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What Causes Abnormal Returns Following Stock Splits?

The Impact of Institutional and Retail Ownership Over Time

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Abstract

In this study we investigate to what degree the composition of ownership, retail and institutional, has an effect on the already established abnormal returns following stock splits. We look at time periods of 1 month, 3 months, 1 year and 2 years. We hypothesize that an increase in retail ownership following a split is positive in the short-run, but negative in the long-run, in terms of returns. Conversely, we then argue that an increase in institutional ownership yields positive abnormal returns in the long-run, and negative in the short-run. This study is largely inspired by the work and contradictory findings of Cui, Li, Pang & Xie (2020), Chemmanur, Hu & Huang (2015) and Chen, Nguyen & Singal (2011).

We find that on average for our dataset, an increase in institutional ownership yields a negative abnormal return of 2.75% compared to a counterpart with increased retail ownership, when viewing a 3-month period. Subsequently, we find that for a 2-year period, companies with increased institutional ownership outperform those without by 7.5% in terms of abnormal returns. These findings are consistent with our hypotheses. However, when statistically testing our calculations, we determine a significant negative relationship between increase in institutional ownership and returns for 3-month, 1-year and 2-year periods. This leads us to reject our hypothesis that an increase in institutional ownership is positively related to abnormal returns in the long-run. Overall, our work lends support to the behavioral signaling effect proposed by Cui et al. (2020.

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1. Introduction

1.1 What is a Stock Split?

A stock split is quite simply a corporate action where a company issues additional shares in some ratio to existing shareholders. In theory, a split should be met with a subsequent reduction in share price, thus leaving the market capitalization unchanged by the operation. To exemplify, if company ABC conducts a 2-for-1 split at a share price of $100, an investor who previously held one share will now hold two shares at $50 apiece. The investor's situation is clearly unchanged by what can be described as a purely cosmetic operation. An immediate question quickly arrives - if the two situations are truly indifferent, why would a company bother to do it? The question becomes even more apparent when considering the time- and cost aspect of it all. After all, basic financial theory teaches us that companies only seek out value-creating actions while attempting to cut costs.

A high-profile recent stock split that spurred our interest is that of Tesla, Inc. After a meteoric rise, the company announced on August 11, 2020, that they would conduct a 5-for-1 split. Around the same time, Apple Inc. conducted a 4-for-1 split (Carrel, 2020). The remarkable thing however, was the response the announcement and implementation of the split received from the financial markets. Tesla gained over 70% in just the 20 days between the announcement and the carrying out of the split (Calhoun, 2020). Similar results could be seen in Apple. This is a recurring theme, despite the crystal-clear message found in traditional financial theory. What is the reason for these anomalies and seemingly contradictory events?

Countless studies have been conducted on what has been labelled the “Stock Split Puzzle”. Nevertheless, there is no clear consensus as to why the phenomenon of stock splits exists. Maureen O`Hara, Gideon Saar and David Easley presented the following statement in their article “How Stock Splits Affect Trading”, which we found quite interesting for further research.

"Stock splits remain one of the most popular and least understood phenomena in equity markets" - Easley, O'Hara & Saar (2001, p. 25)

1.2 Institutional and Retail Investors

During the course of this thesis, the actors in the financial markets will be split into retail and institutional investors. We are interested to see to what extent the composition of these impact the subsequent returns following stock splits. These are groups with vastly different specters of possibilities, for several reasons. An institutional investor is by definition a legal entity, while retail, or individual, investors are physical beings. Typical examples of such institutions are banks, mutual funds, hedge funds, endowments and more, while the authors of this thesis are examples of retail investors. A distinct difference between the two is that the institution manages capital for a multitude of people, whereas the retail investor manages his or her own capital. Implicitly, on a general level we can attribute a larger capital pool, more professionalism and skill to institutional investors, relative to the individual investor.

Naturally, there are significant variations within both categories. Every individual investor has a different skillset, experience level and desired outcome from investing, and the results will vary accordingly. A pension fund tasked with safely managing the retirement savings of thousands of police officers will not act in the same manner as a speculative hedge fund utilizing algorithm trading. In this paper there will be no distinction made between active and passive institutional investors, mainly due to limited availability of such data – but more on this later. Still, looking at the two groups is common practice and often of great interest for a variety of reasons. One of these, which we will discuss at length at a later stage, is the possibility of an informational advantage. Could institutional investors not only be better equipped to analyze the available financial information, but also be provided superior information?

Another common assumption is that retail investors are more subject to irrationality and bias. In other words, their decisions are more likely to be driven by emotion than the decisions of institutions. This will be a central theme in our later discussions. These, as well as other characteristics, enable us to form theories related to composition of the two groups and its impact on future firm performance. Can we observe scenarios where institutional and retail investors come to seemingly opposite conclusions? What can we infer from changes in this parameter, if anything?

1.3 Background

It has been consistently shown in multiple studies that there are abnormal returns associated with splits, with several possible theories proposed. What is certain is that leading companies, whose sole purpose is to maximize shareholder value, would not continue to spend time and resources on corporate actions that they consider to create no value. It seems fairly obvious that stock splits are considered by some of the financial world's brightest minds to be beneficial to the performance of their companies on some level. We will provide a run-down of acclaimed explanations and studies conducted on the subject, before specifying which areas we have found to be particularly interesting for further investigating.

Within the field of research done regarding this topic, different theories have been mentioned as possible solutions to the puzzle. Two leading explanations have been proposed to explain the abnormal returns associated with stock splits. Fama et al. (1969) were among the first to point to the signaling effect of stock splits as a source of abnormal returns. Valuable information about a company's future performance could be found in the splits, and thus picked up by observant investors. Specifically, Fama pointed to the fact that split announcements are thought to greatly increase the probability of a rise in dividends from the company. In other words, the source of the abnormal returns isn't the split itself, but rather the message(s) conveyed in the split. This line of reasoning has enjoyed plenty of empirical support from influential studies such as Grinblatt et al. (1984), Asquith et al. (1989), McNichols & Dravid (1990) and Louis & Robinson (2005). Even though the signaling theory is supported by highly qualified economists, the exact channel through which signaling works is unclear in the studies mentioned above

Another prominent and well-documented explanation is the "optimal trading range" hypothesis, first brought on by Lakonishok & Lev (1987) and since supported by Dyl & Elliott (2006). The argument here is that a company has an optimal price interval in terms of share price where the management wants to stay within reach of, thus improving the liquidity and marketability of the stock by lowering the share price. An important aspect here is that investors are thought to think of share prices in "dollar terms" per share, instead of looking at total market capitalization. In practice, this would mean that an investor who sees his favorite stock trade at $50 when it previously traded at $25 would prefer the company to conduct a 2-for-1 split such that the price again returns to the interval he's accustomed to. However, the "optimal trading range" hypothesis is inconclusive, since evidence that points to the contrary also exists. For example, Copeland (1979) and Conroy et al. (1990) pointed to contradicting findings.

More recent studies have focused on the role of the different types of investors and its relation to abnormal returns. Investors are roughly split into institutional and retail investors, where institutional refers to banks, funds, endowments and such, and retail meaning a non-professional individual. An increasing number of researchers believe that the composition of the investors partaking in splits have an effect on the yielded returns. As institutional investors are thought to have better access to privileged information and/or be more skilled in interpreting available information, it is certainly interesting to what extent they are present in splits.

In their paper where they directly test the information production theory proposed by Brennan & Hughes (1991), Chemmanur, Hu & Huang (2015) present evidence that institutional investors make abnormal returns net of brokerage fees by participating in splits. In addition, they find that trading volume by these institutions increases after a split and state that one can predict future performance of a company by the degree to which institutions are involved. Chen, Nguyen & Singal (2011) conclude that splits with increased institutional ownership are more likely to contain information, while those without are more likely to be driven by marketability.

Contradictory to this, Cui, Li, Pang & Xie (2020) conclude in their study that the announcement effect of splits is more pronounced among firms mainly held by retail investors and that returns are smaller for firms with higher institutional ownership. This is based on a behavioral signaling framework and data collected from the Chinese market.

Even though the studies looked at entirely different markets with equally different mechanics, we found this contradiction to be very interesting. It's basically an extension of the discussion surrounding efficient markets - is the market driven by irrationality and sentiment or rationale and numbers? By comparing the studies and discussing their findings, we quickly wondered whether it could be the case that they both were right in their own way. Could it be that the behavioral explanation proposed by Cui et al. where the optimism of retail investors is cited as a main reason is true in the short-term, but wears off in the long-term? Furthermore, could it be that once the optimism retracts, the ability to interpret and analyze information found in the splits is what drives returns? If institutional investors truly are more skilled and/or receive more information from companies and brokerages, this would imply that splits with high participation of institutional actors dominate those without. Thus, the two contradicting studies lay the foundation of this thesis regarding methodology and formulation of research questions. We set out not to once again prove that there are abnormal returns associated with stock splits, but to provide further insight into how the composition of ownership, split into institutional and behavioral, contributes to the returns achieved following splits.

1.4 Hypotheses

Our line of reasoning thus, is that the market takes some time to adjust to the new information, and in that period abnormal returns can be achieved from splits with a high degree of retail ownership, whereas in the end the highest returns will come from superior analytical skill/access to information. Markets can be driven by optimism and sentiment in the short-run, but never in the long-run. We argue that we will see the short-term positive effect of retail investor’s sentiment more than reversed in the long-run, and outperformed by the superior skill and knowledge of the institutional investor. Splits with a higher degree of institutional ownership will outperform those with a decrease over time. To be perfectly clear; we theorize more than a simple mean-reversion in the long run. Summarizing this in the form of hypotheses, we arrived at the following two:

Hypothesis 1

H0 – Increased retail ownership following splits will yield higher positive abnormal returns in the short-run, relative to splits with an increase in institutional ownership

Hypothesis 2

H0 – Increased institutional ownership following splits will yield higher positive abnormal returns in the long-run, relative to splits with an increase in retail ownership

1.5 Structure

In the following chapter we will go into greater depth in regards to existing literature and the prominent theories dominating the field today, creating a theoretical framework. Our literature review will begin with documenting the fact that stock splits are in fact associated with abnormal returns, before moving on to the different explanations. We will narrow our scope towards recent studies focusing on the composition of ownership and its implications. Then we will proceed to the process of gathering data and present our finalized dataset. Moving on, the next section tackles the methodology and subsequent statistical testing. The results will be interpreted, and the thesis ends with conclusions and final remarks.

2. Theoretical Framework

The second chapter will provide a structure that constitutes a foundation necessary to understand and study stock splits and its implications. Relevant theories and studies will be reviewed and categorized, with the aim of creating an appropriate overview of the topic.

2.1 The "Stock Split Puzzle"

In this section we will create a theoretical framework that summarizes the vast selection of theories and explanations to the puzzle that is stock splits. The topic has interested researchers for many decades, and still does to this day. With the examples of Apple and Tesla already mentioned, there is good reason to suspect that the academic interest will persist for quite some time. Whether or not we will ever reach a unison agreement remains to be seen. Roughly put, we can divide the proposed solutions into two main categories:

1. Signaling
2. Optimal Trading Range

These are the two directions that have dominated and continue to dominate studies on the topic. Within both groups, there exist multiple versions with varying similarities and subtle differences. Some are virtually indistinguishable, while others serve as sharp contrasts to each other. In the coming section, we will review the most relevant and significant propositions within each category, in addition to some outliers. Together, they constitute our puzzle. First, however, we will start by providing a brief discussion of a theorem that can be viewed as a cornerstone within the field of wealth distribution and capital structure.

2.2 Miller-Modigliani Theorem, Efficient Markets Hypothesis and Financial Theory

Like stated in the introduction, traditional financial theory suggests there should be no added value stemming from stock splits, which could be compared to slicing the same pizza in different ways. No matter how many slices you cut it into, your caloric intake remains the same, assuming you eat the whole thing. Two of the cornerstones of traditional financial theory is the Miller-Modigliani proposition and the Efficient Market Hypothesis (EMH). In this section, these two are used as a proxy for basic financial theory - which would suggest that there are no abnormal returns associated with stock splits.

Existing in different forms, EMH entails markets being efficient in the sense that a company's stock price reflects available information and thus leaving no possibility for abnormal returns. While most economists dispute the strongest form of EMH, that all information is priced into every stock at all times, the slightly weaker forms enjoy a great deal of support and remain an integral part of most valuation techniques. Whether or not markets are truly efficient or to what extent, is a question as old as markets themselves, and it is not one we will attempt to answer. Still, it is a good starting point to state that if markets and its actors are completely or mostly efficient, there should be no abnormal returns stemming from simply slicing your pizza into smaller pieces.

The Miller-Modigliani theorem is another example of a monumental piece of work that has laid the foundation of modern capital structure. Published in the late 1950s, the argument is that a company's capital structure is irrelevant to the valuation of said company, hence sometimes being referred to as the "Irrelevancy Proposition". Whether a company is financed with debt or equity or a mix of the two, it is worth exactly the same amount in perfectly efficient markets. Market imperfections such as taxes, financing costs and transactions costs are left out. Accordingly, the same irrelevance goes for a company's decision to distribute wealth to shareholders, most commonly in the form of dividends. Despite not stating anything explicitly about stock splits, the logic of their work can be extended to include splits, which in some cases are viewed to be a special form of dividend.

Another aspect of financial theory that is relevant to an investigation of stock splits and abnormal returns, is the discussion on the "rational investor". That an investor acts rationally is an important assumption behind many theories and models. Loosely defined, it means that an investor attempts to maximize his or her utility based on available information, which he or she is able to interpret. Implicitly, one would assume that a rational investor would view stock splits as little more than cosmetic corporate operation that creates no value in itself.

These are only examples of trains of thoughts that are fundamental in basic finance theory, and only serve here as representations of the logic that should lead us to the conclusion that there are no abnormal returns associated with stock splits. As mentioned, it is not our aim to prove or disprove of these theories, but we find it to be a necessary background to be familiar with when further exploring existing empirical work.

2.3 Signaling Theory

The signaling theory is one of the two leading proposed explanations to the stock split puzzle. It is well-established among researchers all over the world of economics, and is useful for describing behavior when two parties have different access to information, due to information asymmetry (Akerlof, 1970). In the particular case of stock splits, the signaling theory argues that stock splits could convey manager's private favorable information regarding firms' future performance to outside investors, which makes a credible signal (Brennan and Copeland, 1988; McNichols and Dravid, 1990; Brennan and Hughes, 1991).

One the one hand, a stock split can boost investors' expectations about the firm's future growth, financial accomplishments and share price, but on the other hand it can be critical in the sense that it leads to a negative shock if these expectations aren't met. When future performance is poor and the firm falls short of expectation, due to loss aversion, investors will be disappointed and cause large price declines.

Thus, in equilibrium, only firms with favorable private information about future performance and fundamentals conduct stock splits. Simply put, the psychological aspect of loss aversion blocks low-quality firms from mimicking high-quality firms through stock splits, meaning that investors correctly infer splits as a signal of positive information. There are several versions of the signaling theory, but the common denominator is that management for some reason wants to send a message, the signal, to the market about the company.

2.3.1 Behavioral Signaling Theory

An extension of the traditional signaling theory is the behavioral signaling theory, proposed by Cui, Li, Pang and Xie (2020), inspired by the work of Baker, Mendal and Wurgler back in 2015. Despite the close relationship between the two theories, there are some distinct and key differences that distinguish the traditional theory from the behavioral approach. Whereas the former depends on destroying real firm value ex ante for the signal to be credible, the new signaling behavioral framework can be credible without destroying real firm value. A survey conducted by Brat et al. (2005) rejects the circumstances for the signal to be credible. Furthermore, the behavioral theory argues that as long as there are ex post psychological costs imposed on investors when companies engage in false signaling, the signal could be credible (Ciu et al., 2020).

Within the behavioral signaling framework the nominal price illusion is an important characteristic, due to investor's belief that stocks with a low price have a higher growth potential than a highly priced stock (Birru & Wang, 2017). In this case, investors would expect a higher price appreciation post-split. Additionally, investors tend to confuse stock splits with cash dividends, although nothing is actually distributed out of the company. By viewing stock splits and cash dividends as equivalent means, stock splits are naturally correlated with positive future fundamentals. As mentioned above, the psychological cost plays a vital role and works as an invisible tool in order to prevent firms with low likelihood of performing great from mimicking high-quality firms through stock splits.

According to Cui, Li Pang and Xie, the behavioral framework is more applicable for stock split, due to how they handle real firm value ex ante to make the signal credible. Moreover, the emphasis of low cost and unaffected firm cash flow strengthen the argument. In contrast, the signaling theory struggles to clarify why an action with minimum cost could provide credible information to investors.

2.4 Information Production Theory

Michael J. Brennan and Patricia J. Hughes argue in their 1991 article that stock splits lead to increased attention from investment analysts who cover the firm. Analysts conduct research on a company's future performance, typically culminating in a target price and a recommendation to investors on whether to buy, hold or sell this particular stock. These reports and recommendations can have an impact on the development of a company's share price. The rationale, then, is that a company whose management feels overlooked and undervalued by the market, wishes to draw more attention from analysts, yielding a more favorable share price. In their article, Brennan and Hughes link this to the dependence of brokerage commission rate on share price as an incentive for analysts to conduct research. As they so fittingly put it; "We argue that managers with favorable private information will find it advantageous to have independent third parties produce information about their firms for investors". This is commonly referred to as the "information production theory".

What sets this theory apart from previous propositions, is that the flow of information about firms is now considered to be an increasing function of firm size and a decreasing function of the share price. In practice, this means that companies can affect the volume of brokers currently covering the company by conducting stock splits that lower the stock price. The argument is not that the split itself causes abnormal returns, but rather that the action of splitting attracts new investors due to analyst coverage. Implicit here lies the assumption that only firms who view themselves as undervalued would carry out splits. This is highly logical, as there would be little reason for firms with poor outlooks to want increased analyst-attention around their projected future performance.

2.5 Optimal Trading Range Theory

Josef Lakonishok and Baruch Lev propose in their 1987 article that splits occur following periods of high growth with the intention to return the share price to a "normal" range. Managers have a specific range in mind, thought to be made up of a combination of market-wide, industry-wide and firm-specific characteristics. There could be many reasons for why management would have such a preferred trading range. One of them simply has to do with the fact that at a certain price small investors would have trouble affording "round" numbers of shares, i.e. one. While it certainly is possible to buy less than one whole share of a company, it is not difficult to imagine that to some investors it would seem "unnatural" to buy half a share of a company, for example. Looking at the Tesla-example that initiated this entire thesis, the share price peaked at $2.213 at market close before the split took effect. This is a substantial amount for many retail investors. If a company's management believes this to be the case for just a small fraction of investors, it would make sense to split the shares to remove that barrier to entry.

Another possible reason could simply be that many investors think of share prices in dollar terms. In practice, this would mean that an investor who sees his or her favorite stock trade at $50 when it previously traded at $25 would prefer the company to conduct a 2-for-1 split such that the price again returns to the interval he or she's accustomed to. At $50 the investor would deem it expensive and may be eager to sell, but at $25 sit perfectly comfortably. This line of reasoning is obviously dependent on investors not being entirely rational, as one would expect a rational actor to disregard any such bias.

Edward A. Dyl and William B. Elliott conclude their 2006 study by stating that firms manage share price levels to increase the value of the firm. This is heavily built on their argument that a company's investor base increases when an optimal trading range is utilized. They cite literature from as far back as 1934 that present findings that any share price under $10 is associated with low credit, and any share price above $200 is met with a reluctance to buy. The purpose of that inclusion is to underline the fact that seemingly irrational preferences regarding share prices have existed for a long time. This is cemented by Baker and Gallagher (1980) who conducted a survey of CFOs who almost unanimously agreed to the notion that "stock splits keep a firm's stock price in an optimal price range".

2.5.1 Increased Liquidity

Containing much of the discussion from the section above, a suggested explanation as to why splits occur is increased liquidity. In an article containing the survey mentioned above, Baker and Gallagher argue that managers believe splits increase the number of shareholders in the firm. By reaching the already mentioned trading range, liquidity will increase due to the interest from individual investors. The authors bring forth an important distinction between institutional and individual (retail) investors that we will discuss in much greater detail later. To reduce the portion of institutional investors, which was on the rise as the article was written, a split is an appeal to individual investors to buy shares. This is thought to increase trading volume and liquidity, as a broader investor base is thought to be more flexible than a narrower one. This could be a way to reduce large movements in the stock price as institutional investors enter or exit their position. With fewer shares on the market, the spread between buy and sell will automatically increase. In a 1993 article, Baker, now joined by Gary E. Powell, further argues for both the trading range and the improved trading liquidity theory, which is deeply connected.

2.6 Tax-Option Value Theory

Yet another proposed theory is the tax-option value theory. In a study that partially builds on findings documented by Constantinides in 1984 as well as Ohlson & Penman (1985), Lamoureux & Poon (1987) argues that the abnormal returns following splits could be the result of “noise” stemming from increased trading volume, which in turn raises the tax-option value of the stock. The noise is followed by a subsequent increase in non-systematic risk, which the researchers believe to result in increased firm value. This theory goes into great depth regarding definitions, measurements and pricing of the different categories of risk, which we judge to fall outside of the scope of our thesis. The essential point is that a stock can be viewed as an option in the sense that volatility gives the owner an option to realize short-term losses and long-term gains for tax purposes. Based on the notion that splits increase volatility, this option increases in value and thus creates abnormal returns.

2.7 Composition of Ownership

In more recent research, the ownership composition before and after splits has been granted more attention. Investors are separated into two groups; institutional and retail. Studies have looked at to what extent the composition of these two groups could be a source of abnormal returns in any way. Chen et al. (2011) used change in breadth of institutional ownership as a new metric, in contrast to existing literature. Furthermore, they used the new metric to separate splits with information from those without information. The underlying assumption that stock splits contain information is supplemented by the idea that certain participants in the market are able to separate information-based splits from those without. In fact, they show that institutional investors are able to anticipate firm future performance. Splits with increased institutional ownership are more likely to contain information, while those without are more likely to be driven by marketability. In line with this thought, Chemmanur et al. (2015) present proof that institutional investors make abnormal returns net of brokerage fees by participating in splits. Moreover, they find that trading volume by these institutions increases after a split and state that one can predict future performance of a company by the degree to which institutions are involved. Summed up, these studies argue that institutional investors are more skilled and might have access to more privileged information, making them better equipped to make decisions regarding a company’s future performance. Thus, one can expect to see better returns in companies whose splits enjoy an increase in degree of institutional ownership.

Conversely, recent literature by Cui et al. (2020) argues that it is the other way around. They find supporting evidence that the announcement effect of splits is more pronounced among firms mainly held by retail investors and that returns are smaller for firms with higher institutional ownership. They cite an inherent misconception among retail investors, who regard a split to be “good news”. The rationale is that stock prices can be driven by investor optimism, which you would assume to be more present among retail investors rather than institutional. As a consequence, splits showing an increase in retail ownership will outperform those with a decrease.

3. Evidence

In the previous section we went through the theory behind some of the most prominent proposed explanations for the supposed abnormal returns. Now, we will review the existing evidence and to what degree the different theories have found empirical support. The starting point will be the documentation of the existence of abnormal returns, before moving on to the theories.

3.1 Stock Splits and Abnormal Returns

Throughout the decades, both short-term and long-term abnormal returns have been attributed to stock splits by renowned academics. In the short-term these returns are typically linked to the announcement effect of a split. A commonly referred to study on this is that of Grinblatt et al. (1984), where the researchers document a positive reaction to both dividend and split announcements that is in excess of expected return. The announcement effect is also supported by Lamoureux and Poon (1987), who were inspired by the 1984-study. Yet another article proving short-term abnormal returns following splits is that of Brennan and Copeland (1988). While these researchers cite varying factors that we will discuss in more detail later, the constant remains; there are statistically significant abnormal returns associated with splits in the short-run.

In the long-run, Desai and Jain (1998) present evidence that the market underreacts to stock split announcements, and document significant abnormal returns on a 1-to-3-year horizon. Much of the same is found by Ikenberry and Ramnath (2002) in their study of news events. These are only some of the many examples that can be found in modern research. Combined, these studies show that there undoubtedly are positive abnormal returns occurring after this seemingly cosmetic corporate action, both in the short- and long-run. Since researchers are yet to fully agree on a universal explanation for this, and perhaps there isn't one, the phenomenon remains unexplained. This underlines further why our mission with this paper isn't to document something that has already been proven, but to find support for and bring clarity to a potential explanation. We take the existence of abnormal returns following stock splits for granted, and seek to find out why.

3.2 Evidence of Signaling

Brennan and Copeland (1988) present evidence confirming a relation between stock trading costs and stock prices by developing a model of stock-split behavior in which the split serves as a costly signal of managers' private information. They reference findings by McNichols and Dravid (1986), among others, that report statistically significant unanticipated increases in earnings following splits. This strongly points to split announcements serving as a signal of future improved performance. Lakonishok and Lev (1987) also present empirical data suggesting splitting firms achieve faster earnings growth than non-splitting firms, measured by using a control sample of such firms.

The data sample used by Brennan and Copeland is that of Grinblatt et al. (1984); a total of 1,035 splits conducted from 1967-1976, with the criterion of a split factor larger or equal to 1.25:1. Abnormal returns are found by deducting returns of a benchmark portfolio from the returns of the splitting firms. Results are interpreted to support the signaling model, in that the number of outstanding shares after the split provides important new information to investors. The rationale behind their model is that the new number of shares serves as a costly signal of its value, based on the fact that cost of trading depends on share price.

Lamoureux and Poon (1987) does not share the view of Brennan and Copeland or the other proponents of the signaling hypothesis. They argue that in order for the theory to make sense, there must be an attributable cost to "false signaling". Without this, they write, there is no way to separate under- and overvalued splitting shares. In their view, such a cost is absent in splits. Additionally, a split could be a signal of just the opposite; that management feels the valuation of the company has reached its peak. Lin, Singh and Yu (2009) present evidence that rejects one of the important assumptions made by Brennan and Copeland; latent trading costs decline rather than increase following splits. Thus, the signaling theory continue to be one of two main explanations behind splits, but is not universally agreed upon.

3.3 Evidence of Information Production

Brennan and Hughes (1991) produced a model where brokerage commission rates of analysts were strongly related to the share price of companies. Their findings point toward analysts thusly having incentives for providing coverage of firms with lower stock prices. Seeing as splits directly result in lower prices, this indicates a motivation for undervalued firms to split their shares in order to increase analyst coverage. Reference is also made to Grinblatt et al. (1984) who discover evidence supportive of the notion that undervalued companies conduct splits due to a desire for analyst attention. Arbel and Swanson (1989) present empirical data suggesting a negative correlation between magnitude of price response and analyst coverage. Chemmanur et al. (2015) lends significant support to the theory proposed by Brennan and Hughes, while extending their hypothesis to include institutional investors and their information advantage.

Grinblatt et al. put forth a possible weakness in the information production theory. In their view, there is no obvious reason as to why a company would choose to split (or announce dividends) to draw attention instead of just issuing a press release of some sort. Still, they mention the risk of revealing valuable information to competitors and liability to shareholders in the event the press release is inaccurate as plausible answers. Lamoureux and Poon however, claim that the theory can be "flatly rejected" by providing direct evidence of the market reaction to reverse splits. If the positive reaction was simply due to increased attention, reverse splits would yield the same result. Empirical data, however, show negative reactions to reverse splits.

In conclusion, the information production theory has enjoyed an increasing amount of support in recent academia, after being categorically rejected in earlier studies. Still, there is not enough evidence to grant a full acceptance just yet.

3.4 Evidence of Optimal Trading Range Theory and Increased Liquidity

The optimal trading range hypothesis has no shortage of empirical backing. Lakonishok and Lev (1987) present evidence that suggest managers are adjusting their share price to average prices of similar firms. This conclusion is drawn from statistics on average price gaps and movements before and after splits are conducted. By employing a measure of an implicit target price, the researchers are able to show via regressions that a market-wide price average is the aim of the splitting firms, with some relation to an industry-wide average. Furthermore, the study documents a substantial increase in trading activity and liquidity.

Edward A. Dyl and William B. Elliott cite the previously referenced surveys done by Baker and Gallagher (1980) where CFOs strongly agree with a statement regarding the existence of an optimal trading range, which in itself is additional evidence of the theory. Moreover, they conduct a regression analysis that includes trading range based on current share price, the book value of equity, average holdings and earnings per share. This trading range, as well as the appreciation in stock price over the five preceding years, gives a probability measure of a firm splitting its shares. The regression results are evidence of the optimal trading range theory. Among other influential studies to lend support to the hypothesis, the work of Conry and Harris (1999) is worth a mention.

Whether or not splits actually result in an increase in liquidity is heavily debated with contradictory findings. Easley, O'Hara and Saar (2001) as well as Lamoureux and Poon, among others, show the opposite, partly due to an increase in the bid-ask spread. Lamoureux and Poon also point to the fact that transaction costs tend to be an inverse function of share price, in their rejection of the optimal trading range theory. Ohlson and Penman's (1985) findings of increased return volatility following splits, is also thought to cause decreased liquidity. Cui, Li, Pang and Xie (2020) reject the hypothesis on the basis of abnormal returns still being largely present when controlling for liquidity and investor visibility. Another argument brought forward by Chemmanur, Hu and Huang (2015) is that the optimal trading range mainly applies to retail investors, since they are the ones who typically are subject to financial constraints and behavioral biases, yet splits with an increase in institutional ownership also have been shown to produce abnormal returns.

3.5 Evidence of Tax Option Value Theory

Lamoureux and Poon (1987) refer to a study carried out by Ohlson and Penman where they document increased volatility of 35% on average on split ex-days. The authors also focus on reverse splits, meaning that the number of shares outstanding is now reduced instead of increased, and find corresponding results, i.e. reduced volatility. Seeing as the rationale is that increased volatility is desirable due to tax purposes, document normal market reactions to both split announcements and ex-dates, and the opposite with regards to reverse-splits. Furthermore, the researchers find a significant increase in beta, systematic risk, for the majority of the splitting stocks, and no such increase for reverse-splitting stocks. This is further investigated by using Scholes-Williams betas, which lends support to the findings.

After documenting the increased volatility, Lamoureux and Poon regress announcement returns on a statistic for shifts in the error variance that pertains to that event. The results are what the authors label “strong empirical support” for the tax-option model.

In spite of the categorical conclusion of Lamoureux and Poon, later research has gone in other directions in their efforts to explain the relation between splits and abnormal returns. In their 2020 study, Cui et al. document abnormal returns following splits in China, where the tax-option value theory seems highly unlikely, due to the fact that capital losses cannot offset taxable income. Quite frankly, it is hard to find any acclaimed literature whatsoever, that investigates the hypotheses of tax-option value and systematic risk. In fact, Lamoureux and Poon are typically only referenced for one of two reasons: 1. Further evidence of abnormal returns following splits, or 2. Reduced liquidity, mainly used to argue in favor of a signaling hypothesis. Brennan and Copeland (1988), however, dedicate a short paragraph to the theory, and concludes that Lamoureux and Poon are “unable to explain the decision to split or to account for the relation between split-announcement returns and subsequent earnings performance documented by McNichols and Dravid (1986)”. Thus, it seems that more recent academia has disregarded the tax-option value theory and concluded that there exist multiple more likely explanations.

3.6 Evidence of Composition of Ownership

Chen et al. (2011) builds on the assumption that there is at least some information to be found in stock splits, and that institutional actors are better equipped to interpret said information. Following that logic, splits with an increase in institutional ownership should produce better returns. They find empirical support for these assumptions by investigating differences between a sample of splits with increased institutional ownership and a control sample. Abnormal changes in breadth of ownership have a statistically significant positive relation with abnormal returns. The results are robust and consistent over multiple time-periods. Their study can be viewed as support of the information production theory in some form.

The same can be said about the work of Chemmanur et al. (2015), which has been thoroughly referenced already in this thesis. While the conclusion and main focus of their study is to directly test information production theory, institutional ownership is an integral part of their article. They prove that commissions paid by institutional investors increase following splits. Further, they prove the predictive power of institutions in terms of long-term performance. Much of the empirical focus lies in exposing the relationship between institutions, brokers and management. Their findings strongly suggest an exchange of information from analysts to institutions prior to public availability. Combined, the two studies document a strong correlation between the degree of institutional ownership and abnormal returns.

This makes the findings of Cui et al. (2020) particularly interesting. In their study of splits in the Chinese market, where they lend heavy support to a behavioral signaling explanation, they too tackle the issue of composition of ownership. Their fourth conclusion states the following: “the announcement returns of stock splits are smaller for firms with higher institutional ownership (...)”. Their rationale is the misconceptions of retail investors, which are not present with institutional actors. They show that retail investors are net buyers after split announcements. It can be added that Lamoureux and Poon find that the ownership base of splitting firms increases by an average of 34.65%, consistent with the findings from China. When regressing institutional holdings on abnormal returns, the researchers find a significant negative relation.

All three studies produce statistically significant results built on sound methodology. Their contradictory evidence serves as the focal point of our thesis. In the following section, we will further investigate the differences between them and elaborate on our own thoughts on the matter.

3.7 Summary

We have now provided a review of what we consider to be the most relevant literature on the topic of stock splits, and its evidence. There is no shortage of interesting studies and significant work. The only mutually agreed upon fact seems to be that there are abnormal returns associated with stock splits, in spite of traditional financial theory. Statistically significant results are produced for all explanations, then either disapproved, doubted or not found interesting enough to be the focus of more recent studies. Some assumptions that serve as virtual support beams of some theories, are rejected by others. The dispute on increased or decreased liquidity is an example of such. The two schools of thought; signaling and trading range - are seemingly splitting researchers in half, with both producing solid pieces of evidence. No universal agreement is in sight for the moment.

What we found to be most interesting, though, was the research done on institutional- and retail ownership. The reason for this is that it is somewhat of a new metric in a topic that has been the subject of high-quality academia in abundance. Its contrasting findings have been the starting point of our thesis, in which we hope to bring clarity to the dispute. There are obvious differences in the studies conducted, the most glaring one being that Cui et al. looked at the Chinese market, while Chemmanur et al. and Chen et al. studied the American market. In addition to a different tax-regime, the studies also conclude that there are notable differences with regards to the investor base itself. The absence of the same incentives of brokers and analysts, and thus the relation to share prices, in China versus the US could also be a big factor. Just how much this alters the empirical findings is hard to say for certain. Whether the presence of abnormal returns following splits in Chinese markets happens in spite of, or because of, these differences is an intriguing question.

As the researchers state themselves, there are aspects of the Chinese market that make it perfectly suitable to test a behavioral signaling explanation. It is not unreasonable to wonder if there's a confirmation-bias present. As the saying goes; "what you measure is what you get". In addition, there's also the time aspect. Cui et al. is more concerned with the short-term announcement effects of splits, while Chemmanur et al. documents long-term abnormal returns in addition to announcement returns. This is a key element for us. There are plenty of examples proving that markets can act irrationally in the short-term, and we consider it likely that this irrationality largely is driven by behavioral biases such as the ones proposed by Cui et al. Therefore, our line of reasoning is that an increase in retail ownership in splitting firms very well could be a driver of abnormal returns in the short-run. Furthermore, we hypothesize that this effect not only is present, but that it is likely to be reversed in the longer-run, to the point that an increase in retail ownership is a negative factor. We follow the reasoning of Chemmanur et al (2015): Chen et al. that says institutions are better skilled and have access to privileged information, making them superior decision makers. Thus, we argue that an increase in institutional ownership should be a source of abnormal returns once the irrationalities of the market have been corrected. As we move forward with our thesis, this is the rationale we seek to test in an empirical manner.

4. Data

In this part of our thesis, we will discuss the data we have used for empirical testing and how we both collected and sorted it. This section will include a detailed description of databases utilized, criteria for potential observations included in the study, reasoning for any limitations put in place as well as a summary of the final dataset.

4.1 Data Collection

We started out by narrowing the scope of our thesis to both a time period and a geographical area. Due to the fast-changing business environment of today, we wanted to obtain as recent data as possible. Thus, we looked exclusively at stock splits conducted starting from 2010. Interestingly, we observed a peak in the frequency of conducting stock splits in 2011. Since we also wanted to say something about returns over a longer time, we excluded any splits occurring after 2017, as we would have had trouble obtaining satisfactory data on pricing. Furthermore, in order to contribute and relate to the existing literature, we found it appropriate to focus on the same exchanges commonly used in previous studies - NYSE and NASDAQ.

Company characteristics and financial data were collected from several different source, including Bloomberg, Eikon, CRSP, Compustat and ORBIS. The use of different data sources allowed for quality checking across different databases and made it possible to manually correct and adjust it, which left us with a reliable and appropriate collection. By having a relatively small sample, the process of choosing the most accurate data among the various variables became easier, which we considered as a huge advantage. Furthermore, it also made it more convenient to fill gaps and compliment the data, to obtain as few missing values as possible. Overall, we believe this to contribute to significantly increase the quality of our dataset. Nonetheless, the different terminals required different sources of identification, and we made use of a combination of ticker, company name, RIC and CUSIP in order to get the data. Before we merged the data into one file, we manually cross-referenced all observations to make sure there was no overlapping between the different sources.

After obtaining the list of splits, we proceeded to gather data on returns for our selected companies. In order to build a foundation for saying something about both the short-term and the longer-term returns, we collected adjusted stock prices for 1 month, 3 months, 1 year and 2 years following a split. For this, we used Compustat’s daily stock prices database. Seeing as our splits rarely were done simultaneously, we were also interested in calculating and comparing abnormal returns, i.e. in excess of a relevant index for the same period. The most appropriate index we found to be the S&P 500. Thus, we obtained daily returns on the S&P for the entirety of our time horizon and were able to extract abnormal returns for every observation with execution day as a base. In addition to returns, we collected data on price, volumes and shares outstanding in order to comprise a more comprehensive set of variables.

4.2 Data Sample

In line with previous studies, we obtained data on the relevant stock splits by using the Center for Research in Security Prices (CRSP) and its database of stock events and distributions. This initial query left us with a sample of 640 splits. After limiting each company to several criteria, removing all delisted companies and any observation with missing values for either announcement date, returns or degree of institutional ownership, we were down to 132 observations. The rationales behind the reduction are threefold; 1) confine the sample to stock splits, 2) mitigate bias in the event study, and 3) remove incomplete observations.

Description	**Reduction**	**Sample Size**
Stock split in relevant period	-	694
Companies delisted during relevant period	242	452
No available data	108	344
Missing values	212	132
Final sample	-	132

Table 1 *- Sample Construction. The table shows the starting and ending point of our data collection, as well as the necessary reductions carried out to obtain a complete dataset. All companies delisted for any reason (for example due to bankruptcy or mergers) were removed. Further, we removed any observation where data could not be found, as well as any observation containing missing values, i.e for share prices, split dates etc.*

We searched exclusively for splits with a distribution code of 5523, a share code of 11 and a split factor of one or higher. These criteria are specified and further explained in a table 3 below. Despite a spike in 2014, the number of stock splits have been relatively stable during our period of research, averaging 18.86 stock splits per year. Figure x shows the distribution of stock splits across the years in our sample. Further, the split factor is the number of additional shares issued per existing share. For example, a split factor of one means a two-for-one split, i.e., investors receive one additional share for every current share they hold. Previous studies have shown the importance of this variable, and in our final sample the spread varies from two-for one to nine-for-one, averaging 1.29-for-1. In fact, our final sample shows 82 % of the splits are two-for one, in line with previous research.

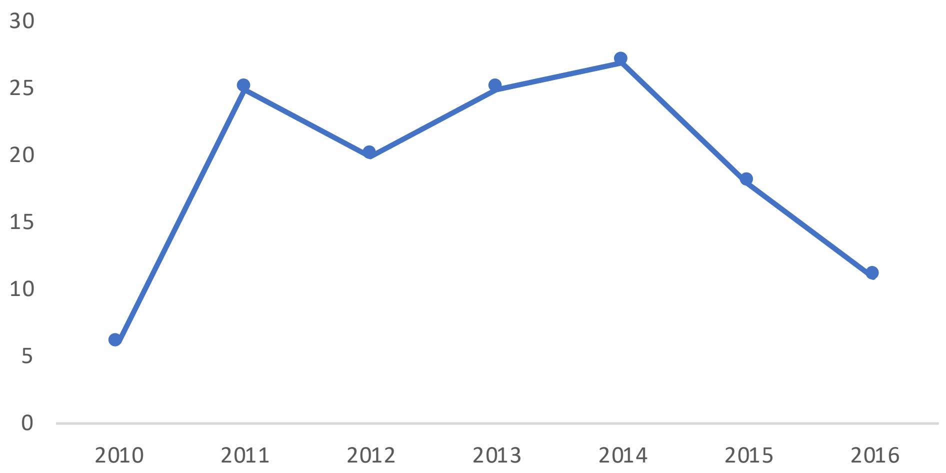

Figure 1 *- Time Series: Splits by Year. Illustration of the number of splits in our final dataset by year*

Year	Number of splits
2010	*6*
2011	*25*
2012	*20*
2013	*25*
2014	*27*
2015	*18*
2016	*11*
Sum	*132*

Table 2 *- Splits by Year. Number of included splits in our dataset by year*

As shown by both the table and the figure, the majority of the splits in our final dataset occurred in 2014. Just why this is the case is hard to pinpoint, but a factor is certainly that the S&P 500 index just came off a 30% year in 2013 and continued to climb roughly 11.4% through 2014 (Irwin, 2015). More specifically, 2014 was a year where interest rates were decreasing and the dollar appreciated greatly. These observations are in line with one of the most common explanations for splits; that they follow periods of a rapid rise in a company's share price. Of the years included, the fewest splits were carried out in 2010. A logical reason for this is simply that the further one rolls back the time, the more likely it is that various events that lead to removal have happened, typically delisting, mergers, acquisitions or similar events. It can also be noted that 2010 followed the financial crisis of 2008-2009, meaning that few companies were likely to have experienced sustained periods of sharp rises in share price leading up to 2010.

The focus area of our thesis lies in the composition of ownership - institutional or retail. Through the use of both a Bloomberg- and an EIKON-terminal we were able to find the change in institutional ownership after a split was carried out for all companies. A decrease in institutional ownership will subsequently mean an increase in retail ownership. We first looked at the percentage change before and after the split date, as that shows to what degree institutions took part in the split itself. We also gathered data on the percentage change around the declaration date, in order to include institutions that took positions as the split was announced.

Criterion	Description
Distribution code of 5523	A distribution code where each digit describes distribution events. First digit is a common digit for splits and stock dividends. The second digit refers to a common stock, while the third digit specifies whether it is a stock split or dividend and distinguish from the first digit. Lastly, the final digit means it is a normal non-taxable stock
Share code of 11	Splitting share is an ordinary common share
Stock split factor of 1 or higher	To clearly differentiate from regular dividends, we include only split with a split factor of 1 or higher

Table 3 – *Criteria specification and description*

4.3 Descriptive Statistics

Variables	Definition
AR	Abnormal return is defined as the return exceeding expected from a particular model.
CAR	Cumulative abnormal return is defined as the sum of daily returns over the period of interest
BHAR	The difference between a τ month buy-and-hold return between a stock and a benchmark portfolio.
∆Institutional Ownership	An increase in institutional ownership for company ι per percent the last available date prior the stock split and
Split factor	The CRSP factor to adjust for shares outstanding, number of additional shares per old share issued.
LnShares Outstanding	The logarithm of the outstanding shares captured on event
LnVolume	The logarithm of the trading volume at event day.

LnMarket Capitalization	The logarithm of the market value of the equity of the splitting firm measured on split execution day. Used as proxy for size.
BV per share	Book Value Per Share is based on fiscal year-end data end represents common equity
Price	Closing price of Bid/Ask average.
Execution Date	The day of stock actual stock split.
Announcement Date	Date the company publicly announces its intention to split its stock.

Table 4 *– Definitions of variables*

Our final sample of companies is greatly varied, and contains giant companies such as Apple, Nike, Coca-Cola and Mastercard. In Table xx we present the sample characteristics for the final sample. Panel A indicates that the average split factor is 1.29, and the average share price is 41.8. Our split factor is slightly above 1, and our Min, Max observations shows that the spread varies from two-for one to nine-for-one, averaging 1.29-for one. The skewed mean is a consequence of the large outliers in our sample in the 99% percentile. In fact, our final sample shows 82 percent of the splits are two-for one, in line with previous research. The average market value is right above USD 17 576 764.5 mill, while the median is right above 5 155 154 USD mill. The volume has a mean of 2 741.7, which we consider as applicable to examine the purpose of this paper.

Turning to Panel B, the average (median) change in institutional ownership is 6.9 (1.3) percent and the minimum change in ownership is 14.8 percent, indicating an increase in retail ownership. This implies that institutions are generally more active during splits than previously. An interpretation of this could be that institutions, who are largely professional, on some level attribute value to stock splits in general.

Finally, Panel C provides the average returns for the companies in our sample. For one month, the average return was just over 1 percent. Over a 3-month period, the average return was 2.6%. More interestingly, perhaps, was the more long-term performance. For 1 and 2 years respectively, the average return was 16.7% and 26.5%. All four periods show positive returns on average, albeit minimal for our first two periods.

		Statistical Properties				
Variable Description	**Mean**	**Median**	**Std. Dev.**	**Min**	**Max**	**Observations**
Panel A: Sample Characteristics						
Split factor	1,2	1,0	0,9	1,0	9,0	132
Splits Per Year	18,8	20,0	7,8	6,0	27,0	132
Price ($)	41,8	39,4	18,8	3,94	115,43	131
Shares Outstanding	320552,8	121475,5	708595,2	4616,0	6029667,0	132
Market Capatalization($)	17 576 764,5	5 155 154,0	542 004 015,0	23 454,82	564 979 797,9	131
Book value Per Share ($)	25,1	21,0	18,9	-0,5	137,3	130
Volume	2 741 789,0	983 146,5	73 468 820,0	2198,0	7,5	132
Panel B: Ownership characteristic (%)						
△ Inst Own	6,9	1,3	30,2	-14,8	267,0	132
Panel C: Return Figures (%)						
Averagere return 1-month	1,0	1,7	9,6	-48,66	27,9	132
Average return 3-month	2,6	3,0	15,6	-56,14	38,13	132
Average return 1-year	16,7	14,6	30,0	-62,6	118,9	132
Average return 2-year	26,5	18,0	47,5	-80,24	159,7	132

Table 5 *- From Panel A split factor is the additional share given for each share held by a shareholder. Price is defined as the closing price of Bid/Ask average on event day in USD. Outstanding shares is the amount of the company's shares on event day. Book Value per share is based on fiscal year-end and represent common equity reported in USD. Volume is the share volume on event day. Market Capatalization is the market value of equity on execution day measured in USD. If values for some reason was unavailable, we substitute in the next trading day. Market capitalization and volume is devided by 1000.*

5. Methodology

The varying conclusions throughout the literature shows that the methodology plays a crucial role and must be carefully designed in order to test the different theories properly. We examine whether the magnitude of ownership structure has a significant impact on the abnormal returns. Second, we test whether the abnormal return varies by adding time period as a new variable.

Our approach regarding computing the split announcement effect is based on declaration day[1] which allows us to best capture the consequences of the event. This line of reasoning is inspired by Apple & Tesla's approximately 4 and 10% gain precisely on execution date. (FN her med link)
Moreover, we use data for subsequent periods adjusted for our specific requirements with respect to the time window. This method, in contrast to the usage of fiscal year, is more appropriate and allows us to measure the impact of stock splits reflected in the share price.

The three studies with seemingly different conclusions, on which we've built much of the foundation for our thesis, have some distinct and quite interesting differences. Otherwise, obviously the results would be identical. We aim to test whether both outcomes can be correct, when we prioritize to use the same variables used in section 3.1.5 (Chemmanur et al. 2015; Lin et al. 2009). Our initial thought points towards both outcomes may be possible, by adjusting the variables. To test our hypotheses, we use an event study methodology approach to observe the effect of a specific event (MacKinlay, 1997), respectively the short and long-run abnormal return with increase in institutional ownership as the main variable.

For the purpose of providing a simple overview of firm performance and returns, we have calculated abnormal returns by subtracting the return on the S&P 500 index from realized return in the corresponding time period in this section. In the more advanced stages of

[1] An alternative method would be to use announcement date as base for compunding the abnormal returns. However, our initial interest was driven by the news of Apple's and Tesla's stock boost om the split day and the following trading days.

statistical testing, we employ the Fama-French 3-factor and the Carhart four-fact model in the calculation of such returns. More on this to follow.

5.1 Event Window

Ideally, the event window should reflect the time the market requires to react to and absorb new information (Kriving et al., 2003). This is easier said than done, unsurprisingly. Market efficiency is often an assumption in the financial markets, even though several studies have contributed evidence that contradicts this assertion, which makes is difficult to determine the proper length of the window. However, our strategy is based on cited literature, which inspired us to divide our research into separate two parts: one short-term analysis and one long-term analysis.

5.1.1 Short-Run Event Window

We calculated the short-term abnormal returns over two holding horizons: 1 month and 3 months, to account for possible deviations between institutional and retail investors. By choosing two periods for our short-term measurement, we will be able to gain deeper insight into the short-term effect changes in ownership has on returns following splits.

5.1.2 Long-Run Event Window

Over time, new information is likely to influence stock prices, implying that initial market reaction might be biased (De Bondt & Thaler, 1990; Bernard & Thomas, 1989; Daniel et al., 1998). The more one expands the time horizon, the more “noise” will be included in the results. Unrelated events can potentially contaminate the effects of the event of interest, and to isolate the effects is a difficult task.

To investigate the effects of stock split in the long run, we examine the stock performance 1- and 2-year post-split utilizing a broad spectrum of analytical tools. Again, by including two periods we hope to make our findings more credible. Whether or not 1 year is to be considered long-term is highly debatable, therefore it seemed appropriate to include an additional 2-year measure. If we were to further extend the time period, we would have to reduce the final sample accordingly, which we deemed unfortunate. That would also allow for even more noise to be included in our results.

5.2 Estimating Normal Returns

Despite decades of research, the main drivers behind stock returns continues to be debated among academics. Up to 300 different variables has been proclaimed to deliberately explain stock return, which complicates the development and usage of any single estimation model. Fama (1998) claimed that all the pricing models partly fails to describe expected returns. While short-term stock returns are minimal, long-term abnormal returns are vulnerable to the variables used in the model as small errors accumulate over time. The same year as Fama claimed the partly failure of pricing models, Binder (1998) stated that model misspecification is a result of either omitted variables of the inclusion of irrelevant factors.

There are several economic and statistical models to determine normal return of a stock. Within the statistical models, the three most popular are the market model, multifactor models, and the constant mean return model, which are all based on statistical assumption and empirical evidence (MacKinlay 1997). Contrarily, economic models such as the Capital Pricing Model (CAPM) are based on economic theories. Through the next subsections, we propose a range of methods to calculate the expected rate of return, an input that plays an essential role in conducting empirical research on the matter at hand.

5.2.1 Constant-Mean Return Model

The model assumes that the expected return of a stock equals the average historical return. The equation (1) shows the mean return of stock X at time t is expressed as R_{it},. Despite the uncomplicated structure, Brown and Warner (1995) claims that it yields the same outcome as more advanced models.

$$E(R_{it)} = \bar{R}_{it} + e_{it}$$
$$e_{it} \sim N(0, \sigma^2{}_{e,i}) \quad (1)$$

There are obvious limitations by estimating expected returns in such a manner, exemplified by considering a growth-company. If said firm carries out innovations and expands its product line, the return will likely be higher in the future. This would imply that for splitting companies, who typically do so after a period of rapid growth, historic average returns would be a poor measure.

5.2.2 Market Model

The market model assumes a linear relationship between the market and the stock return, lanced as a potential improvement of the constant-mean return MacKinlay (1997).
Know through econometrics, the explanatory power increases by adding more factors, which in turn reduces the variation and thus makes the model more capable of measuring abnormal returns. The model is presented in equation (2)

$$E(R_{it}) = \alpha_i + \beta_i R_{mt} + e_{it}$$
$$e_{it} \sim N(0, \sigma^2{}_{e,i}) \quad (2)$$

R in equation (2) represent the return of the market portfolio, e captures unsystematic risk related to each security and the constant B is the slope of the regression which correspond to the beta of the stock. The intercept a and coefficient B is estimated by regressing he security's return on the markets return.

5.2.3 Market Adjusted Return

The market adjusted return is a simplification of the market model with the intercept alpha equal to zero and the constant B equal to one across all securities. Thus, the expected return is equal to the market return that fluctuates over time, but remains constant across securities. The general formula for the market adjusted return model is expressed in equation (3)

$$E(R_{it}) = R_{mt} + e_{it} \qquad (3)$$
$$e_{it} \sim N(0, \sigma^2{}_{e,i})$$

5.2.4 Capital Asset Pricing model

The Capital Asset Pricing model is widely used throughout finance and was first brought forth by Sharpe (1964) and Lintner (1965), inspired by Markowitz' (1952) portfolio theory. The model uses portfolio theory to determine whether or not a security is fairly valued and provides a useful measure to investors aiming to calculate what return they can consider as acceptable on an investment. In equilibrium, the model assumes that a stock which diverge from its equilibrium price, will by market mechanisms eventually drift back.

Despite the theoretical aspects of the model are justified, there are several assumptions behind the CAPM formula that have been criticized and failed to hold in reality, due to violating basic market functionalities.[2]

$$E(R_{it}) = r_f + \beta_i\left[E(r_{m)} - r_f\right] + e_{it} \tag{4}$$

According to equation (4), the expected return of security i is given by the return an investor can achieve with certainty, i.e the risk-free rate which typically is a 10-year government bond yield. Next, the market risk premium is added as a compensation for the extra risk arising from investing in a stock, multiplied by the systematic risk associated with the stock, B. Since unsystematic risk can be diversified away by holding a well-diversified portfolio, the only way to attain higher returns is by taking on additional systematic risk. [3]. The beta-value of an individual stock is found by dividing the covariance between the stock's return and the market return on variance of the market.

5.2.5 Factor Models

The three-factor pricing model made by Fama and French (1993) is an extension of the traditional CAPM, and it constitutes a new model by adding risk for value and size. The model explains stock returns by three risk factors: market risk factor (market return minus risk-free rate), size factor (small minus big, SMB) and book-to-market factor (high minus low, HML). Studies show that small capitalization and value stocks outperform comparable stocks, which led Fama and French to include factors that accounted for these differences.

[2] The CAPM has some limitations in real life because most of the assumptions are unrealistic (lack of transaction and taxation cost, information asymmetries, etc)
[3] Interest rates, wars and recessions are examples of systematic risk.

$$E(R_{it}) = r_f + \beta_i\left[(Er_m) - r_f\right] + b_i SMB_t + b_i HML_t + b_i MOM + e_{it} \qquad (5)$$

SMB, HML and MOM added as additional risk-factors represents three zero-investment portfolios. The first added risk-factor, SMB explains the part of the excess return which compensates for the risk caused by investing in small capitalization firms. It consists of a long position in small capitalization stock financed by a short position in a large market capitalization firm. HML explains part of the excess return which compensates for the risk caused by investing in value firms, and consist of a long position in a high book-to-market stock financed by a short position in a low BM stock.

The coefficients are estimated by regressing the excess return of security I on factors expressed on the right-hand side of the equation. Since the introduction of the three-factor model, additional factors have been added to form new models, such as Carhart's (1997) momentum factor. Furthermore, McKinlay (1997) stated that there are small gains from using a multifactor model compared to the simple market model in short term studies.

5.3 Measuring Abnormal Returns

In general, two different methods are regularly used to calculate abnormal returns; the cumulative abnormal return (CAR) and buy-and-hold abnormal return (BHAR). The mathematical expressions are shown in equation (6) and (7) respectively.

$$AR_{it} = R_{it} - E(R_{it}) \qquad (6)$$

These different methods can produce mismatching inferences, as highlighted in several research papers. The main difference between CAR and BHAR: arithmetic versus geometric sums. CAR utilize arithmetic returns, whereas BHAR are compounded through the employment of geometric returns. In summary, the statistical differences may disrupt the associated test statistics and thus the results. The following subsections go into further detail on the usage of the two methods.

5.3.1 Cumulative Abnormal Returns

Cumulative abnormal return (CAR) is defined as the sum of all abnormal returns over the event window. CARs are normally calculated over a short time period, as evidence from Ritter (1991), Barber and Lyon (1997) claimed that CARs were in conflict with economic grounds, and hence are biased predictors of long-run returns. Later on, several biases, such as new listing bias and skewness bias have been added, where the skewness bias is less prominent for CARs than BHARs. Nevertheless, Fama (1998) claimed that CARs had an advantage compared to BHARs in terms of statistical measures as well as being skeptical about the compounding of the systematic errors.

$$CAR_{i(\tau,T_3)} = \sum_{t=\tau}^{T_3} AR_{it} \tag{7}$$

In this paper, we use CAR for obtaining abnormal returns for our short-term periods of 1- and 3-months, respectively.

5.3.2 Buy-and-Hold Abnormal Returns

Buy-and-hold abnormal returns can be calculated as the average return from buying and holding a portfolio throughout the event window, denoted in equation (9). Due to the compounding effect and use of geometric calculations, BHARs are more suitable for estimating long run performance as they are better able to capture investors experience (Barber & Lyon, 1997). Unfortunately, difficulties may occur when studying long-term performance. An underperformance from a newly listed firm creates a positively skewed abnormal return, namely the new listing bias (Ritter, 1991; Barber & Lyon, 1997).

Consequently, the test statistics and related results are inaccurate. Next, abnormal returns are positively skewed, particularly long-term. The skewness bias is alleviated by using a single control-firm, but is significant when a reference portfolio is used. The last bias, also put forth by Barber and Lyon, is the rebalancing bias. This relates to the rebalancing strategy of an equally weighted matching portfolio.

$$BHAR_{i,(\tau,\mathrm{T}_3)} = \prod_{t=\tau}^{\mathrm{T}_3}(1 + R_{it}) - \prod_{t=\tau}^{\mathrm{T}_3}(1 + E[R_{it}]) \tag{7}$$

However, the compounding of systematic errors raises concerns, and Fama (1998) claimed that the BHAR disregards the overstated test statistics caused by cross-sectional relationship of abnormal returns. Later on, Mitchell and Stafford (2000) suggested to avoid BHAR when calculating statistical inference. This is particularly a problem when the test statistics are unadjusted for positive cross-correlations.

To sum up, Barber and Lyon favors BHAR, but similar to Ritter (1991) they find advantages utilizing both methods. When obtaining the values for long-term abnormal returns in this thesis, we utilize BHAR.

5.3.3 Cross-Sectional Analysis

Cross-sectional analysis might be of interest when several sources are applicable to explain abnormal returns (MacKinlay, 1997). The procedure involves running a regression of abnormal returns on variables specified prior to the regression. By taking a step back and seeking explanations behind the main driver, MacKinlay argued that the cross-sectional method can strengthen the knowledge of the main variables, and thus make the output more precise.

$$CAR_i + \delta_1 x_{li} + \delta_2 x_{2i} + \cdots + \delta_M x_M + e_{it} \tag{8}$$

Where CAR is the cumulative abnormal return of firm i, and xii denotes firm specific characteristic L. On the one hand the method can add additional insight, which is to be considered a positive thing, but on the other hand, the method is disputed as the explanatory power in most cases never manage to exceed ten percent (Eckbo et al., 2000). Furthermore, there might be a correlation between the variables on both sides of equation (10), which is undesirable.

Due to the missing explanatory variable, i.e the expectation of the market of the managers' private information, it makes the model vulnerable to the omitted variable bias (Scruggs, 2005). Whether the linear estimators are inconsistent or not, is discussed by Eckbo et al. (1990). They concluded that when the issuer selects the event date, the estimator becomes inconsistent. However, the studies are to some extent divided and for most of the research the magnitude of self-selection bias remains unfamiliar.

5.3.4 Significance Testing

Literature distinguishes between parametric and nonparametric tests to assess the statistical significance of the findings. To do so, we calculate the t-test (parametric) by dividing the coefficient by the standard error of the variable (Helbæk, 2011). The presumption of the normal distribution is held by using a parametric test. This is not the case for a nonparametric test (MacKinlay, 1997) In addition, some researches argue that parametric have a higher power in addition to being well-specified compared to nonparametric ones (Brown & Warner, 1985). We report significant values for the independent variables for the 0.1(*), 0.05(**) and 0.01(***) levels using t-distribution. The results are calculated with a statistical program and summary functions to report tests of statistical significance.

6. Empirical Results and Findings

We now advance to the more investigative portion of the thesis, where we will dissect our dataset and perform various tests to detect significant relationships. The introductory stage of the chapter will be dedicated to calculating and comparing abnormal returns for our sample, before moving on to regression analysis.

The main focus in these assessments is on the variable of interest; change in institutional ownership. Therefore, for the continued discussion and testing of our dataset, we consider our sample to consist of two subgroups; splits with increased and decreased institutional ownership. We initiate this by first presenting the calculated abnormal returns for our four time periods, and the mean differences between the two groups, and how the findings relate to our stated hypotheses. This constitutes section 6.1.

Further, we conduct statistical testing on our data to establish the significance of our findings. We split this up into four subsections, one for each time period. Together, they make up section 6.2, 6.3 and 6.4. The chapter reaches its end with section 6.5 and 6.6, where we conduct additional testing to investigate the robustness of our findings, and discuss the limitations of our research.

6.1 Calculated Abnormal Returns

We showed in chapter 4 that on average, our dataset of splitting companies achieved seemingly solid returns, and that companies with an increase in retail ownership achieved higher returns for the first three time periods. Subsequently, splitting companies with an increase in institutional ownership documented higher returns in the 2-year period. However, simple returns are not what we are interested in, as that can be contaminated by a variety of events occurring in the respective environment.

The previous chapter detailed the methods used to calculate abnormal returns. This section provides the results of said methods. For the 1- and 3-month periods we used cumulative abnormal returns (CAR) and for the longer term we used buy-and-hold abnormal returns (BAHR). Furthermore, we utilized the CAPM, Fama-French 3-factor model and finally Carhart fort factor. The findings will be presented chronologically in the following sections.

6.1.1 Short-Term Abnormal Returns

Ownership	CAPM		FF-3		CARHART-4	
	1-Month	3-Month	1-Month	3-Month	1-Month	3-Month
Increased Institutional Ownership	0.29	-0.09	0.5	0.9	-0.5	-0.6
Increased Retail Ownership	-1.54	2.66	-0.2	2.2	0.5	2.2
Difference	1.83	-2.75	0.7	-1.3	-1	-2.8

Table 6 *– Short-Term Abnormal Returns by Model. Abnormal returns are found for the two groups by subtracting the model-estimates from realized return for the corresponding time period. The bottom row highlights the differences.*

Presented above are the realized short-term abnormal returns for the two groups, using all three estimation models. The bottom row highlights the corresponding difference between abnormal returns on splits with increased institutional ownership and splits with increased retail ownership. A negative difference would be in support of our first hypothesis; that short-term increased retail ownership yields higher abnormal returns for splitting companies. Contrarily, a positive difference is inconsistent with our hypothesis.

We observe that when using the CAPM and the Fama-French 3-factor model, the 1-month difference is positive while the 3-month difference is negative. Interestingly, the abnormal 1-month returns of splits with increased institutional ownership are positive and negative for increased retail ownership. When the momentum-factor is added, both mean differences are negative. Now, increased institutional ownership is associated with negative abnormal returns, while increased retail ownership achieves positive abnormal returns.

Overall, we consider this to be supportive of our hypothesis. We have established that for our sample, on average, increased retail ownership is desirable in terms of abnormal returns relative to increased institutional ownership.

6.1.2 Long-Term Abnormal Returns

Ownership	**CAPM**		**FF-3**		**CARHART-4**	
	1-Month	**3-Month**	**1-Month**	**3-Month**	**1-Month**	**3-Month**
Increased Institutional Ownership	7	9.2	5.2	4.3	1.4	-3.7
Increased Retail Ownership	6.7	2.7	6.6	1.5	2.6	-7.2
Difference	0.3	6.5	-1.4	2.8	-1.2	3.5

Table 7. *Long-Term Abnormal Returns by Model. Abnormal returns are calculated for the two groups by subtracting the model-estimates from realized return for the corresponding time period. The bottom row highlights the differences.*

The mean abnormal returns for the two groups are summarized in the table above. Again, the table contains all three models. For the long-term, we expected to see a positive difference for both periods, indicating that on average, splits with increased institutional ownership outperform those with a decrease. We see that when using the CAPM, this is accurate. The 1-year difference is minimal, but positive. For the 2-year period it is quite substantial.

The Fama-French models now yield a negative difference for the first year. Although not in line with our previous reasoning, it can be argued that a year is too short of a period to be considered long-term. Therefore, it is more interesting to observe the positive 2-year difference, which is present in both models. We find it notable that when adding the momentum-factor, both groups deliver negative abnormal returns over a 2-year period.

In total, the positive difference in abnormal returns between increased institutional ownership and increased retail ownership for a 2-year period is supportive of our second hypothesis. Our dataset shows, on average, that splits with an increase in institutional ownership outperform those with an increase in retail ownership.

6.2 Regressions

Having already established some support for our hypotheses, we now assess its significance on a statistical level. We do so by carrying out regressions on the effect of institutional ownership on returns, including several control variables. By adding control variables, we hope to improve the explanatory power of our testing. In other words, we attempt to assign as much of the achieved returns to the different factors as possible.

In addition to using the input from the CAPM, Fama-French 3-factor model and Carhart four-factor model, we include control variables such as price, volume, shares outstanding, book value per share and split factor. We are of the opinion that this forms a sound empirical basis to draw conclusions from. The variables used are summarized and further explained in chapter 4. All regressions are conducted in Stata.

6.3 Testing the Short-Term Effects of Stock Splits

Initially, we carry out the regression on the 1-and 3-month returns in a test of our first hypothesis. Our rationale would suggest a negative coefficient for the variable containing change in institutional ownership, pointing towards an increase in retail ownership yielding better returns in the short term. We would expect this relationship to be present for one or both of our short-term periods in order to gain support.

6.3.1 Short-Term Abnormal Returns

Models 1-4 show the results when examining the 1-month period, while models 5-8 show the 3-month period. The results in the models show a marginally positive coefficient, suggesting that an increase in institutional ownership has a positive effect on 1-month abnormal returns. This is contrary to our previous argumentation, as well as to the averages computed from our dataset. However, change in institutional ownership is insignificant in all the models and therefore not suited to draw conclusions from.

More interesting, however, is the coefficients when using the 3-month period. Here we document statistically significant negative coefficients when using all models and control variables. This is in line with our first hypothesis; that in the short-run, an increase in retail ownership will yield superior abnormal returns relative to an increase in institutional ownership. It is also supportive of the findings of Cui et al. (2020). Further, it is noticeable that the coefficient for the 3-month period is significantly positive for all but the last model where we incorporate all control variables. This is a documentation of short-term abnormal returns following splits, that cannot be explained by the 4-factor model. The constant is positive across the board for the 1-month period as well, although not significant.

	1-Month				3-Month			
	1	2	3	4	1	2	3	4
△ Inst Own	0,016	0,017	0,016	- 0,004	-0,179***	-0,183***	-0,184***	-0,151***
	(0,60)	(0,63)	(0,58)	(-0,13)	(- 4,36)	(-4,41)	(-4,39)	(-2,89)
Mkt-rf	0,397*	0,127	0,137	0,070	0,660***	0,282	0,292	0,259
	(1,73)	-0,48	(0,51)	(0,24)	(3,29)	(0,99)	(1,01)	(0,87)
SMB		0,869**	0,084*	0,832*		0,609	0,580	0,628
		(2,02)	(1,90)	(1,77)		(1,25)	(1,15)	(1,20)
HML		0,224	0,264	0,324		0,788**	0,828**	0,794*
		(0,52)	(0,56)	(0,68)		(2,12)	(2,01)	(1,83)
MOM			0,074	0,086			0,068	-0,027
			(0,23)	(0,26)			(0,23)	(-0,09)
Price				- 0,112				-0,066
				(- 0,87)				(-0,35)
LnVolume				0,921				0,886
				(0,88)				(-0,58)
LnShares Outstanding				-1,634				-1,982
				(-0,29)				(-0,24)
LnMarket Capatalization				0,198				2,640
				(0,04)				(0,34)
Book Value per share				0,038				0,111
				(0,65)				(1,28)
Split factor				-0,179				-2,261
				(-0,16)				(0,07)
Constant	0,573	0,627	0,617	8,329	2,356*	4,053***	3,988**	1,641
	(0,65)	(0,71)	(0,69)	(0,56)	(1,74)	(2,60)	(2,51)	(0,07)
Observations	132	132	132	129	132	132	132	129
R2	0,025	0,056	0,056	0,106	0,184	0,215	0,215	0,243
Adjusted R2	0,01	0,026	0,019	0,022	0,175	0,190	0,184	0,172

Table 8. *Short-run returns regressed on change in institutional ownership and control variables post-split. CAPM, FF3F and Carhart 4-factor model are used. The number in parantheses are t-statistics. Significance levels of 1%, 5% and 10% are denoted ***, ** and *, respectively*

Mkt-rf is as could be expected positive and significant, but more surprisingly only in model 1 and 5, while insignificant in the remaining models. The coefficients are positive and when significant, between the expected levels. Nonetheless, due to the lack of significant results for all the models, we cannot conclude.

LnSize is included as a proxy for firm size and is expected to be positive. In the present case, the coefficients are positive, but insignificant in both model 4 and 8. At the same time, the coefficient for SMB is significant and positive, implying a positive relationship between small companies and returns.

Split factor is included to examine whether the abnormal return will increase with the split factor, where the information production theory implies that the information advantage of institutional investors will be greater for splitting firms with a higher split factor. In fact, we find that the coefficient is negative, which means that a higher split factor reduces the abnormal return. Unfortunately, the relationship is not statistically significant in a manner that allows us to firmly conclude in any way.

6.3.2 Short-Term Analysis Summary

Overall, our short-term findings for the 1- and 3-month period are supportive of our first hypothesis. We have shown a statistically significant negative relationship between increased institutional ownership and 3-month returns for our dataset. The 1-month results were inconclusive, but when including all factors and control variables the coefficient for change in institutional ownership is negative. The interpretation is that an increase in retail ownership following splits yield better returns than a similar increase in institutional ownership. Our theory is that the optimism and behavioral bias of retail investors are more prominent than the rationality of institutional investors, at least in the short-run.

6.4 Testing Long-Run Effects of Stock Split

Secondly, we now aim to examine the statistical significance of change in institutional ownership on returns in the long-run, measured on a 1-year and 2-year time period. Having found encouraging results in the short-run, we are curious to see if our predicted reversion will take place as we extend the time period. Once again, our hypothesis is that increased institutional ownership yields additional abnormal returns. Therefore, a positive and statistically significant coefficient for change in institutional ownership would be supportive of our prediction, and vice versa. We are mostly interested in the results for the 2-year period, as that gives the market additional time to adapt and adjust to any irrationalities or irregularities.

6.4.1 Buy-and-Hold Abnormal Returns

Below are the results of regressing returns on CAPM, FF3F, Carhart 4f and the aforementioned control variables.

	1-Year				2-Year			
	1	2	3	4	1	2	3	4
△ Inst Own	-0,206***	-0,203***	-0,205***	-0,264***	-0,033***	-0,337***	-0,363***	-0,569***
	(-2,65)	(-2,55)	(- 2,60)	(-2,68)	(-2,52)	(-2,51)	(-2,72)	(-3,54)
Mkt-rf	1,384***	1,429***	1,518***	1,500***	1,000***	1,031**	0,765	0,785
	(5,22)	(3,94)	(4,17)	(3,98)	(2,84)	(2,04)	(1,47)	(1,49)
SMB		0,098	0,139	0,332		-0,235	0,437	0,300
		(0,16)	(0,23)	(0,53)		(-0,26)	(0,45)	(0,31)
HML		-0,179	0,163	0,220		0,082	1,001	0,895
		(0,48)	(0,40)	(0,51)		(0,16)	(1,43)	(1,29)
MOM			*0,639**	*0,804***			*1,132***	*1,508***
			-1.68	*(2,06)*			*(1,93)*	*(2,21)*
Price				*-0,237*				*0,340*
				(-0,64)				*(0,55)*
LnVolume				*0,596*				*3,856*
				(0,20)				*(0,83)*
LnShares Outstanding				*1,926*				*33,572*
				(0,12)				*(1,27)*
LnMarket Capatalization				*-2,320*				*-34,586*
				(-0,15)				*(1,37)*
Book Value per share				*-0,042*				*-0,219*
				(-0,25)				*(-0,82)*
Split factor				*(0,94)*				*-1,072*
								(-0,21)
Constant	*-0,883*	*-1.581*	*-4,826*	*7,397*	*2,498*	*1,341*	*0,067*	*76,196*
	(-0,20)	*(-0,26)*	*(0,75)*	*(0,18)*	*(0,25)*	*(0,09)*	*(0,00)*	*(1,10)*
Observations	*132*	*132*	*132*	*129*	*132*	*132*	*132*	*129*
	0,204	*0,205*	*0,223*	*0,271*	*0,104*	*0,105*	*0,130*	*0,186*
Adjusted	*0,191*	*0,180*	*0,192*	*0,202*	*0,090*	*0,076*	*0,096*	*0,110*

Table 9 *– Long-run returns regressed on change in institutional ownership and control variables. The number in parantheses are t-statistics. Significance levels of 1%, 5% and 10% are denoted ***, ** and *, respectively*

The regression shows a statistically significant negative relationship between increased institutional ownership and returns for both of our two periods. This is contradictory to what we hypothesized. Even more so, the coefficient is smaller (more negative) for the 2-year period than the 1-year period. From the table it is also clear that the momentum-factor is significantly correlated with the return of the splitting firms. This is in line with previous reasoning and studies, suggesting that splits occur after periods of high growth. The market-factor is significant for all models when looking at the 1-year period, and for the 2-year period when using CAPM and Carthart four-factor model. When utilizing the Carthart four-factor model and the control variables, the results are insignificant, but positive. These are the only variables who are found to be of statistical significance.

6.4.2 Summary of Long-Run Results

Our findings for the long-term periods, 1- and 2-years, is not supportive of our second hypothesis. The coefficients for change in institutional ownership are consistently negative, indicating a negative relationship between degree of institutional ownership and achieved returns. Although the degree of significance is varying, the consensus is rather clear. The fact that the coefficient decreases in size from the 1-year period to the 2-year period strongly suggests that there is no long-term positive relationship between an increase in institutional ownership and returns. Had it only been the 1-year period showing negative coefficients, it could have been argued that the period still is to be considered short-term. This must be considered a rejection of our long-term hypothesis for our dataset.

6.5 Robustness/Additional Testing

To further examine our empirical findings and its significance, we carry out additional testing. We now split the sample into three categories for two variables; firm size measured by market capitalization (share price multiplied by shares outstanding) and the magnitude of the change in institutional ownership. For each variable, we assign the observations into small, medium and large size and change in institutional ownership, respectively. Furthermore, we run the previous regressions using all three aforementioned models and control variables. Splitting an already small sample into even smaller subgroups is unlikely to yield statistically significant results, and introduces more room for error. Still, we are of the opinion that it can contribute further to the existing findings.

6.5.1 Change in Institutional Ownership

The dataset is sorted from largest to lowest increase in institutional ownership and then split into three equally sized groups; small, medium and large. This is of great interest, as the magnitude of the increase, or decrease, in institutional ownership could be directly related to institutions having specific information regarding a company's future performance. Following the rationale of previously reviewed studies, institution's possession of privileged favorable information, or simply a more advanced skillset, should result in a proportionally larger increase in institutional ownership and returns, and vice versa.

The lower third of the sample has the following percentage-change interval: [-14.88, -0.2]. For this group, our hypotheses would suggest higher short-term abnormal returns and lower long-term abnormal returns. We hereby label this group "Panel A".

The middle third of the sample has the following percentage-change interval: [-0.17, 3.57]. The vast majority of observations in this group contains an increase in institutional ownership. This is not surprising, considering the large average increase in institutional ownership. Hereby labelled "Panel B" for further reference.

The upper third of the sample has the following percentage-change interval: [3.66, 267]. This is a substantial spread. For this group, our hypotheses suggest lower short-term abnormal

Panel A	Small △ Inst Own			
	1-Month	3-Month	1-Year	2-Year
△ Inst Own	0,605	1,289	2,538	-0,112
	(0,85)	(1,61)	(1,50)	(-0,04)
Constant	9,550	-10,152	-23,460	63,072
	(0,93)	(0,98)	(-1,01)	(1,55)
Observations	44	44	44	44
R2	0,145	0,260	0,374	0,236
Adjusted R2	-0,113	0,036	0,184	0,005
Panel B	**Medium△ Inst Own**			
△ Inst Own	-0,027	0,215	-4,265	-17,390***
	(-0,03)	(0,10)	(-1,04)	(2,75)
Constant	7,205	7,999	18,690	36,258
	(1,63)	(0,82)	(0,82)	(0,84)
Observations	45	45	45	45
R2	0,376	0,274	0,409	0,424
Adjusted R2	0,181	0,04	0,225	0,244
Panel C	**Large△ Inst Own**			
△ Inst Own	0,007	-0,178***	-0,260**	-0,506**
	(0,16)	(-2,99)	(-2,47)	(-2,59)
Constant	4,235	12,814*	3,435	56,841
	(0,83)	(1,91)	(0,24)	(1,38)
Observations	44	44	44	44
R2	0,314	0,523	0,448	0,374
Adjusted R2	0,060	0,353	0,250	0,151

Table 10 *– Sample separated into small, medium and large increase in institutional ownership and subsequently carried out regression of change in institutional ownership on returns. The number in parantheses are t-statistics. Significance levels of 1%, 5% and 10% are denoted ***, ** and *, respectively*

For the group with the lowest increase in institutional ownership, Panel A, we see positive coefficients for our variable of interest when examining 1-month, 3-month and 1-year. For the last period, it is negative. The constant, however, is positive for the 2-year measure. Neither of the coefficients are statistically significant, and thus makes it inexpedient to strongly emphasize the results, although they are peculiar.

For Panel B, all coefficients for increase in institutional ownership are negative, with the exception of the 3-month period. The 2-year coefficient is highly negative, and is statistically significant. This further underlines the previous findings, and is in direct contradiction to our second original hypothesis. Now, the constant for all periods is positive, although not in a significant manner.

Panel C yields three significant coefficients for our variable of interest, all negative. This further cements the findings of our previous regressions, and is surprising with the regard to what we hypothesized. An increase in institutional ownership has a negative causal effect on returns for time periods of 3 months, 1 year and 2 years. It is also interesting to note that the 3-month constant is significantly positive.

In summary, the results from this subcategorization have not yielded any results contradicting the earlier regressions. There is a lack of statistical significance, which is to be expected when employing such a small sample. This is likely also the reason for the large variations in coefficients. If anything, the credibility of our initial regressions is strengthened.

6.5.2 Market Capitalization

Similarly, the sample is now sorted by market capitalization, found by multiplying post-split share price and post-split number of shares outstanding, and then split into three equally sized groups. Moreover, we run regressions on all three groups using all models and variables. By conducting these additional tests, the aim is to identify any significant difference stemming from the varying size of the firms. This is highly relevant, as firm size has been suggested in several of the referenced studies to have a clear impact on splits and the subsequent performance. We found in previous sections that small companies provide significant abnormal returns for a 1-month period, indicating the opposite for large companies.

The lower third of our dataset has the following market capitalization interval, in thousands: [23 455, 2 387 514]. Here we find the smallest companies. From here on referred to as "Panel A".

The middle third of our dataset has the following market capitalization interval, in thousand: [2 475 929, 7 442 265]. Hereby referenced as "Panel B".

The upper third of our dataset has the following market capitalization interval, in thousands: [7 516 562, 564 979 798]. This is by far the largest spread of the sample. Unsurprisingly, the largest company measured by market capitalization, is Apple, which is more than three times as big as number two on the list, Coca-Cola. This group is now labelled "Panel C".

The results were as follows:

Panel A	Small Cap			
	1-Month	3-Month	1-Year	2-Year
△ Inst Own	0,090**	- 0,246**	- 0,475**	- 0,714**
	(2,19)	(-2,60)	(-2,59)	(-2,55)
Constant	(-8,479)	(-3,787)	-15,230	63,247
	(-1,72)	(-0,34)	(0,67)	(1,63)
Observations	42	42	42	42
R2	0,454	0,384	0,360	0,310
Adjusted R2	0,277	0,185	0,153	0,088
Panel B	**Mid Cap**			
△ Inst Own	-0,099	-0,077	-0,047	-0,300
	(-1,20)	(-0,82)	(-0,27)	(-0,96)
Constant	13,867	-18,055	-17,038	26,767
	(1,06)	(-1,23)	(-0,53)	(0,45)
Observations	45	45	45	45
R2	0,322	0,429	0.361	0,392
Adjusted	0,122	0,261	0,173	0,213
Panel C	**Large Cap**			
△ Inst Own	0,054	-0,036	0,720	1,549
	(0,20)	(-0,07)	(0,83)	(1,00)
Constant	5,565	6,791	-6,021	(-1,943)
	(1,44)	(0,84)	(-0,36)	(0,05)
Observations	42	42	42	42
R2	0,232	0,17	0,35	0,210
Adjusted R2	-0,014	-0,085	0,141	-0,043

Table 11 *– Sample split into small, medium and large market capitalization. Regressed returns on change in institutional ownership. The number in parantheses are t-statistics. Significance levels of 1%, 5% and 10% are denoted ***, ** and *, respectively*

In line with the previous findings, small cap firms provide significant abnormal return in all models. Consequently, a positive change in institutional ownership has a significant effect on abnormal return when calculating for a 1-month period with a coefficient of 0.09 (significant at the 5%-level). According to our findings for 3, 12, and 24 months, respectively, the effect of an increase in institutional ownership yields negative abnormal return. For instance, the coefficient for a small cap firm, measuring for 24-months is –0.714, and is significant at the 5% level.

The two remaining panels, B and C, return no significant results and thus make no grounds for conclusions. The medium-sized group attains negative coefficients for all time periods, while the large group is positive for all periods but 3 months. A significant positive coefficient here would be very interesting, as this is the category Apple and Tesla, who inspired this study, belong to.

In total, we discovered nothing that discredits our preliminary conclusions by splitting the observations by market capitalization. We did observe a statistically significant positive coefficient for the 1-month period for small companies, but it is not enough to fundamentally alter the regressions already carried out.

6.6 Limitations

There are several limitations and possible sources of error in this study, as with all others, despite our best effort to limit them. Combined, they might explain the absence of statistically significant findings. We have already mentioned and acknowledged that our final dataset is small, which could be a source of inaccuracy. There was a trade-off between wanting very recent and complete data versus having a larger sample selection. We have chosen the former rather than the latter, and are of the opinion that this is favorable due to the constantly changing economic and financial environment.

Further, we have not gathered data on changes in ownership from before the announcement date to right after, which could capture different actors positioning themselves prior to a split. Again, this was a conscious decision made in order to best assess the split itself. The starting point and inspiration for the thesis was the sensational returns of Apple and Tesla achieved at the split-date and following trading days. Thus, we found it appropriate to collect data related to the split-date rather than the announcement-date.

Yet another aspect is the lack of distinction between active and passive institutional investors, mentioned in the introductory stages of the paper. This could have an impact on our findings. We know that different entities have different mandates, processes and decision-making criteria that will yield varying investing behavior and results. One could argue that a more active institution could have access to more information, in addition to possessing superior trading-skill relative to the more passive institution. Further, an active institution is more likely to act on said information, should it possess it.

Naturally, it would be interesting to have data on further sub-categories within institutional investors. Our rationale, however, is that the separation into the two groups captures enough of the essence we are interested in. We have grounds, as shown by the before-mentioned studies, to say that institutional investors in general, without further distinction, are more professional, have better access to privileged information, are more skilled and suffer from less bias than retail investors. It can also be added that while this distinction is popular in recent research, it has not been conducted in relation to the topic of stock splits – at least not to our knowledge. Inherently, then, the separation of institutional and retail investors should be significant enough to draw conclusions from.

In spite of the mentioned limitations, and any others that may exist, we feel that our work contributes to the existing literature in a way that warrants further study.

7. Conclusions and Final Remarks

We set out to test the following two hypotheses:

1. Increased retail ownership following splits will yield higher positive abnormal returns in the short-run, relative to splits with an increase in institutional ownership
2. Increased institutional ownership following splits will yield higher positive abnormal returns in the long-run, relative to splits with an increase in retail ownership

Through the use of abnormal return calculation, comparison of simple averages and statistical testing we found mixed support for our theories. For the 3-month period we found a significant negative relationship between increase in institutional ownership and subsequent returns. In addition, we calculated an average negative difference in abnormal returns between increased institutional ownership and increased retail ownership for all three models used in this thesis. For the 1-month period, we did not find any significant relationship in either direction, although the coefficient was negative when adding all factors and control variables. Considering that we found little support when employing the 1-month period, we cannot fully accept our first hypothesis, but we did prove the hypothesized relationship for a 3-month post-split period.

The results related to our second hypothesis was even more ambiguous. Initially, we presented a positive mean difference in abnormal returns between increased institutional ownership and increased retail ownership, for the 2-year period. This was consistent across all models. The 1-year period, however, was negative when using both of the Fama-French models. Surprisingly, the statistical testing determined a significant negative relationship between increased institutional ownership and returns, across all models for both time periods. This means that for our sample, we reject our long-term hypothesis.

Overall, our findings are more in line with the behavioral explanation proposed by Cui et al. (2020), but not definite. From our findings and our dataset, it seems that an increase in retail ownership following splits is favorable in terms of future returns, no matter the time horizon. Extending this further, it could be interpreted in a way that is supportive of the notion that behavioral bias is what drives the market reactions to stock splits. The rationale we built our second hypothesis on found little to no support through our testing, and several implications can be drawn and pondered from this. Perhaps institutions don’t possess privileged information or superior skills, relative to individual investors? Or at least not institutions in general? Maybe there is no information asymmetry stemming from brokerages and their commissions and such? These are all interesting trains of thoughts arising from our findings.

There is no doubt that stock splits and abnormal returns will continue to be investigated for years to come. Due to the fact that the two main categories of explanations, signaling and optimal trading range, continue to find new empirical backing, the likelihood that researchers will agree upon one single theory is unlikely just yet. Nonetheless, the authors of this thesis hope to see a continuation of the focus dedicated to the composition of ownership as of late. We interpret our findings to further contribute to the rationale that the degree of retail- and institutional ownership play an important role in determining the return achieved by firms, both in the short– and long-run.

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