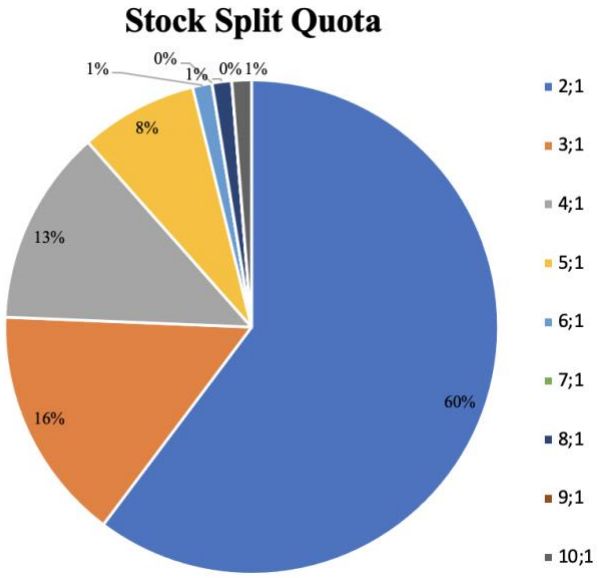
Appendix 5. Pie chart containing the distribution of A- and B-shares



Source: Own calculations of data from Thomson Reuters DataStream.

The figure above shows the distribution of A- and B-shares in the chosen sample. We see that 95% of the sample consists of B-type shares.

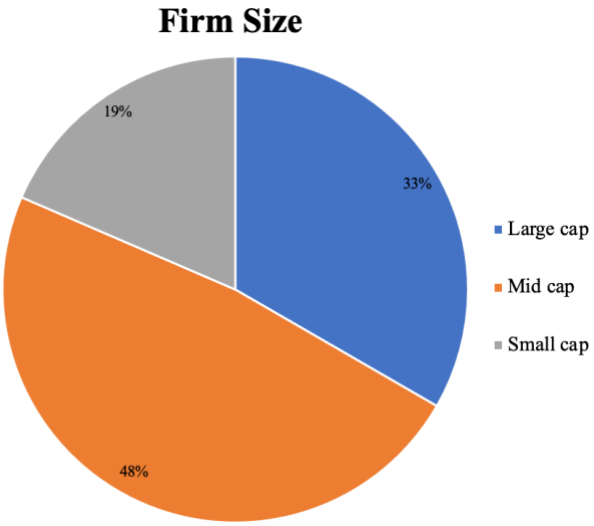
Appendix 6. Pie chart containing the distribution of split quota



Source: Own calculations of data from Thomson Reuters DataStream.

The figure illustrates the distribution of the different split quotas in the sample. As presented above, the majority (60%) are 2:1 stock splits.

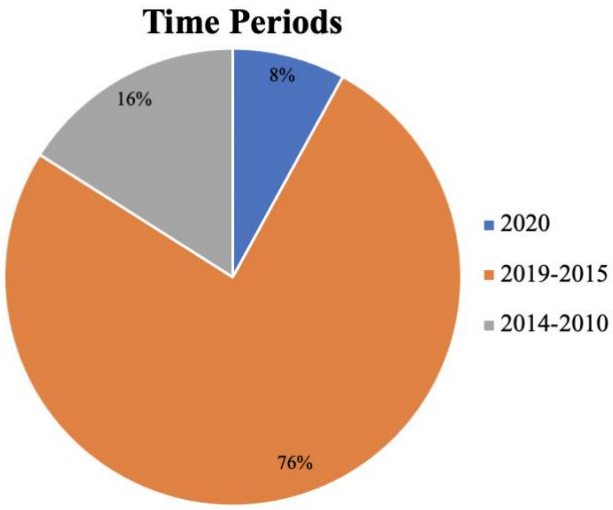
Appendix 7. Pie chart on the distribution of market capitalization



Source: Own calculations of data from Thomson Reuters DataStream.

The pie chart depicts the distribution between large, mid and small-cap companies in the final sample.

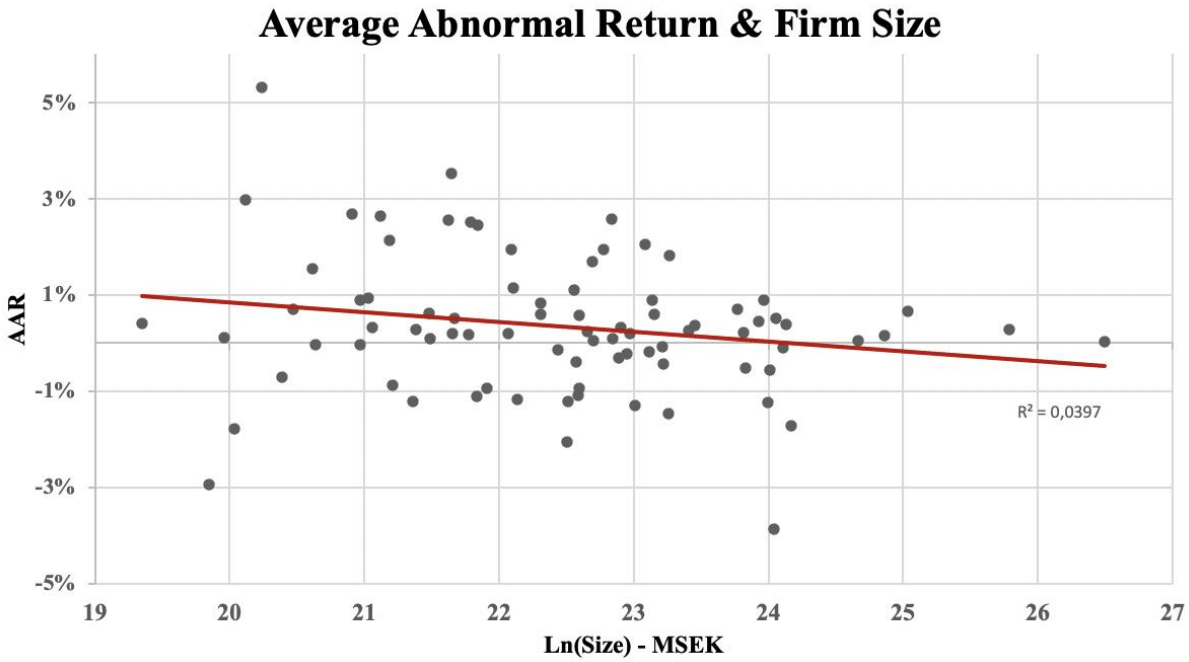
Appendix 8. Pie chart on the distribution of the time periods



Source: Own calculations of data from Thomson Reuters DataStream.

The figure above shows the distribution between the different time periods in the final sample.

Appendix 9. Scatter plot on average abnormal return and trading volume



Source: Own calculations of data from Thomson Reuters DataStream.

The figure above shows the average abnormal return corresponding to firm size.

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