Open your mind. LUT.
Lappeenranta University of Technology

LAPPEENRANTA UNIVERSITY OF TECHNOLOGY
School of Business
Department of Accounting

Effects of stock splits on stock returns: An event study of Finnish companies

(Osakkeen nimellisarvon jakamisen vaikutus osakkeiden tuottoihin: Tutkimus suomalaisista yrityksistä)

8.5.2010

Written by: Mikko Reinikainen 0315134
Opponent: Jukka-Pekka Hämäläinen
Instructor: Timo Alho

Lappeenranta – 2010

Table of Contents

1. Introduction

1.1 Why to study stock splits?

Stock splits are simple corporate actions, which managers of public listed companies execute in order to change the number of shares outstanding. The usual split is a 2 for 1 increase, which means that the amount of shares is doubled and the share price reduced by 50% so that the total market value of the stock remains the same. Stock splits are usually issued in order to improve the liquidity of the stock.

From the mathematical point of view, the invested capital is simply spread over larger number of stocks and there is no additional cash inflow generated. From this view-point, the stock splits are just simple paper transactions with high administrative costs and no effects on the company's future earnings.

In recent studies, stock splits have been surprisingly associated with a positive price reaction on the announcement date, which would imply that the announcements of the splits are actually carrying financially relevant information about the company's performance.

Baker & Gallagher (1980) interviewed 100 chief financial officers of firms listed in NYSE and their primary justification of the stock splits was to achieve better trading range in order to attract more investors. The theory simply argues that low trading price attracts more investors, therefore reducing trading costs and increasing the trading volume of the stock.

Two popular theories have been developed in the financial literature to explain why the stocks behave this way. The signaling hypothesis argues that managers use stock splits to encourage private investors to gain confidence in the firm's future, whereas the liquidity hypothesis argues that managers use stock splits in order to increase trading volume by bringing the share price down to a more affordable level. The liquidity hypothesis is very intuitive, but the increase in trading volume does not fully explain the positive price reaction of the stock on the announcement date. The

signaling hypothesis is less intuitive, but it may provide the explanation for the abnormal returns.

Stock splits have not been exactly in the center of Finnish financial debate and there has not been done much research in this area. The motivation of this research paper is to investigate the phenomenon in Finnish stock markets and bring up-to-date information on stock splits using current Finnish data. The study is closely connected with the valuation theory of stocks and the efficient market hypothesis.

The main idea of the research is to conduct an empirical study to examine whether the signaling hypothesis holds in the Finnish markets during the examination period of 1996 to 2007. The study is conducted using an event study methodology to calculate if abnormal returns occurred around the announcement dates of stock splits during the examined time period. There is only one previous research conducted on Finnish data by Antti Niini, whose study examined a sample of Finnish data for the time period of 1985-1997.

The purpose of this study is to extend the analysis by examining all the splits issued thereafter. Because stock splits in Finland are usually announced at the same time with dividends, it's hard to separate the effect of stock split and dividend announcements. The previous study investigated only 18 stock splits and all of the stocks in the sample experienced simultaneous stock dividend announcements. This study tries to find a solution to that problem by examining also a sample of pure stock split announcements.

1.2 Research goal and research problem

The main idea of this study is to test the validity of the signaling hypothesis of stocks splits in Finnish stock markets. If the signaling hypothesis holds, abnormal returns should be detected around the stock split announcement dates. Positive abnormal returns would imply that investors are regarding stock splits as favorable information about the company.

The study is also connected with efficient market hypothesis. The idea of efficient markets comes originally from Eugene Fama, a professor of finance at the Chicago School of Business. According to the hypothesis, a financial market is efficient when market prices reflect all available information about the economical value of assets. Semi-Strong form of efficient market hypothesis states that stock prices should react to financially relevant news quickly. If abnormal returns are found around the split announcement dates, it gives a clue about how efficiently the Finnish stock market is working. (Fama, 1998, 1)

The main goal of the study is to determine, whether the 38 stock splits issued by 31 Finnish companies during the examination period have caused statistically significant abnormal behavior in the stock returns around the announcement dates of the splits.

1.3 Limitations of the study

This study specifically focuses on Finnish data, which covers the time period from 1996 to 2007. During that period a total of 51 stock splits were issued by 41 companies in Helsinki Stock Exchange. 13 stocks are eliminated from the final sample because of low quality data, such as missing closing prices. Thus, the final sample of stocks covers 38 stock splits issued by 31 Finnish companies.

This study specifically examines the validity of signaling hypothesis of stock splits in The Finnish stock market (OMX Helsinki). The other hypotheses of stock splits are not covered in this research paper.

The primary source of information for the identification of Finnish companies which issued a stock split during the research period was The “Pörssitieto 2007” book by Gunnhard Kock. The actual announcement dates of stock splits were also verified and confirmed by looking at the database of stock exchange releases provided by Finnish business magazine Kauppalehti.

The “Pörssitieto” book contains detailed information about all the Finnish companies which are listed in Helsinki Stock Exchange at the release time of the book. The 2007

edition of the book includes information up till 17.6.2007.

The time period of 1996-2007 was defined by looking at the availability of data. The Kauppalehti On-Line database of Finnish stock exchange releases only contains information from 1996 onwards and the “Pörssitieto 2007” book contains data only up till 2007.

1.4 Methodology and Data

The research methodology used in the study is called an event study, which was introduced by Eugene Fama in 1969. The main idea of the methodology is to test how a release of firm-specific information affects the price of the stock in question. In this study, the firm-specific event is the announcement of a stock split. (Fama, 1998, 1)

The event study methodology is used to investigate whether stock split announcements are associated with positive changes in shareholder wealth on average during the research period.

The gathering of included the following steps. The information about how many stock splits were issued by Finnish companies during the time period 1996-2007 was found in the “Pörssitieto 2007” book. After identifying all the 38 stock splits, the announcement dates of the splits were verified using Kauppalehti’s on-line stock exchange release database. The final phase included the gathering of data from Thomson One Banker database and exporting them into an excel spreadsheet. The event study analysis is done with Microsoft Excel.

1.5 Structure of the paper

The first chapter introduced the reader to stock splits; why companies issue them and why it is important to study them. The second chapter contains a brief literature review of previous international researches on stock splits. The third chapter explains the theoretical framework and the basic concepts of company and share valuation. The fourth chapter explains the event study methodology used in the study. The fifth

chapter describes the data, the research methodology and the analysis of the results. The sixth and final chapter presents the summary of the research. The appendices contain examples of the stock split announcements of the companies.

2. Literature review

Financial theories crafted to explain the abnormal behavior of stock splits on the announcement day have primarily focused on two major theories. The liquidity hypothesis suggests transaction costs between investors and financial intermediaries as the explanation; whereas the signaling hypothesis argues that by splitting the managers are actually signaling favorable information about the firm's future performance to the market.

An important thing to be pointed out is the difference between the reason for companies to split the stock and the reason what causes the positive abnormal behavior in the stock returns on the announcement date. Most companies justify the stock splits as an effort to get the stock trading price lower improving the liquidity of the stock. Liquidity improvements of the stock have no connection to the value of the company, which means that there has to be a different reason behind the valuation effects of the stock split.

The seminal paper in stock split research is the study made by Fama, Fisher, Jensen & Roll (1969). They examined whether abnormal behavior exists in the return rates of a stock in the months surrounding the split. Residual analysis technique introduced by the authors has been utilized in different kinds of event studies all over the world and is considered to be a ground-breaking innovation in financial analysis techniques. The paper is amongst the most cited financial research papers of that time.

Empirical results provided by the paper show that stock splits are usually preceded by a period, during which the rates of returns are strangely high even though no information about the split has yet reached the market. The researchers suggested that the splitting companies have usually experienced remarkable increases in expected earnings and dividends during the pre-split period. The evidence supports such reasoning that the investors are searching any information available from the company to reduce the uncertainty concerning whether they can maintain the earnings at their new higher level. In other words, the market interprets the splits as a greater possibil-

ity that the dividends will increase. Thus, by reacting to the split, the market actually just reacts to the dividend implications of the split. (Fama, 1969)

The evidence also suggested that on average the market reacts to new information very rapidly and the information concerning the split is fully included in the stock prices at least by the end of the split month, but usually almost immediately after the announcement. (Fama, 1969)

Maureen McNichols and Ajay Dravid (1990) were specifically examining the effect of split factor on the amount of returns around the announcement date. Their sample consisted of stock splits and dividends which occurred from 1976 – 1983. The day 0 of their event study was defined as the day when the splitting of the stock was announced in The Wall Street Journal. It was also determined, whether the stock announcement was made in conjunction with simultaneous disclosure of company related events. The evidence suggested that investors' presumptions about firms future earnings corresponded with the managers split factor choice.

Robert Conroy and Robert Harris (1999) investigated stock splits by NYSE firms from 1925 to 1996. In their research 5 264 splits were identified which were conducted by over 200 firms. Price responses were captured around split announcement dates and a three day cumulative abnormal return centered on the split announcement day was calculated. In addition, they provided supplementary tests of split effects by looking at changes in analysts' forecasts of earnings per share before and after the announcement date. The conclusion of their research was that the equity market values of the stocks increased significantly around split announcement dates and also analysts' earnings forecasts increased significantly when the split factor was higher than anticipated.

Wulff (2002) investigated the market reaction to stock splits using German data. He used a sample of splits issued by firms listed on Frankfurt Stock Exchange during the period from 1994 to 1996. The sample for examining execution date effect consisted of 83 splits and the sample for examining announcement date effects consisted of 78 splits. The estimation period in his event study was over a period of 200 days and the event window was ± 30days. He found statistically significant abnormal returns

around both the announcement and execution day of German stock splits. However, the abnormal returns found in the study were consistently much lower than studies conducted on American data. The author explained this by the legal restrictions of German companies to use stock split for signaling.

Leledakis & al. (2009) found also positive abnormal returns around the announcement date, despite the institutional characteristics of the Greek market, which should minimize the signaling effects. Standard event study methodology was used and the sample consisted of 89 stock splits issued in the Athens Stock Exchange. The event day was defined as the day when board of directors first proposes splitting to the shareholders. Splits which coincided with other corporate announcements on the event day were omitted from the study. The estimation period was 100 days and the event period 21 days (-10 through +10).

Yague, Gomez-Sala and Poveda-Fuentes (2009) investigated stock splits issued by Spanish firms listed on the Spanish Stock Market Interconnection System from 1997 to 2005. Stocks with any other significant events 10 days around the announcement day of the split were eliminated from the study. Their final sample consisted of 45 splits issued by Spanish companies. In addition to the usual analysis of investors' reaction to the split, they also studied whether the financial analysts consider the split to be a positive signal from the management. The financial analysts are professionals, which frequently update their earnings forecasts to reflect any new information on a company. The results indicated that also professional analysts considered stock splits as signals of favorable information to the market.

The pioneering stock split research on Finnish data was conducted by Antti Niini (2000). He investigated whether there existed shareholder wealth effects around the announcement and execution dates of stock splits at the Helsinki and Stockholm Stock Exchanges. He used a sample of 18 announcements for Finnish companies and a sample of 90 announcements for Swedish companies from time period 1985-1997. The research concluded that there exist statistically significant abnormal returns surrounding the announcement day on both the Swedish and Finnish markets. Statistical significant abnormal returns were also found around the execution dates of

the stock splits at the Stockholm Stock exchange, but not at the Helsinki Stock Exchange.

Table 1. Summary of previous research

Study	Hypothesis examined	Findings
Fama, Fisher, Jensen & Roll (1969)	Signaling	The market uses the announcement of a split to re-evaluate the expected income from the shares. The new information is reflected in the price almost immediately after the announcement.
McNichols & Dravid (1990)	Signaling	Firms incorporate their private information about future earnings in choosing the split factor.
Conroy & Harris (1999)	Signaling	Interpretations of stock splits are based on the firms past history of splits. Around 2 % wealth gains were accompanying stock splits.
Antti Niini (2000)	Signaling	Statistically significant abnormal returns were detected around the announcement day.
Wulff (2002)	Signaling / liquidity	Stock splits are associated with abnormal returns on both the announcement and the execution day.
Yague, Gomez-Sala and Poveda-Fuentes (2009)	Signaling	Investors in the Spanish market upwardly revise share prices and financial analysts improve their earnings forecasts after stock split announcements.
Leledakis, Papaioannou, Travlos, Tsangarakis (2009).	Signaling	Splits by Greek firms produced positive price reactions.

The literature review reveals some interesting viewpoints. While the CFO's of most firms explain their split decision as an effort to get the stock prices down to appropriate trading level, major body of academic research suggests that by splitting the firms are actually "signaling" favorable information to the market. Favorable information can be defined as something which would affect the firm's future cash flow. Most of

the empirical studies have found a positive price reaction on the announcement days. Therefore, it is reasonable to take the signaling hypothesis under investigation in this study as well.

3. Theoretical framework

3.1 Valuation of companies

The theoretical framework of this study is constructed upon the modern valuation theory of companies and shares. This chapter introduces the theoretical framework, which this study is based on. The following paragraphs explain the basic principles behind valuation issues and show how they are connected with the signaling hypothesis of stock splits.

Valuation is an age-old methodology and a very broad branch of finance. The following introduction will just cover the basic principles. Valuation is usually defined as the methodology or methodologies of how to calculate the intrinsic value of the company. Depending on the valuation model, the variables used in the valuation calculations are usually equity, debt, material assets, immaterial assets and projections of future cash flows.

The theory on valuation starts with the question why value is the proper metric to be used and does the maximization of shareholder value give the best result for economical and social well being of the society as a whole. There are differences in the ways of thinking between American, European and Asian companies. The underlying questions behind valuation go well beyond the scope of this Bachelor's Thesis and will not be addressed here. (Copeland, Koller, Murrin, 1994, 3-30)

The basic valuation model in modern finance is the DCF (Discounted Cash Flow) analysis. The value of the firm is simply thought as the expected future cash flows of the firm discounted at a certain risk rate. There are lots of other tools to measure company performance, but they do not include the time value of the money, nor do they provide a multi-periodic point of view. The DCF model provides a good way to analyze the value of companies which have identical earnings, but different cash flows or risks. (Copeland et al, 1994, 69-93)

Understanding where the value comes from and how it is measured are crucial in order for the managers and investors to make reasonable business and investment decisions. It is good to keep in mind that lots of different valuation models exist and there is no consensus amongst researchers and financial analysts about the best possible method. Most of the valuation methods are usually just derivatives of the DCF model. The proper valuation model should be chosen according to the fundaments of the firm. (Kallunki, Niemelä, 2004, 124-125)

It is also good to keep in mind that all of the theoretical models of valuation demonstrated above provide just a simple picture of the value creation process. In reality, the company value is never precisely known and the stocks traded on the market are somewhat under or overvalued.

3.2 Valuation of shares

There is a difference between management point of view and investor point of view when approaching the valuation issue. Corporate management has all the inside information available while investors have to work with just the information which is available outside. Nonetheless, both parties are using the same financial tools in order to achieve a thorough understanding of the intrinsic value of the company.

As pointed out before, value is defined in many ways in the financial literature. An important distinction is usually made between equity value and enterprise value. Equity value is the market capitalization of the firm; market price per share times the shares outstanding. The enterprise value is the equity value plus net liabilities. (Copeland et al, 1994, 149)

The equity value of a company is usually lower or higher than the actual value, which could be derived from the fundaments of the company. This leads to the notion that there are either undervalued or overvalued companies traded on the market. The undervalued stocks are bought and overvalued sold. The hard part is to figure out how to calculate the real value and what are the factors that should be included in the valuation calculations.

The first generation of valuation models for stock shares were developed in the beginning of 20th century. The basic idea of the original models is to discount the future cash flow of the dividends. In other words, the value of the company is the discounted value of future dividends. The dividend based models include lot of simplifications and are not suitable for valuing companies which rarely pays dividends. (Vaihekoski, 2004, 176-177)

The second generation of valuation models uses the so called FCF (Free Cash Flow approach. FCF is defined as the net cash flow available for all the securities holders of an organization. The main difference to dividend based approaches is that FCF models takes into account both capital providers; the debt and equity. The intrinsic value of the share is calculated by dividing the discounted net cash flow by the amount of shares outstanding. There are also third and fourth generation valuation models, but they will not be discussed in further detail in this paper. (Vaihekoski, 2004, 176-177)

Research by Copeland has presented an extremely strong correlation between the market value of the company and its expected cash flows discounted to present time. For example, quarterly information about company earnings usually shows an increase or decrease in the share price, depending on the content of the news. This happens because the market interprets the change in earnings as a signal of future cash flows. There are also lots of other economical factors, which affects the market value of the shares. (Copeland & al., 1994, 69-93)

Cash flow analyses are usually performed by financial analysts, who might use extremely complicated models in their calculations. Factors, such as the age of the company, growth of the industry, development of the technology and customer retention affects the valuation calculations. (Vaihekoski, 2004, 186-187)

3.3 Market efficiency

Market efficiency is a disputed issue in the financial world. The concept of efficient markets simply states that all the publicly available information on a company is quickly incorporated into its stock price and the invested capital is always allocated

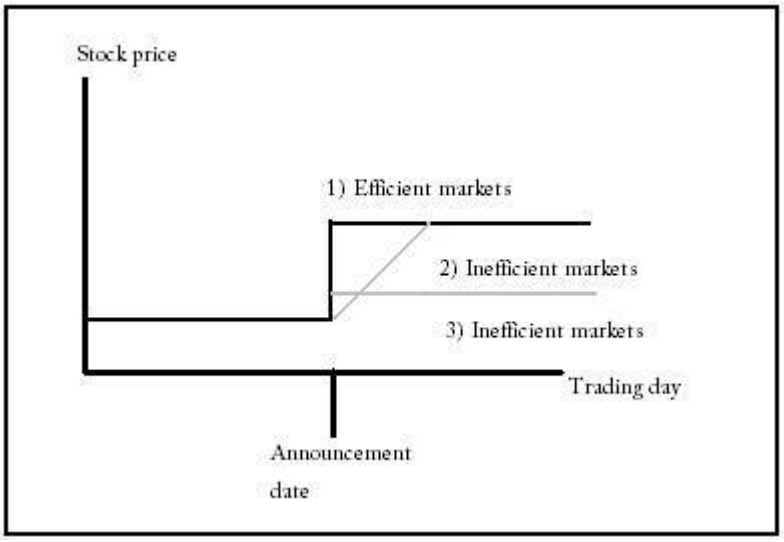
efficiently. In practice, perfectly efficient markets do not exist, but the concept gives a starting point for the evaluation of market efficiency. (Kallunki & Niemelä, 2004, 92)

The father of modern finance, Eugene Fama, defines efficient market as a place, where at any point in time the actual price of security will be a good estimate of its intrinsic value. Fama invented the event study methodology to test the informational efficiency of markets. (Fama, 1998, 1)

Market efficiency can be thought as the sum of allocation efficiency and information efficiency. The concept of allocation efficiency states that the market price of the stock reflects perfectly the expected returns of the firm and the risk involved in the return. The market is allocating capital efficiently when the capital is being invested in the most profitable way. The concept of information efficiency addresses the question how fast the market is reacting to relevant new information. In modern economy information is widely available to everyone and thus it should be incorporated in the stock prices quickly. The market should also know what information is relevant for the future success of the company and what is not. (Kallunki & Niemelä, 92-93)

Ever since the market efficiency was suggested, researchers have been looking for anomalies in the market to refute the efficiency claim. Most of the claims against the efficient market hypothesis are concerned about short-term anomalies, but on the long run the market seems to be working according to the DCF principle. It is stated, that managers who make business decisions using the DCF approach will be rewarded by higher share prices in the future. (Copeland & al. 1994, 92)

In efficient markets, investors cannot profit by trading on lagged price reactions, because the price effect of the information announcement is instantaneously incorporated into the stock price. If the markets are working completely efficiently, then there would not be any wrongly priced stocks in respect to any relevant information. (Kallunki & Niemelä, 2004).



Picture 1. A description of the difference between efficient and inefficient markets.

3.4 Valuation effects of stock splits

In the previous chapters much has been discussed about the valuation of stocks and efficient markets, but the most important question to be addressed is what connects these theories to the valuation of stock splits. Why there should be a valuation effect visible on the stock split announcement date?

The financial literature has not reached a consensus about the primary cause of the valuation effects of stock splits, but various hypotheses have been developed as explanations. The following paragraphs will briefly introduce the signaling hypothesis, which is still regarded as the best explanation for the announcement effects of stock splits even after 40 years of its introduction.

There is a lot of information being exchanged between the management of a company, the investors investing in it and the financial analysts analyzing it. The knowledge difference between these parties is known as information asymmetry in the financial literature. It is obvious that the managers have better knowledge of the value drivers of the company and the risks involved in them. The management has different ways to communicate their knowledge to the market. This is where the signaling hypothesis comes in. The basic argument of the hypothesis is that management conveys

information about the company's performance to the markets by the stock split announcement. (Grinblatt, Masulis & Titman, 1984)

In order for the signal to have any effect on the company share, it should contain information about the firm's future performance. In other words, the information should be something which affects the net cash flows of the company. The problem in the case of stock split announcements is the lack of relevant financial content of these signals. Since the stock split is just a simple act to increase the amount of shares outstanding, it is difficult to see how it could affect the firm's future performance. The valuation theory suggests that there should be no implications on the company value, since stock splits do not directly affect the companies' cash flows.

Other disadvantage of the signaling hypothesis is its assumption that investors and analysts are able to discern whether the management is trying to signal positive information or just trying to mislead in a hope of short term profits. This means that when the stock split is announced it is impossible for the investors to be sure that the management is not trying to signal a positive change in the firm's cash flows, but trying to fool the markets instead. On the other hand, it is obvious that the market cannot be fooled in long run and those companies which are signaling false information would be spotted quickly.

Usually events which are connected with a positive price reaction affect directly the estimates of future cash flows, such as the announcements of positive earnings, dividends, mergers and acquisitions, discovery of a new technology and so forth. A positive announcement effect of stock splits would imply that the split announcements are in fact carrying financially relevant information about the company. (Kallunki & Niemelä, 2004, 94)

This suggests that the signaling hypothesis is standing on quite weak grounds. It is equally possible that the management is not intentionally trying to signal anything, but the effect is purely psychological. Usually when the stock prices have steadily grown over the years the market assumes this trend also to continue in the future. This assumption might not be based on financial figures or cash flow analyses. The

splitting announcement could then be thought of a signal that focuses the market's attention on the stock, which would be seen as abnormal performance on that day.

In conclusion, the previous academic studies have found a positive price reaction on the announcement date of stock splits, which would imply that the split signal contains some favorable informational content. It is, however, still unclear for the academics as what exactly is the positive information the investors are reacting to.

4. The event study methodology

4.1 Background

Over the past 45 years, the event study methodology has become a widely used tool in econometric research. The methodology was created by Eugene Fama to test the efficient market hypothesis, which states that the whole market as well as individual securities instantaneously absorb and reflect new information as soon as it becomes available. In other words, the stocks returns should experience systematical abnormal behavior whenever markets learn relevant information, which will affect the company's future performance. (Kothari & Warner, 2004, 4)

Kothari and Warner (2004) reported that approximately 565 event studies were published in the five leading financial journals for the years 1974 through 2000. The flow of papers has been stable and the total number of research papers published in all business journals is much greater.

In modern day econometric research event studies are used to examine the effect of a specific corporate event on the company's stock price. Event studies usually examine the abnormal return behavior for a sample of companies experiencing a similar corporate event. The results of the studies provide a general estimate of the impact of a certain corporate event on the wealth of the firm's claimholders. The impact of the event is measured as the magnitude of the abnormal performance of the stock returns at the time of the event. (Kothari & Warner, 2004, 4)

This study will use the event study methodology to examine whether the announcements of stock splits have caused abnormal behavior in the stock returns on the announcement dates. The following paragraphs will briefly introduce the event study methodology.

4.2 Research design

4.2.1 The steps

A standard event study is carried out by going through 3 main steps, which are briefly introduced here.

1. First step is to identify the event, which is assumed to cause abnormal returns in stock returns. Next step is to define the event window and the estimation period. Event window is the period of time when the event is assumed to cause abnormal returns on the stock. The estimation period is the time period, when the stock is assumed to behave normally. The estimation period is used to calculate how the stock would have behaved in absence of the event. The last important choice of the first step is to choose the data frequency. (Campbell, 1997)

2. Second step is to select the sample of firms and define the screening criteria. The study can be limited to a certain time period, industry or stock exchange. Also the firms in the sample should not have experienced any other significant events, expect the one under investigation. Otherwise the researcher cannot be sure which event causes the abnormal returns on the stock. The estimation method of normal returns should also be selected at this point. (Campbell, 1997)

3. Third step is to estimate the normal returns, which would have happened in absence of the event. The abnormal returns are simply calculated by subtracting the estimated normal return from the actual event period return. The final phase includes the test of statistical significance and the interpretation of the results. (Campbell, 1997)

4.2.2 Defining normal returns

Normal returns are simply the estimates of the stock returns in absence of the event. A model of normal returns must be specified before abnormal returns can be calculated. Normal returns can be estimated by several different methods, including mean return model, market model and capital asset pricing model. The methods differ by the bias and precision of the estimated normal returns. These methods will not be presented here in greater detail. (Kothari & Warner, 2004, 10)

The most widely used method in event studies is the single index market model, which estimates the normal return parameters by regressing the sample stock against a stock index over an estimation period. The Ordinary Least Squares (OLS) method is commonly used to estimate the parameters. It has been concluded by Brown & Warner (1985) that event studies based on the OLS method and standard parametric tests provide reliable results under a variety of conditions. It was also concluded that the alternative methods to estimate market model parameters did not give clear-cut benefits for detecting abnormal returns. (Brown & Warner, 1985, 25)

The single-index market model used in this study is presented in the equation 1. The normal returns are estimated by regressing the sample stocks against the return on the OMX Helsinki index. Justification for choosing this index will be provided in chapter 5.

(1) The OLS market model: $R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}, \quad E\varepsilon_{it} = 0,\ Var[\varepsilon_{it}] = \sigma^2$

Where,

R_{it} = Expected normal rate of return on the stock i at time t
R_{mt} = Return on the market index at time t
α_i and β_i = The Ordinary Least Squares **estimators** of the market model
ε_{it} = The error term of the model at time t

4.2.3 Defining abnormal returns

There are different ways to estimate normal returns, but the abnormal returns are always calculated the same way. Abnormal returns are a direct measure of the change in the stockholder wealth which is associated with the event. Abnormal returns are calculated as the difference between the actual returns and the estimated normal returns for each stock in the event window. Other way to think the abnormal returns are the component of returns which are unexpected. In econometric models, the error term represents the variation in the dependent variable which is unknown and not caused by the independent variable. The abnormal returns are calculated using the equation 2 for all of the firms in the sample and then combined together. (Seiler, 2004)

(2) The estimated equation: $\varepsilon_{it} = R_{it} - \alpha_i - \beta_i R_{mt}$

Where,

ε_{it} = The abnormal return on stock i at time t
R_{it} = The estimated normal rate of return on the stock i at time t
R_{mt} = The return on the OMX stock index at time t
α_i and β_i = The Ordinary Least Squares **estimates** for the stock i. The estimates are calculated from a regression against OMX Helsinki market index over a 135 day estimation period.

4.3 Statistical design and hypothesis testing

4.3.1 Mean abnormal returns

The aim of an event study is simply to investigate whether the predicted cross-sectional distribution of returns differ from the actual returns around the event window. In other words, the abnormal returns across the securities in the sample have to be averaged in common event time and then checked if the mean of abnormal returns differs from zero. (Kothari & Warner, 2004, 10-11)

The cross-sectional mean residual on a sample of 38 stocks for any event day is given by the equation 3.

(3) $\overline{AR_t} = \frac{1}{38}\sum_{i=1}^{38} \varepsilon_{it}$

Where,

$\overline{\mathrm{AR_t}} =$ The mean abnormal return on the sample of 38 stocks for any event day t.

In statistical terms, the null hypothesis of the test is that the mean of abnormal returns is zero. The counter hypothesis is that the mean of abnormal returns differs from zero. Pre-event abnormal returns would indicate that the event is partially anticipated and post-event abnormal returns indicate the information is not instantaneously absorbed.

4.3.2 Test statistics

Test statistics are usually computed for a given measure, such as abnormal returns and compared to its assumed distribution under the null hypothesis that the mean abnormal returns equals zero. The null hypothesis is rejected if the test statistics corresponds to the critical value, which usually is specified as 10%, 5% or 1% tail region. (Serra, 2004, 3-4)

The parametric student's t test statistic used in this study is given by the equation 4.

(4) t-statistic = $\overline{AR_t} \;/\; S(\overline{AR_t})$

Where,

$\overline{AR_t} =$ Average abnormal return on the sample stocks for any event day t.
$S(\overline{AR_t}) =$ Estimate of the standard deviation of the average abnormal return $\sigma(\overline{AR_t})$.

The cross-sectional t-statistic described in equation 4 makes the important assumption that the abnormal returns are independent and normally distributed. It has been widely noted in previous research that the stock returns are non-normal. However, the central limit theorem states that any distribution converges to the normal distribution when taken large enough sample size. In case of small sample sizes, the normality assumption is threatened, thus increasing the risk of misspecification. The simulation made by Brown and Warner (1984) demonstrates that OLS-market model with a standard parametric t-test provides a sufficiently specified test with high power. (Kothari & Warner, 2004, 16)

4.3.3 Reliability

An event study is well specified only if the assumptions underlying the estimations are correct. An event study can be though as a combination of two tests. The first tests whether the model of expected returns is correct and the second whether the mean of abnormal returns is zero. In addition, the assumptions underlying the statistical properties of the abnormal returns have to be correct for the parametric test to be properly specified as stated in the previous paragraph. (Kothari & Warner, 2004, 15-16)

There are three main issues which greatly affect the reliability of an event study. The first one is the size of the event window. The smaller the event window, the better changes that no other company specific or market-wide event is affecting the returns. There is no optimal length of the window, but less insignificant days in the event window tends to increase the power of the test. (Koivuluoma, 2001, 17-18)

The second issue is contagion effect, which happens when there are several company-specific events happening around the event window. When a stock is experiencing contagion effect, it is impossible to distinguish what causes the potential abnormal returns. (Koivuluoma, 2001, 17-18)

McWilliams and Siegel (1997, 637) present various methods to deal with the contagion effect. The obvious method is to remove those companies, which experience contagion in the event window. If this is not possible, the researcher may create two

groups where the contagion effect is respectfully present and absent. The third option is to subtract the effect from abnormal return calculations. It should be noted that the sample size and the power of the test are positively correlated. In other words, as the sample size increases the probability of type 2 error decreases because there is a higher probability to detecte the abnormal effect of the event.

The third issue is the quality of stock return data. If the stocks experience non-synchronous trading, it may be visible as biased beta estimates and result in erroneous calculation of normal and abnormal returns. Also a higher volatility in the return data decreases the probability for the test statistic to detect the abnormal returns. Simulations by Kothari and Warner concluded that the power of the event study is significantly higher when investigating stocks with low variance than stocks with high variance (Kothari & Warner, 2004, 50-51)

4.3.4 Specification and power

There are two types of errors when conduction statistical inferences. The first is known as the type 1 error, which occurs when the null hypothesis is falsely rejected. The second error, known as the type 2, occurs when the null hypothesis is falsely accepted. A correctly specified test statistic gives a Type 1 error corresponding to the chosen significance level. Power is usually measured as one minus the probability of a type 2 error. The power of an event study test depends on five key factors; the used data frequency, the size of the event window, the method of estimating normal returns over the event window, the variance of the investigated securities and the magnitude of the actual abnormal behavior. (Kothari & Warner, 2004, 15-25)

There is a substantial literature concerning event study methodology research, which tries to find the best method of creating highly specified tests with a high power to detect abnormal performance. One of the main tools used in the methodology research is a so called simulation, which was first introduced by Brown and Warner in 1980. Simulation means that different event study methods are applied to a sample, which is constructed by a random selection of securities and event dates. The purpose of the simulation is to compare the performance of different methodologies and determine which one gives the most specified and accurate results.

Table 2 presents the simulation conducted by Brown and Warner in 1984. Their simulation found out that the market model methodology is able to detect abnormal behavior 99.6% of the time when the actual level of abnormal returns is 2%.

Table 2. Rejection frequencies for various levels of abnormal performance, using one-tailed tests at the 5% significance level. The sample size is 50 randomly selected securities (Brown and Warner 1984, 13)

	Actual level of abnormal performance at day '0'			
Method	0	0.005	0.01	0.02
Mean adjusted returns	6.4%	25.2%	75.6%	99.6%
Market adjusted returns	4.8	26.0	79.6	99.6
Market model	4.4	27.2	80.4	99.6

5. Empirical study

5.1 Data

5.1.1 Population and sample

The target population in this study is defined as the number of stock splits issued by all Finnish listed companies during the time period from 1996 to 2007. Since the target population only consisted of 51 stock splits, it was not necessary to perform any sampling procedures. A total of 13 stock splits were eliminated from the initial sample, because of low quality or missing data. Thus the final sample consists of 38 stock splits, which were issued by 31 Finnish listed companies during the defined time period.

Out of the 38 announcements, 23 contained simultaneous dividend announcements. Only 15 announcements were free of other company specific information releases. This presents a problem for distinguishing between stock splits and stock dividends as the cause of possible abnormal returns.

5.1.2 Data description

The data of stock prices used in this study was acquired from Thomson One Banker financial service. The raw data consisted of closing prices of the stocks for 181 days. The closing price series were then transformed into logarithmic return series, because logarithmic return series have many preferable properties for research purposes, such as time consistency. Data from Thomson One Banker is adjusted for stock splits & stock dividends. The total number of variables examined is 38 and each variable is a return series of 181 stock closing prices.

Some of the variables included missing values in the estimation period, which are corrected by taking an average of the surrounding closing prices of the missing date. This procedure might affect the reliability of the estimated normal returns.

Daily data frequency is used in order to increase the power of the test and properly isolate the possible effects of stock splits on daily returns. Monthly data frequency would be too infrequent and intraday data would not provide any additional accuracy.

5.2 Methodology

5.2.1 Introduction

An event study methodology is used to examine the abnormal returns around the announcement day of the stock split. The normal returns are estimated by single-index market model, where the normal returns are calculated by performing a regression of the stock prices against the market index over the estimation period. The key concepts of the methodology are described in chapter 4. The following paragraphs shortly describe the choices and definitions of the key elements for this study.

5.2.2 Event date and window

The event date is defined as the date when the stock split is announced. In Finland companies usually announce stock splits simultaneously with stock dividends during the annual general meeting (AGM). The results of the AGM are published to investors via press release. This causes a serious problem for distinguishing between the possible split effect and possible dividend effect. The data contained a total of 15 samples, which were free from simultaneous dividend announcements. The analysis is made for all of the samples and then just for the 15 dividend free samples.

The announcement day is chosen over the execution day as the event date, because on the execution date the information about stock splits should already be included in the stock prices. Abnormal returns on the execution day of the split would be a clear sign of an inefficient market.

The event window describes the period of time, when the event is assumed to cause abnormal returns in the stock under investigation. In this study, the event window is defined to include -5 to +5 days from the event date. If the information about stock

splits leaked to investors before the actual press release, then possible abnormal returns occurred before the event date. Likewise, if the markets are not working efficiently, the possible abnormal returns could occur later. Earlier studies have shown that the effect of an announcement is usually incorporated in the stock price within a few days. (Seiler, 2004)

5.2.3 Estimation period

Estimation period is the period of time, over which no events have occurred. It is used to estimate how the asset price behaves in absence of the event. In other words the stock return is regressed against the market return over the estimation period to estimate the normal returns of the stock for the event window.
There is no consensus amongst researches about the optimal length of the estimation period. In this study the estimation period was defined to include 135 days, which should be enough to determine the relationship between the stock and the market. (Seiler, 2004)

As noted before, there are many ways to estimate the normal returns. This study will use the single index market model, where the normal returns are estimated by regressing the stock against the market index. The choice of market index is really important for the reliability of the estimated betas. The empirical average of the betas in this study is 0,40. In practice, this means that on average correlation of the sample stocks with the market is 40%. The result is typical to Nordic markets, where factors such as infrequent trading might affect the estimators. The result corresponds with the research of Antti Niini (2001).

In this study, the index choice for the market model is The Helsinki Stock Exchange General Index (OMX Helsinki). It is a capitalization weighted index, which consists of all the stocks traded on the exchange. It provides the best reliability for calculating the OLS-regression estimates, because each company is assigned a corresponding weight in the index.

5.3 Analysis of the results

Chapter 4 introduced the concepts of test specification and power. The power of the test comprised of five important factors; the data frequency, the length of the event window, the sample size; the statistical properties of stock returns and the estimation method of normal returns. Factors, which increase the power of this study are the daily data frequency and the fact that stock split announcement date is known precisely. Factors, which reduce the power of the study are low estimated empirical betas for the market model and the relatively low sample sizes of 38 and 15.

The power of the test statistics depends on the normality assumption of the abnormal returns. In large samples, the t-test statistic should approximate a standard normal random variable, as depicted by the central limit theorem. The sample size of 38 for the whole sample is enough to sustain some skew in the distribution of abnormal returns, but the sample size of 15 for the pure split sample may not be enough to make reliable inferences. (Ahern, 2008, 13)

The results for the whole sample of 38 stocks are presented in table 3 and the results for the 15 pure splits are presented in table 4. The standard deviation of the abnormal returns vary between 2,4% and 3,9% in table 2 and between 1,5% and 4,4% in table 4. This indicates that the cross sectional abnormal returns show quite a reasonable amount of variation from the mean.

Table 3 shows that the only statistically significant day at 5% level is the event day 0. These results say that on the announcement day the average abnormal return for the 38 stocks during the years 1996-2007 is 1,3%. As mentioned before, careful interpretation is required because 23 of the 38 firms in the sample announced also dividends at the same time with stock splits.

Table 3. Mean AR, standard deviation and t-statistic for the event window (-5 to +5). The critical value of two-tailed t for the 95% confidence interval is 2,0262. The sample size is 38.

Event time	Mean AR	Standard Deviation	T-Statistic
-5	0,002	0,026	0,491
-4	-0,003	0,025	-0,754
-3	0,002	0,022	0,673
-2	0,001	0,024	-0,378
-1	-0,002	0,020	-0,668
0	**0,013**	**0,039**	**2,026**
+1	0,007	0,032	1,356
+2	-0,003	0,026	-0,804
+3	-0,004	0,024	-1,010
+4	0,005	0,030	1,029
+5	0,007	0,028	0,145

Table 4 presents the average abnormal returns for those 15 stocks, which did not experience simultaneous announcement of stock splits and stock dividends. The announcement contained only information about the decision to split the stock. The results show that none of the cross-sectional mean abnormal returns for any event date are statistically significant at the 5% level. These results would suggest that the pure stock split announcements do not cause any statistically significant abnormal behavior on the stocks around the announcement day during the investigated time period.

Table 4. Mean AR, standard deviation and t-statistic for the event window (-5 to +5). The sample size is 15.

Event time	Mean AR	Standard Deviation	T-Statistic
-5	-0,002	0,037	-0,231
-4	-0,009	0,037	-0,924
-3	0,001	0,026	0,108
-2	-0,001	0,030	-0,105

-1	-0,003	0,025	-0,493
0	**0,005**	**0,041**	**0,516**
+1	0,011	0,044	0,955
+2	-0,005	0,015	-1,355
+3	-0,008	0,035	.0,910
+4	0,013	0,043	1,140
+5	0,000	0,037	-0,035

The explanation for the positive announcement effect witnessed in the table 3 could be provided by the simultaneous announcement of other company specific news, such as the announcements of dividends. The results for both samples have to be interpreted carefully, because there is a possibility of type 1 and type 2 errors. Factors, which contribute to the errors, are the relatively low sample sizes and a possible bias in the estimated market model betas. Especially the sample size of 15 in the pure stock split sample is not enough for the t-test to be specified. Simulations by Brown and Warner, which are discussed in chapter 4, also showed that when the actual abnormal performance is really low it becomes harder for a test to detect it.

It is also possible to make conclusions about the pre-event and post-event results of the study. The results in table 3 show that the announcement is not anticipated by the market as the highest mean abnormal return for the whole 5 day pre-event period is only 0,2%. The results would also suggest that the effect of the announcement is incorporated in the stock prices really quickly, because the abnormal returns diminish almost instantly after the event date. To summarize, the event does not seem to induce post- or pre-announcement drifts.

The conclusions slightly differ from the previous study on Finnish data, which was conducted by Antti Niini. His study presented a mean abnormal return of 3,2% on the announcement day. However, the sample size under investigation in Antti Niini's study was only 18 firms and the simultaneous company specific announcements were not controlled. The analysis of the pure splits demonstrates that the market model with a t-test used in this study failed to detect abnormal behavior around the event date.

In conclusion, this study cannot confirm that the signaling hypothesis of stock splits holds in Finnish markets during the examined time period. In other words, the stock splits are not causing valuation effects in the shareholder wealth of the stock holders on average during the estimated time period. This result differs from the previous empirical results but confirms with the valuation theory.

6. Summary

The purpose of this study is to examine the validity of the signaling hypothesis of stock splits in Finnish stock markets. The signaling hypothesis is tested by examining possible abnormal returns around the announcement day of the split. The empirical study is carried out by performing a standard event study methodology. The sample used in the study consists of all the Finnish firms which announced a stock split during the research period. The research period of the study is 12 years (1996-2007) and the number of investigated stocks is 38.

Abnormal returns are calculated as the difference between the actual return and the estimated normal return. The market model is selected as the proper econometric model for estimating the normal returns. The estimation of normal returns is done by ordinary least squares regression. The statistical significance of the obtained abnormal returns is verified by student's t-test.

The initial sample of 38 stocks includes 23 stocks which experienced at least one other company specific announcement, such as stock dividend. The remaining 15 stocks were free from other company specific announcements and only experienced the splitting announcement. The test of mean abnormal performance is done two times; first test includes all the 38 stocks and the second test only the 15 pure stocks. On the announcement day, the event study test detected mild abnormal returns (1,3%) in the 38 sample stock, whereas no abnormal performance was found in the pure sample of 15 stocks.

This study did not find evidence of the signaling effect of stock splits present in the Finnish stock markets during the time period of 1996-2007. In other words, the investors did not consider stock splits as positive signals from the management. On the other hand, the Finnish stock market is working seemingly efficient as the study found no pre-split or post-split drifts before or after the announcement. Statistically significant cross-sectional mean abnormal returns are detected only on the announcement date in the sample of 38 splits, which includes companies that announced stock dividends at the same time with stock splits.

In conclusion, the results of this study differ from the previous empirical studies, but they have to be interpreted with caution. The Finnish markets differ from USA and central Europe, which means that there might be differences in how the markets are interpreting the messages from company management. The study is also subject to a handful of possible errors and misspecifications in the econometric model and test statistics, which may have decreased the statistical power of the test.

Unfortunately, there is still very little data available on corporate actions such as stock splits by Finnish companies, which makes it hard to construct a large enough sample for a reliable event study. The problem of simultaneous announcements poses also a difficulty in distinguishing the cause of the announcement effect. Possible future research on shareholder wealth effects of stock splits in Finnish markets should be conducted only when enough reliable data are available.

List of references

Ahern, Kenneth R. 2009, Sample Selection and Event Study Estimation. Journal of Empirical Finance, Vol. 16, No. 3, June.

Baker, Kent H. & Gallagher Patricia L. 1980, Management's view of stock splits, Financial Management, Summer, p. 73–77.'

Brown, S., and J. Warner. 1985, Using daily stock returns: The case of event studies, Journal of Financial Economics 14, p. 3-31.

Campbell, J., Lo, A. & Mackinlay, A. 1997, The Econometrics of Financial Markets. Princeton University Press, Princeton, New Jersey.

Copeland, T. & Koller, T. & Murrin, J. 1994, Valuation: Measuring And Managing The Value of Companies. John Wiley & Sons, Inc.

Conroy, Robert M. & Harris, Robert S. 1999, Stock Splits & Price Information: The role of share price. Financial Management, Vol. 28, No. 3, Autumn.

Fama, Eugene F. & Fisher, Lawrence & Jensen, Michael C. & Roll, Richard. 1969, The adjustment of stock prices to new information. International Economic Review, February, Vol. 10, No. 1, p. 1–21.

Fama, Eugene F. 1998, Market Efficiency, Long-Term Returns, and Behavioral Finance. Journal of Financial Economics, September, Vol 49, Issue 3, p. 283-306.

Grinblatt, Mark & Masulis, Ronald W. & Titman, Sheridan. 1984, The Valuation Effects of Stock Splits and Stock Dividends. Journal of Financial Economics (JFE), Vol. 13, No. 4

Kock, Gunhard. 2007, Pörssitieto 34. Pörssitieto Ky. Vantaa.

Koivuluoma, P. 2001, Tulosjulkaisun informaatiosisältö ja markkinoiden tehokkuus. Jyväskylän yliopisto. Taloustieteiden tiedekunta. Pro gradututkielma.

Kothari, S.P. & Warner, Jerold B. 2007. Econometric Issues and Methodological Trends. In *Handbook of corporate finnce: Empirical corporate finance, Vol. 1,* Ed. B. E. Eckbo. Elsevier. Netherlands.

Leledakis, George N. & Papaioannou, George J. & Travlos, Nickolaos G. & Tsangarakis, Nickolaos V. 2009, Stock splits in a neutral transaction cost environment: Evidence from the Athens Stock Exchange. Journal of Multinational Financial Management, Vol. 19, February, p. 12-25.

McNichols, Maureen & Dravid, Ajay. 1990, Stock dividends, stock splits and signaling. The Journal of Finance, July, Vol. XLV, No. 3, p. 857–879.

McWilliams, A & Siegel, D. 1997, Event studies in management research: Theoretical and empirical issues.Academy of Management Journal, 40.

Niini, Antti. 2000, Shareholder Wealth and Volatility Effects of Stock Splits: Some Results on Data for the Helsinki and Stockholm Stock Exchanges. Liiketaloudellinen Aikakausikirja, 1/00, p. 37-70.

Seiler, Michael J. 2004, Performing Financial Studies: A Methodological Cookbook. Prentice Hall.

Serra, Ana Paula. 2004, Event Study Tests: A Brief Survey. Revista Electrónica de Gestão Organizacional, Vol. 2, No. 3, pp. 248-255.

Vaihekoski, Mika. 2004, Rahoitusalan sovellukset ja Excel. Werner Söderström, Helsinki.

Wulff, Christian. 2002, The Market Reaction to Stock Splits – Evidence from Germany. Schmalenbach Business Review, Vol. 54, July 2002, p. 270 – 297.

Yague, Jose. & Gomez-Sala, Carlos J. & Poveda-Fuentes, Francisco. 2009, Stock split size, signaling and earnings management: Evidence from the Spanish market. Global Finance Journal, Vol. 20, Issue 1, p. 31-47.

Appendices

1) Example of a press release containing pure stock split announcement

2) **Example of a press release containing simultaneous announcement of stock splits and stock dividends.**