DOES THE PUBLISHING OF SHORT SELL-ING INFORMATION AFFECT STOCK MAR-KET PRICES

Case: Helsinki Stock Exchange

Master´s Thesis
-in Accounting and Finance

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1   INTRODUCTION

1.1   Background and motivation

Short selling has been the number one target of criticism of other market participants in the stock markets in the past ten years or so. As short selling is all about pessimism towards market development, other market participants have reacted hostilely towards short sellers. The short sellers have been sometimes accused of even manipulating the stock markets and causing collapses in the stock markets. Even the market regulators have quite recently attacked against short selling all around the world with different increasing regulation. The most extreme example of the increasing regulation are the short selling bans that remove short sellers entirely from the stock markets. (see e.g. Beber & Pagano 2013). The U.S. Securities and Exchange Commission (SEC) was one of the authorities that has banned short selling temporarily. The SEC told in a news release regarding to the matter that it will

> "…prohibit short selling in financial companies to protect the integrity and quality of the securities market and strengthen investor confidence." (SEC 19.9.2008).

Further arguments for the short selling ban in the press release were e.g.

> "…it appears that unbridled short selling is contributing to the recent, sudden price declines in the securities of financial institutions unrelated to true price valuation. Financial institutions are particularly vulnerable to this crisis of confidence and panic selling because they depend on the confidence of their trading counterparties in the conduct of their core business." (SEC 19.9.2008)

What is this sensational confidence breaking and panic causing short selling then and how new is it as a phenomenon if the market authorities are so afraid of it in the 21st century? To start with the latter, short selling is definitely not a new phenomenon or recent invention. The first time, when short sellers were accused with similar arguments as the SEC did in 2008 as shown above, was almost 400 years earlier in year 1610, when the Dutch States General prohibited short selling. (Stringham 2003, 328, according to De Vries & Van der Woude 1997, 151). Ever since, short selling and short sellers have periodically been criticized or harshly attacked against. For example Napoleon called short sellers as the enemies of the state, during the financial crisis short selling was banned

almost all around the world in some form and most recently the Chinese financial authorities banned short selling in the beginning of the year 2016. (Bodie et al. 2011, 111.)

What is short selling then and what kind of entities are practicing this deprecated procedure? Short selling is a way to make profits on falling stock prices. Traditionally stock investing is perceived as long positions i.e. buy first at low prices, sell later at higher prices. In short selling the idea of selling at higher prices and buying at lower prices is the same, but the order of the transactions is the opposite. Short sellers sell the stocks first and later hope to buy those stocks back at lower prices. So the short sellers are the ones who are trying to predict falling stock prices and benefit from those price decreases. To answer the latter question, who are these so called short sellers, is a bit more complicated. Basically almost any investor is able to sell short if that is the desired transaction. However, as the academic literature points out, the short sellers seem to be sophisticated, enlightened and well-informed investors who are able to beat the market return consistently. (See e.g. Khan & Lu 2013; Drake et al. 2011; Boehmer et al. 2010; Christophe et al. 2010; Desai et al. 2006).

As already mentioned, short selling has recently faced plenty of regulation. In the point of view of this thesis, one of the more interesting rules set recently, was the decision made by the European Union (EU 236/2012) where it wanted to enhance transparency in the markets and thus decided as a part of the new regulation that the information of significant short positions[1] should be public information. This regulation made significant short positions in the European Union (EU) area visible, frequently updated and available for everyone. This can be seen as enhancing transparency in the stock market, but also as a risk that threatens the stability of the market prices. Since the other market participants now have frequently updated information of the sophisticated short sellers' transactions, they could decide to follow the better informed short sellers i.e. 'bears'[2] and thus even make their short sales self-fulfilled prophecies.

There are possibilities to three different kinds of price reactions from publishing the more detailed short selling information. Firstly, this kind of transparency could cause a negative price reaction. Secondly, it could cause a positive price reaction or thirdly the stock market might not face any reaction at all.

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[1] Significant short position in this study means a net short position that is greater than or equal to 0.2% of the issued share capital of the company concerned. (EU 236/2012.)

[2] Bear refers to an investor with a pessimistic attitude towards the development of the market prices. (Bodie et al. 2011, G-2.)

First of all, there might be a significant negative price reaction to the public short sell-ing information. As the short sellers' transactions and investment strategies might be cop-ied by other market participants they could start conducting the act of herding[3]. According to the academic literature, short sellers are not solely better informed investors, there are various other groups. For example Fang and Yasuda (2014) present another skilled in-vestment entity: the so-called star-analysts[4]. The factor that unites the short sellers and the star-analysts is the fact that their returns exceed other market participants' returns. Also, it is possible to copy the investment strategies of these entities. The recommenda-tions of the analysts' cause sometimes even large-scale price changes in the intraday stock prices. Especially vulnerable to these large-scale price changes are the areas exposed to the 'periphery syndrome'[5]. In peripheries it is easier to observe intraday price reactions since they more often are larger in the peripheries. The area or stock market studied in this thesis, the Finnish stock market, can be considered as a periphery. (Leivo & Pätäri, 2011, 403). As the short sellers can be considered as well-informed investors like the star-analysts and the significant short positions as significant transactions done by these better informed entities, it is extremely interesting to see, whether the information of the signif-icant short positions has a negative herding effect to stock prices in the periphery i.e. Finnish stock market.

Secondly, there might be a so called contrarian[6] reaction, which means that there would be a positive price reaction to the negative information that the significant short positions represent. In this scenario the investors are assuming that "when people predict a downturn, they have already sold out, at which point the market can only go up." The other investors in the marketplace might react as if the short sellers' significant positions are a signal of a sold-out, which has already happened and there will only be positive price pressure for a stock as the short sellers have to purchase those stocks back in some point. They believe that all negative news is already priced to the stocks and the upcoming

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[3] Herding behavior can be seen as following the crowd since all market participants begin to act as a herd and trade similarly. Herding causes more volatile prices and has a negative effect on liquidity. (Park & Sabourian 2011, 973–974).

[4] Star-analyst refers to an analyst with a prestigious reputation. Fang & Yasuda (2014, 236) use the All American analyst title to tell the difference between star-analysts and other analysts.

[5] Periphery syndrome refers to the scenario in which the bigger international institutional inves-tors sell their equities first from the remote stock markets during turbulent times. Those areas suffer from more volatile stock prices during crises and are called peripheries. (Leivo & Pätäri 2011, 403).

[6] Contrarian behavior is sometimes called as antiherding, as it is the opposite of herding (Effinger & Polborn 2001.)

trend can only be positive. Thus they begin acting in a contrarian way compared to the short sellers. This type of thinking is popular especially in Wall Street. (Desai et al. 2002, 2264). Both of these phenomena's herding and contrarian behavior can be explained using the financial theory of behavioral finance. (Park & Sabourian 973-974.)

Thirdly, there might be no significant reaction at all. This is the outcome that the perhaps 'still ruling paradigm[7]' in finance in the form of neoclassical finance and efficient markets hypothesis would suggest. According to this financial theory the daily expected returns should be very close to zero and the stock prices should follow a random walk. In this case however, slightly negative returns might be expected since the information considering short sales are usually considered as negative information. (Fama 1998, 283–284). Another explanation for a lack of significant reaction could be that the stock prices and the short-interest are not related to each other. If short selling is done without profit-targeting, e.g. in hedging purposes, this would be the case. The short sellers would go short not in order to profit from the short position but to safeguard profits elsewhere. (Desai et al. 2002, 2264).

Briefly, this thesis is examining whether the Finnish stock market reacts to the released short selling information in some harmonious style. Short selling has faced plenty of regulation recently, and the public short selling information might give rise to specific price reactions. The possible price reactions are negative (herding reaction), positive (contrarian reaction) or there might be no price reaction at all. Furthermore, the empirical part of the thesis will also examine whether the stock market should react somehow to the released short selling information in the financial periphery of Finnish stock market i.e. do the shorted stocks perform in any specific manner.

1.2 Objectives and the purpose of the study

The objective of this thesis is to try to provide more information on short selling and the effects it might or might not have on the other market participants' behavior in the stock market. More specifically it is done by examining the effects of publishing the significant short position information[8] on the stock prices in the Finnish stock market OMX Helsinki[9]. The Finnish stock exchange is an extremely suitable venue to study whether the

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[7] As Jensen (1978, 95) stated his beliefs that "there is no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Markets Hypothesis."

[8] The terms public short selling information and information about the significant short positions are used synonymously in this thesis.

[9] In this thesis the terms OMX Helsinki, Helsinki stock exchange and the Finnish stock exchange are used synonymously and they all refer to the Nasdaq OMX Helsinki or Nasdaq, Helsinki.

stock market experiences some kind of herding or contrarian reaction to the public short selling information. As Grinblatt and Keloharju (2000) were able to point out, there is a unique blend of both contrarian and herding investors in large numbers in the Finnish stock market who could react differently to the public short selling information. Also as Finland is a European Union member country, the regulation (EU 236/2012) is regulating also the Finnish stock market and the public short selling information is available. On top of these, the Finnish stock exchange is a financial periphery (Leivo & Pätäri 2011, 403) and in the peripheries it is easier to observe intraday price reactions. As a result from these factors, the Finnish stock exchange could face different reactions to the thorough short selling information and is an extremely suitable marketplace to study whether there are herding or contrarian reactions to the public short selling information.

Secondly, this study is trying to interpret whether there should be some kind of reaction to the public short selling information in the Finnish stock exchange. This is done by trying to find whether there is connection between the publishing of the short selling position information in the stock market and the stock price around that event. Thus the goal is to find out whether the results of this study support the efficient market hypothesis or whether they are against it. The objectives of this thesis are to find out:

- *Does the publishing of short selling information affect stock market prices?*
- *Should the publishing of short selling information affect stock market prices?*

To be able to clearly meet the objectives, there is a need of getting acquainted with the theoretical framework about this subject. This includes familiarizing oneself with the background and basic ideas behind short selling, efficient market theory and the competing financial theory behavioral finance. By getting acquainted with those theories it is possible to interpret, which phenomenon or phenomena explains the results of this study. The aim to interpret, which phenomenon might explain the results of this study is the sub-objective of this thesis.

The purpose of this study is to give a comprehensible and easy-to-approach review to this theme. Most of the scholarly articles in finance and even most of the finance theses are full of mathematical and technical expressions that are difficult to handle for non-mathematicians. Thus those articles and theses give very little value to others than mathematicians and other technicians. As the purpose of this study is to be comprehensible, the expressions used in this study are not mainly mathematical. This is a quantitative study in finance, so some statistical and mathematical expressions are needed but even when used, the goal is to make them as clear to everyone as possible. The similar words could be used to describe this thesis as Fama (1995, 75) used to describe his writing:

"In general the theory (of random walks) raises challenging questions for anyone who has more than a passing interest in understanding the behavior of stock prices. Unfortunately, however, most discussions of the theory have appeared in technical academic journals and in a form which the non-mathematician would usually find incomprehensible. This article describes, briefly and simply, the theory (of random walks) and some of the important issues it raises concerning the work of market analysts. To preserve brevity some aspects of the theory and its implications are omitted. More complete (and also more technical) discussions of the theory of random walks are available elsewhere; hopefully the introduction provided here will encourage the reader to examine one of the more rigorous and lengthy works listed at the end of this article."

1.3   Research methods, data and limitations

This study is a quantitative empirical study that is based on financial market data. Financial market data can be seen as close to unbiased data as data can be. In this study there is a need for two types of data. First, there is a need for the short selling data and second, data about the stock prices. The short selling data is gathered from the database of the Finnish financial authority *Finanssivalvonta*[10]. The short selling data is a time-series data that will cover all significant net short positions in the OMX Helsinki marketplace starting from the November of 2012 and ending in the January of 2016. In total there will be around 3,000 positions. Short sellers are required to report the significant short positions no later than at 3:30 pm on the following trading day after the transaction day. That date is also the date in this study when the public is expected to become aware of the significant short position. A significant net short position that needs to be reported is a position that:

…equals 0.2 % of the issued share capital of the company concerned and each 0.1 % above that. (EU 236/2012.)

The second type of data needed for this study is time-series data about the stock prices. As the objective of this study is to examine whether there is and whether there should be a consistent price reaction on the date of publishing of the significant short selling position i.e. on the event date, different stock prices are needed. There is a need for the price on

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[10] The full online address to the database is: <http://www.finanssivalvonta.fi/en/Supervision/Market_supervision/Short_positions/Previous_positions/Pages/Previous_positions.aspx>

the event day and a need for the ending price of the previous date. The first section of the empirical part of this study will be carried out by comparing those two prices and tryi-ng to find statistically some results. The second section of the empirical part of this study is more concerned on whether the stock prices should react to short selling data. To find out that there is a need for further stock price information. In this case the data will cover the price information of the stocks on dates up to t+50 trading days. The stock price data is gathered from the online database of the Nasdaq OMX Nordic[11].

There are some limitations that will guide this thesis. First, as the OMX Helsinki stock market is fairly small in the terms of liquidity, volume and also number of companies, there are only 35 companies that have been sold short in the selected time period. In total there are around 3,000 short positions to examine, but those positions are not evenly distributed between those 35 companies. As the following table 1 clearly points out, some of the companies have been more popular among short sellers like Outotec Oyj and Outokumpu Oyj that cover together 983 out of 3004 positions in total. Thus those two companies cover 33,0 % of all the short positions in this study. Conveniently but unscheduled those two stocks or companies happen also to be the worst performers in the Helsinki stock exchange during the examination period. However, the fairly small number of shorted companies can be seen as a limitation.

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[11] The full online address to the database is: <http://www.nasdaqomxnordic.com/osakkeet/historiallisetkurssitiedot?languageId=1>

Table 1 The companies in this sample and their short position frequencies

Company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	BASWARE OYJ	3	,1	,1	,1
	CARGOTEC OYJ	103	3,4	3,4	3,5
	CAVERION OYJ	6	,2	,2	3,7
	CITYCON OYJ	6	,2	,2	3,9
	CRAMO OYJ	7	,2	,2	4,2
	ELISA OYJ	20	,7	,7	4,8
	F-SECURE OYJ	5	,2	,2	5,0
	FORTUM OYJ	3	,1	,1	5,1
	HUHTAMÄKI OYJ	7	,2	,2	5,3
	KEMIRA OYJ	56	1,9	1,9	7,2
	KESKO OYJ	24	,8	,8	8,0
	KONE OYJ	56	1,9	1,9	9,9
	KONECRANES OYJ	128	4,3	4,3	14,1
	METSO OYJ	221	7,4	7,4	21,5
	METSÄ BOARD OYJ	3	,1	,1	21,6
	NESTE CORPORATION	290	9,7	9,7	31,2
	NOKIA OYJ	260	8,7	8,7	39,9
	NOKIAN RENKAAT OYJ	291	9,7	9,7	49,6
	ORION OYJ	34	1,1	1,1	50,7
	OUTOKUMPU OYJ	379	12,6	12,6	63,3
	OUTOTEC OYJ	604	20,1	20,1	83,4
	PKC GROUP OYJ	28	,9	,9	84,4
	RAMIRENT OYJ	3	,1	,1	84,5
	RAUTARUUKKI OYJ	6	,2	,2	84,7
	SANOMA OYJ	40	1,3	1,3	86,0
	STOCKMANN OYJ ABP	11	,4	,4	86,4
	STORA ENSO OYJ	99	3,3	3,3	89,6
	SUOMINEN OYJ	8	,3	,3	89,9
	TALVIVAARAN KAIVOSOSAKEYHTIÖ OY	68	2,3	2,3	92,2
	TIETO OYJ	13	,4	,4	92,6
	UPM-KYMMENE OYJ	50	1,7	1,7	94,3
	UPONOR OYJ	2	,1	,1	94,3
	VALMET CORPORATION	17	,6	,6	94,9
	WÄRTSILÄ OYJ ABP	12	,4	,4	95,3
	YIT OYJ	141	4,7	4,7	100,0
	Total	3004	100,0	100,0	

The time period can also be seen as a limitation as the EU regulation made this kind of short selling data public in the November in 2012 the significant short selling positions before that date are left outside of this study. Thus some could argue that the arguments against short selling (such as the arguments of SEC in the section 1.1 in this study) given during the larger financial crisis might not be valid during this time period. On the other hand Europe and the European Union were suffering from the Eurozone crisis during the time period that this study consists of. And as can be seen from the figure 1, there was a

longer period of declining stock prices, which lasted for a great part of the year 2015. Thus if the arguments given during a crisis could be seen as generalizable the same arguments could be used to justify this study. There is also a period of steady increase in stock prices, which lasted almost the entire year 2013. And then there is the period of very little movement in the stock prices which lasted almost the entire year 2014. So even though the time period of the study could be seen as fairly limited, it does indeed cover very different times.
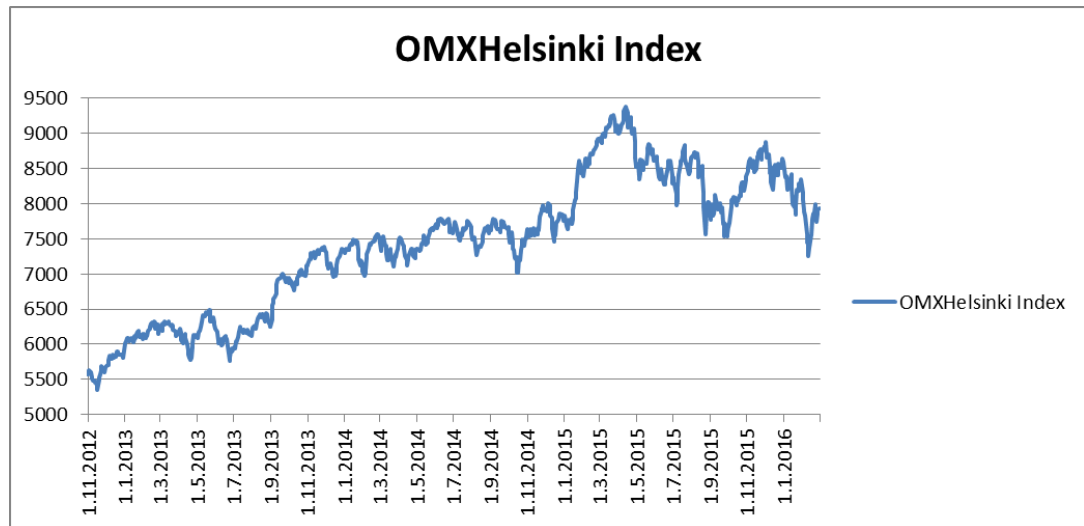
Figure 1 OMX Helsinki index development 1.11.2012–29.2.2016

There is one last limitation to this study, which cannot be left without a mention. The significant short position information is covering only those short positions, which have been made by selling the stocks short directly in the stock market. Thus this study is examining only those short positions. However, there are multiple other ways to create a short position. For example a short position can be created in the derivative market by acquiring different kind of stock options or by shorting different kind of Exchange Traded Funds. For example those short positions are left outside of this study.

1.4   Structure of the study

This study includes five chapters. The first chapter is the introduction. It includes the background and the motivation for this thesis, objectives and research methods and information about the data and limitations of this thesis. The main purpose of the introduction is to bring forth interesting, current and scientifically valid arguments to justify this thesis. Other purposes of the introduction are e.g. clarifying the objectives of this study and the research methods used in it. All in all the purpose of the first chapter is motivating and convincing the readers of the importance of this thesis.

The second chapter is about short selling and the effects that it has on the stock market. To be able to fully understand the purpose of the empirical part of this study, one has to get acquainted with short selling. This includes covering different short selling transactions and positions and the unique features of those positions. A Short position is generally thought to be a riskier position than a long position, so the risks of short selling are also part of the third chapter. Closely related to the unique features and the risks of short selling is an idea of short sellers being more informed investors. In the second chapter, the roots for the short sellers' information advantage are presented. Finally, different kind of short selling strategies are introduced in the second chapter of the thesis.

The third chapter is about the theoretical frameworks, which might explain the possible results of this study. The neoclassical finance and the behavioral finance theories will be covered in the third chapter. The more important issues among those theories from the viewpoint of this thesis are the efficient market hypothesis, herding behavior, contrarian behavior and noise. Those topics need to be covered thoroughly in order to fulfill the objectives of this study. The purpose of the third chapter is to provide a comprehensive overview of the framework behind the concept of each theory in finance. The third chapter consists of introduction of the development of those theories, and introduction of the key elements in them such as getting further acquainted on the different forms of efficient markets, random walk theory, financial anomalies and the psychological aspects such as herd behavior, contrarian behavior and irrational investments.

The fourth chapter includes the hypotheses formulation, testing of the empirical data with different hypotheses and the empirical results. The empirical testing is divided to different parts depending on the tested matter. The first part of the empirical testing is focusing on whether the public short selling information is treated as noise. The second part of the empirical testing is focusing on whether the public short selling information should be treated as noise. The final part of the empirical testing is examining the OMX Helsinki by using the same methods, which are used in most of the short selling related studies. This is done to be able to compare the financial periphery with the larger and more liquid trading venues. The fifth and the final chapter is used to summarize the whole thesis and make the final conclusions.

2   SHORT SELLING

2.1   Short selling and the roles

To reach the always desired returns in the stock markets, an investor is hoping to be able to buy when prices are low and sell when the prices are high. With a normal and 'traditional' long position the order is the one described above as the investor buys the stocks first and attempts to sell them later with a higher price in order to make profit. With short selling the buying and selling of stocks happens in a reversed order. The investor is selling the stocks first and then hopes to buy them back later with a lower price. Short selling is thus a way for an investor to try and benefit from the falling market prices. (Bodie et al. 2011, 107).

Table 2 Time of transaction in long and short positions

Transactions in long and short positions		
Time	t	t +1
Long position	buy	sell
Short position	sell	buy

There is also another distinctive factor that makes short selling substantially different from traditional stock purchases and sales. That factor is the fact that the short seller does not own the stocks at all in any point of the short selling process. The investor or short seller is just borrowing the stocks from a lender with the help of a broker to create a short position and later returns the borrowed stocks back to the lender to cover and close the short position. The lenders are usually institutional investors, who benefit from this kind of lending activity. (Angel & McCabe 2009, 240). For this lending process to be a reliable and fair transaction, the short seller gives some sort of collateral in the form of margin requirements and agrees to pay interest for the borrowed stocks. These are called as short selling costs and more of these can be found in the next section "Risks of short selling" in this study. After the short seller has been able to borrow the wanted stocks, the borrowed stocks are sold in the stock market. Then the short seller is waiting for the price of that or those securities to fall in order to make profit. After some time the short seller buys the stocks back and returns them to the original lender to cover the short position. (Bodie et al. 2011, 107-108). The returned stocks do not have to be exactly the same stocks because stocks that are traded on the stock market are identical to each other. The short selling process can be shown as a following figure 2.
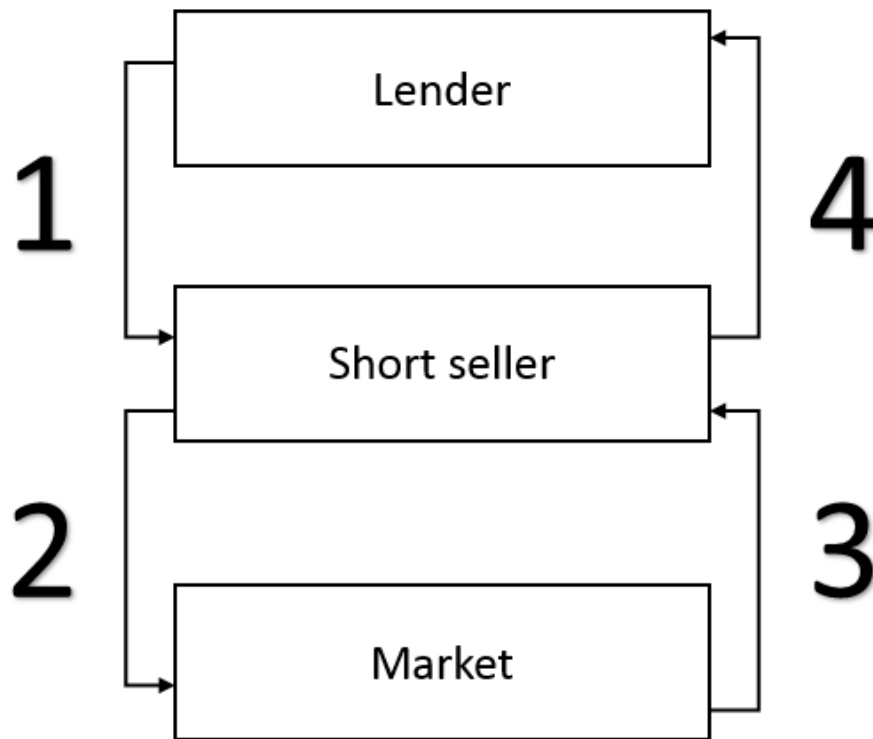
1. Short seller borrows the stocks
2. Short seller sells the stocks in the market
3. Short seller buys the stocks back from the market
4. Short seller returns the stocks to the lender

Figure 2 Short selling process

As the figure 2 above illustrates, the first step in short selling is the borrowing of the stocks. This phase might face some limitations as some stocks might not be available for borrowing. This limitation can be bypassed temporarily with naked short selling but still the restricted amount of the available stocks can seriously limit short selling. For this reason the stocks shorted are most often larger companies' stocks that are easily available for short selling purposes. The second step, selling the stocks in the market happens almost immediately after the stocks have been borrowed. By selling the borrowed stocks, short seller has created a short position. Between the second and third step is a significantly longer time gap than there is between any other sequential steps in this figure. During that gap the short seller is hoping that the price of the stock or stocks concerned will fall in order to make profit. The short position exists as long until the short seller buys the stocks back from the market and returns them to the lender. The average duration of a short position is very difficult to evaluate but some more or less rough evaluations claim that an average duration of a short position could be somewhere around 11 days.

However, it has to be mentioned that it is not uncommon at all that the duration of a short position is even several months. (Diether et al. 2009, 578).

As short sellers try to benefit from the falling stock prices, it is fair to argue that they are trying to predict or forecast bad times for stock markets. And as is the case in all predictions regarding the future, they are only predictions and even at the best just enlightened estimations. Thus short selling could be considered sometimes just as gambling. However, even though short selling could be considered sometimes just as risky gambling, short selling actually has several important roles in the stock market. Usually those are categorized into the following roles: providing liquidity, making price discovery process faster and offering negative opinions. Short selling provides liquidity to the marketplace and thus makes it more fluid and better functioning. Short selling also has an important role in price discovery process and thus enhances market efficiency. Related to the role of making the market more efficient is the role of providing also negative views to the market. By providing these alternative opinions, short selling could be considered as a tool for the stock markets to prevent overpricing. (Boehmer & Wu 2013, 287; Beber & Pagano 2013, 348).

Liquidity is one of the key elements of a fluid and liquid marketplace. On liquid marketplaces assets can easily be bought and sold without volume based changes in the asset prices. Short selling is one of the key factors to provide that desired liquidity to the market. In the possible absence of natural sellers in the stock market, short sellers might be the only ones offering stocks for others to buy. (Angel & McCabe 2009, 239–240). Short selling is responsible for a large share of the entire market volume. According to Boehmer, Jones and Zhang (2008, 491) short selling covers over 12.9% of the market volume. Some sources like Diether, Lee and Werner (2009, 604) hold short selling accountable for even larger numbers of liquidity in the marketplaces. They noticed that in the year 2005 short selling was responsible for 24% of liquidity in NYSE and 31% of liquidity on Nasdaq.

The other major role that short selling has in the stock market beyond providing liquidity is the role of providing negative opinions to the market and make the price discovery process more efficient. Short selling e.g. quickens the price adjustments in the stock market and also prevents overpricing by providing negative views to the stock market. (Angel & McCabe 2009, 241).

As mentioned earlier, naked short selling is a way to sell stocks short even though nobody is willing to loan the stocks of a certain company in exactly that moment. Naked short selling is a very specific type of short selling and has caused a lot of controversy. In naked short selling the short seller is selling stocks, which he or she does not yet possess. The naked short seller agrees a settlement date (t+n) with the buyer. The stocks are delivered to the buyer on the settlement date. The buyer however pays the current market price for the naked short seller immediately (at the moment t). The naked short selling process

can be examined more precisely through the figure 2 below. The step 1 is the date, when the short seller sells the stock to the buyer and receives the current market price. The step 2 is the settlement date, when the short seller has to deliver the stock to the buyer. To do that the short seller has to buy the stock form the marketplace for the current marketplace. The profit or loss that the short seller makes is the difference between the current market prices on those two dates. If the price on the settlement date is lower than the price on the date when the naked short selling position is acquire the short seller is making profit. Naked short selling has been a very controversial method since there are numerous cases when the naked short seller has not been able to deliver the stocks. (Angel & McCabe 2009, 239, 241).
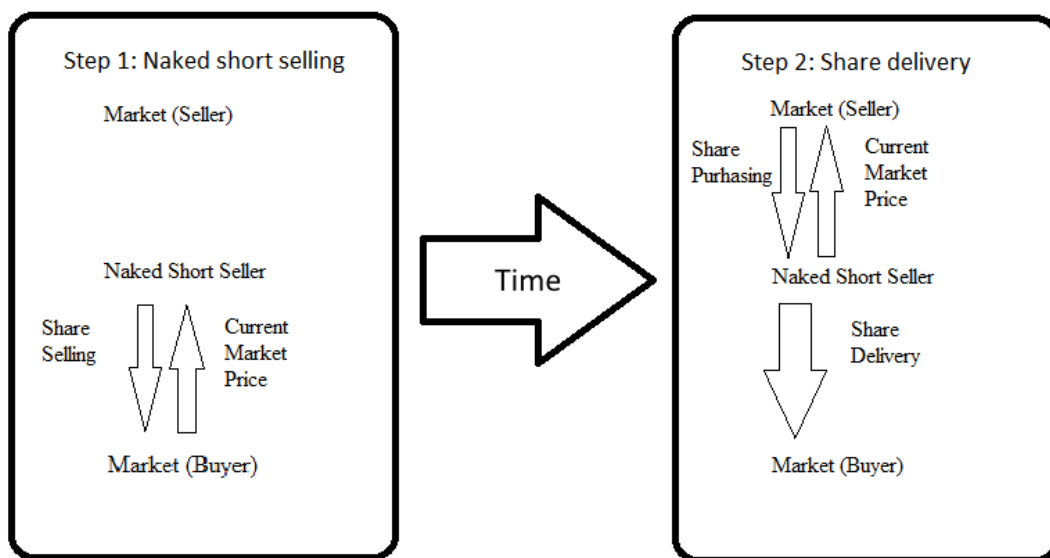
Figure 3 The naked short selling process

As stated earlier, the short sellers tend to be extremely profitable investors and they are generally thought to be a sophisticated group. Khan and Lu (2013, 1743, 1761–1762) found out that the short sellers, who front-run large insider sales for companies with low accounting information quality, are able to reach abnormal profits of over 3% in the following 20 trading days after the short position has been created. The short sellers seem to be very sophisticated since the front running of insider sales is strongly concentrated around those firms with poor accounting information quality.

Drake et al. (2011) combined the positive (buy) and negative (sell) analyst recommendations and short-interest with an inverse relationship in their study in order to find whether it is possible to trade profitably against the analyst recommendations. They found out that an investment strategy, which sells short stocks with positive analyst recommendations but high short-interest and buys stocks with negative analyst recommendations

but low short-interest, is able to reach abnormal positive returns. The short sellers have different incentives than the analysts do as the short sellers actually place even large amounts of capital in stake. The analysts on the other hand tend to over-recommend stocks since they benefit from high frequency trading. Even though the analyst recommendations are widely followed and appreciated, it is actually the short-interest that matters more and should be monitored more closely instead of analyst recommendations.

Related to the theme of combining short sellers' transactions and financial analysts' recommendations is the study of Christophe et al. (2010). They were able to find that there seems to be abnormal amounts of short sales prior to the analysts' recommendation downgrades. Thus the short sellers were able to proactively take actions to benefit from the stock price decreases caused by the analysts' recommendation downgrades and thus reach abnormal returns. However, Christophe et al. (2010, 105) notice that the front-running of analyst recommendation downgrades can be caused by two factors. Either the short sellers are able to predict the upcoming downgrades from the companies' financial situation or some entities are tipping short sellers from the upcoming downgrades. Even though the data of Christophe et al. (2010) supported both of those factors, there was stronger support for the tipping of short sellers. This means that the short sellers are using all possible means, including even the questionable ones, to reach higher returns.

Boehmer et al. (2010) noticed that the positive signals from the short sellers are absorbing very slowly to the stock prices. That is, the stocks with very low short-interest are able to reach statistically significant positive returns in even greater scale than the heavily shorted stocks reach negative returns. This means that not only the short sellers are able to recognize the peak of the stocks with low or negative future returns, they are also able to recognize the top stocks with positive future returns and avoid shorting those stocks.

Desai et al. (2006, 89) remarked that unlike other market participants, short sellers are able to identify companies with dubious earnings reports that need to be restated later. Thus the short sellers are able to go short before the restated reports with worse financial figures are published. These short positions are naturally profitable. On top of all these illustrations, Desai et al. (2002) among other similar studies have been able to find out that heavily shorted stocks reach negative monthly returns of almost -1%. All of these examples are a proof that short sellers indeed are well-informed and enlightened investors, who are able to reach higher returns. Considering the higher risks of short selling that are introduced next the respect towards short sellers' returns should not at least decrease.

2.2   Risks of short selling

As mentioned earlier, short selling is generally thought to be far more risky than the tra-
ditional long position investing. Short sellers are betting against the historical market
trend, they face the possibility of unlimited losses and those losses can realize sometimes
quickly in the form of short squeeze. There are various costs in short selling that affect
the possible returns and on top of these, the short sellers need to be masters' of timing.
These risks of short selling are covered next.

Betting against the market

One of the oldest wisdoms considering stock markets is that in the long run the stock
markets have been rising. Thus as in the long run the market prices have increased short
selling on average in the long run would have been unprofitable. This historical frame-
work or fact makes short selling look like gambling in some ways. If the short seller is
not an informed investor the short position will on average be unprofitable. As can be
seen from the following figure 4, the returns for a long position have on average been
11.4%. This means that the average returns for a short position have been negative at -
11.4% per annum. And this figure does not even include different short selling costs.
However the returns have varied a lot during different years. At some years the returns
for long positions might have been even over 40% and at some years there might have
been even greater than -20% negative returns. On average however, the short positions
would have generated remarkable losses in the history.
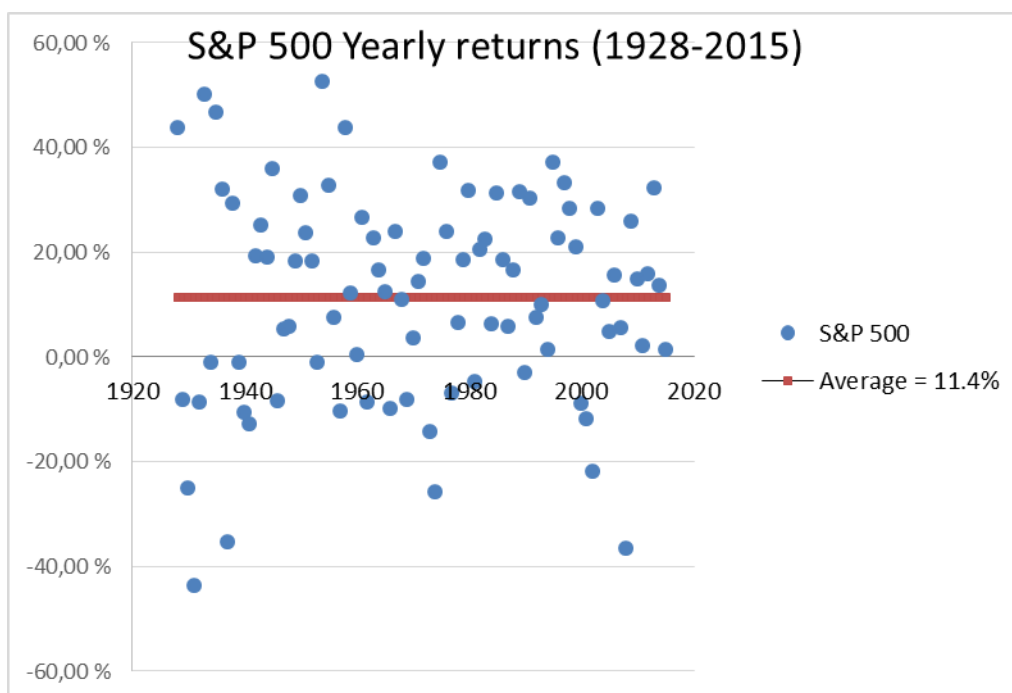
Figure 4 S&P 500 yearly returns

Infinite losses and restricted winnings

Short selling includes also several other risks than just the risk of betting against the historical trends. Whereas the losses of a normal long position are restricted to 100% as one can only lose the capital that has been invested to the stock, in short selling the losses can theoretically be infinite. On the other hand a short seller can achieve at most the profit of 100%, whereas the theoretical maximum profit of a long position is infinite. The theoretical maximum losses and profits occur, if the stock price goes to zero or if it reaches an 'infinite' value. The figure 2 below illustrates the profits and losses of a short position for a share that has been shorted at 10€. (Pettengill et al. 2015, 92).
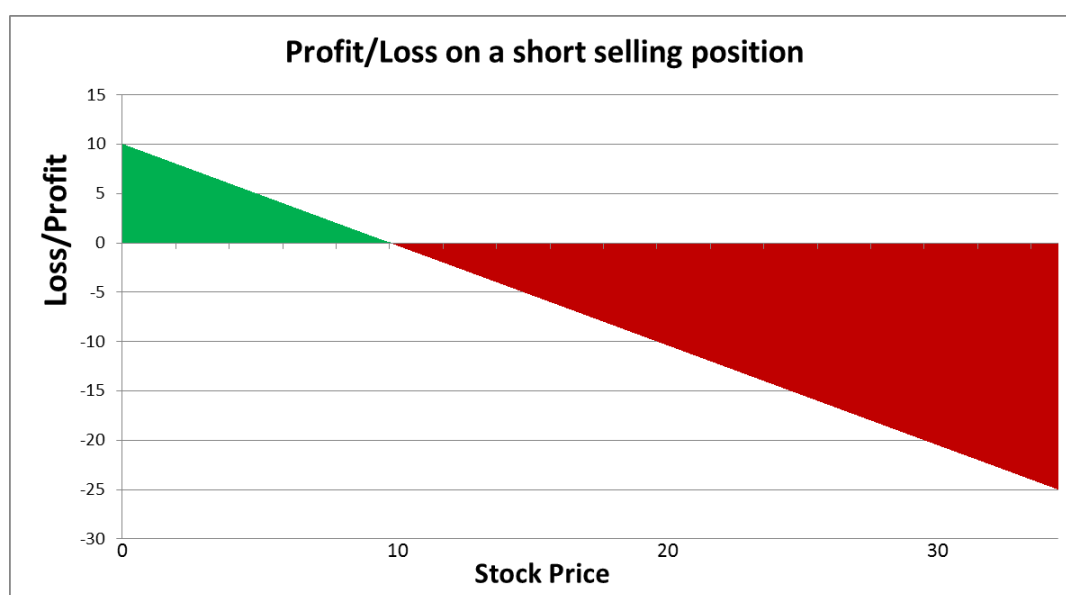
Figure 5 The restricted profit and infinite loss of a short position (Pettengill et al. 2015, 81)

The Short seller makes a profit on the green area of the figure above i.e. at any point, when the stock price is below the 10€ stock price. Since the stock price cannot reach negative values, the maximum profit or returns for a short seller in this case is 10€ i.e. 100%, when the stock price reaches a value of zero. In practice, the exact 100% returns are more theoretical since the value of a stock rarely goes to zero and the short sellers often are happy with more modest returns.

However, if the stock price increases from the level of 10€ the short seller is making a loss. For example at the 20€ stock price, the short seller makes a 10€ loss i.e. return of -100%. As the stock prices can increase indefinitely in the stock market and do not have any theoretical maximum point, the loss of a short seller can also increase to an infinite level. If a short seller decided to sell the S&P 500 index short in the beginning of 1928 he or she would now have almost -3000% of a return. Actually these theoretically infinite

losses can and have been realizing a lot faster in the history. Short squeeze is an example, which causes sudden and almost infinite losses for short sellers. It will be introduced next in this thesis.

Short squeeze

Short squeeze is one of the biggest nightmares that a short seller may encounter. In a nut shell short squeeze is a situation, where there is a serious lack of supply of a heavily shorted stock. The short seller is thus unable to cover the short position and has to pay exorbitant prices for the stocks to cover the short position. Simon (1994, 44) calls short squeeze as the "loser's nightmare" and that concept is an excellent way of pointing out the harmfulness of short squeezes for short sellers.

Short squeezes are usually formed, when a larger market participant or an alliance of market participants decides to manipulate the market by cornering[12] it. As a result of this market manipulation the stock price begins to increase above its intrinsic value and that makes short sellers interested of shorting that stock. When short sellers sell the stocks short, the market manipulator continues buying all of those shorted stocks until there are no stocks left to be shorted. At this point the market manipulator can theoretically own up to 100% of all the company's floating stocks. It means that while the market manipulator owns 100% of the floating stocks, there still might be e.g. 10% of short interest ÷ float -ratio. It is in this moment when the short sellers find themselves in trouble. As the original lenders want their stocks to be returned, the short sellers are unable to buy those stocks back. The market manipulator can ask even ridiculous amounts for selling those stocks to short sellers as the manipulator is the only participant who is holding those stocks. Thus the stock prices soar into new heights. (Järvinen & Käppi 2004, 799).

Probably the most famous and notorious short squeeze is the Volkswagen short squeeze in 2008. Volkswagen was heavily shorted stock back in 2008. The short interest was high because the car industry was facing serious challenges at that time, but still the price of the Volkswagen stock had steadily increased. Porsche had been buying the stocks of Volkswagen constantly during the past three years and when it revealed in October 26th of 2008 that it owned a major part (~75%) of all the floating Volkswagen stocks the short sellers found themselves cornered. As that 75% covered almost all of the stocks that were available for trading as the rest of the stocks were owned by passive investors like the German government and different index funds, the stock price began rocketing. As the short sellers were trying to cover their short positions the price of the Volkswagen stock increased in just a few days from a bit over 200€ to over 1000€ and that made

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[12] Cornering the market means acquiring a significant proportion of a certain company's shares. (Järvinen & Käppi 2004, 799.)

Volkswagen as the world's most valuable company for a short period of time. (The Economist 2008, 85)

The original owner (lender) of the stocks might not know at all about the loaning of stocks to short sellers. Most of the time the lender does not even have to know of the loaning action. This is because if the original owner of the stocks wishes to sell the loaned stocks, the broker can just borrow stocks of the same company from other investors using the same broker and return those stocks to the lender. During short squeezes however, there just are not any stocks to borrow from other investors and thus the short sellers need to return the stocks immediately to the lender. This might lead to a furious bidding race between different short sellers and that makes the stock price increase even further. (Bodie et al. 2011, 109).

Margin trading and the costs of short selling

Short selling is conducted through margin accounts. To be able to sell short a margin account is required. Margin account is a specific type of an account. In some cases the margin account makes leveraged trading possible. In the case of short selling the margin requirements are quite different. In order to be able to enter a short position the margin requirements for a short sale account is 150%. It means that an investor needs to have the full value of short position (100%) in the account plus an additional 50% as collateral in order to set up a short position. This arrangement can be seen in the following table 3. (Regulation T)

Table 3 Initial margin requirements

Number of shorted stocks	Stock Price	Short position value	Margin requirement
1000	10,00 €	10 000,00 €	15 000,00 €

Once the short position has been acquired, the margin requirements however do change. The minimum margin requirement for ongoing short positions is 100% of the current market value of shorted securities plus at minimum an additional 25% in the United States and 20–30% in Europe of the current market value of the securities on the margin account. However, if the shorted stocks decrease in value, the margin requirement is 150% of the current market value of the short position. If the margin account does not meet those requirements the short seller receives a margin call. It means that the short seller has to deposit more money to the margin account or otherwise the short position will be closed. Due to the features that margin account has in form of margin requirements, the theoretical possibilities of infinite losses are limited in practice. If the short position is not profitable, the short seller might have to deposit more money to the margin account or the short position will be closed. More often than not the short sellers choose

to close the short position. So theoretically the infinite losses of a short position are possible, but in practice the nature of margin account is a restricting factor for those losses. The margin requirement of over 100% for the ongoing short position means that the short seller might have to deposit more money to the margin account if the shorted stocks increase in value. However, if the shorted stocks decrease in value some margin is released and the investor can withdraw cash from the margin account. (Bodie et al. 105–106; Regulation T).

The same can be noticed from the table 4 below. In the table 4 the margin requirement for ongoing short position is either 125% or 150% depending on whether the stock increases or decreases in value. The original stock price was 10.00€ and thus the initial margin requirement is 15 000€. As the value of the shorted stock increases above 12.00€ the short seller receives the margin call and has to either close the short position or deposit more money. If the stock price increases to 15.00€ the short seller has to deposit 3 750.00€ to the margin account. However, if the stock price decreases, the short seller can withdraw money from the margin account. If the stock price decreases to 8.00€ the short seller can withdraw 3000.00€ from the margin account and the margin requirement would still be met. If the stock price decreases to 5.00€ the short seller could withdraw 7500.00€ from the margin account. (Regulation T).

Table 4 Notional margin requirements

Number of shorted stocks	Stock Price	Short position value	Margin requirement (125% or 150%)	Margin call
1000	12,00 €	12 000,00 €	15 000,00 €	- €
1000	15,00 €	15 000,00 €	18 750,00 €	- 3 750,00 €
1000	8,00 €	8 000,00 €	12 000,00 €	3 000,00 €
1000	5,00 €	5 000,00 €	7 500,00 €	7 500,00 €

The arrangement with margin requirements creates costs for short sellers. Not only the short sellers need to hold 100% of the money received from selling the stock short in the margin account they have to also have up to even 50% of additional collateral. This creates opportunity costs[13] for short sellers. The money that is held as collateral because of margin requirements could have been invested in other profitable investments.

In addition to the margin requirement related costs, the short seller has to pay the usual commissions to the broker for stock transactions and some sort of fee for the provider of the shorted stocks. This fee paid to the lender varies a lot depending on the supply of the stocks available to short selling. Stocks that are easy-to-borrow have an annual fee as low as 0.05%. On the other hand the price of the hard-to-borrow stocks is remarkably higher

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[13] While investing into one asset, the investor loses the opportunity for the returns of other asset. Opportunity cost is the concept, which refers into that idea of the lost return in the optional investments. (Spiller 2011, 595)

as those annual fees can rise even above 10%. Usually the larger companies' stocks are those with the smaller fees and smaller companies' stocks have higher fees. This is one of the reasons why the larger stocks are much more popular among short sellers than the smaller stocks. (Cohen et al. 2007, 2068–2069).

Timing

One of the key elements of short selling is to find overvalued stocks just before the stock prices begin to slump. Though it sounds fairly simple, it is easier said than done. It is not enough for a short seller to find overpriced securities. The short seller has to buy them just before the stock price starts falling. Thus timing is everything in short selling.

   A good example of the problems with timing is the dotcom bubble that burst in 2000 (Figure 6). Even though the markets kept rising throughout the three previous years, everybody was stunned when the market actually collapsed. For example if an investor was sure that the intrinsic fundamental value of the index was 2000 points, he or she might have gone short soon after the price of that index went over that hypothetical intrinsic fundamental value in the beginning of 1999. As noticed on the previous section about the margin calls and maintenance margins, the short seller might have been forced due to solvency issues to close the short position long before the index begins to fall. Thus even if a short seller is right about overvaluation like might have been in the case around dotcom bubble he or she could have still made a huge loss with short position. Also, even though the market would not increase from the assumed overpriced value, it does not mean that the prices begin decreasing immediately. The prices can remain at the same level for a long time and as the short seller has to keep collaterals in the margin account, the opportunity costs might force the short seller to close the short position. Timing is all that matters. As the old Wall Street quote goes that "Markets can remain irrational a lot longer than you and I can remain solvent." The problem of timing is real for all price fluctuating securities, but for short sellers that problem can be more actual than to other investors, since short sellers face the possibility of infinite losses and might be forced to close the short position. (McGuigan & King 1974, 567).
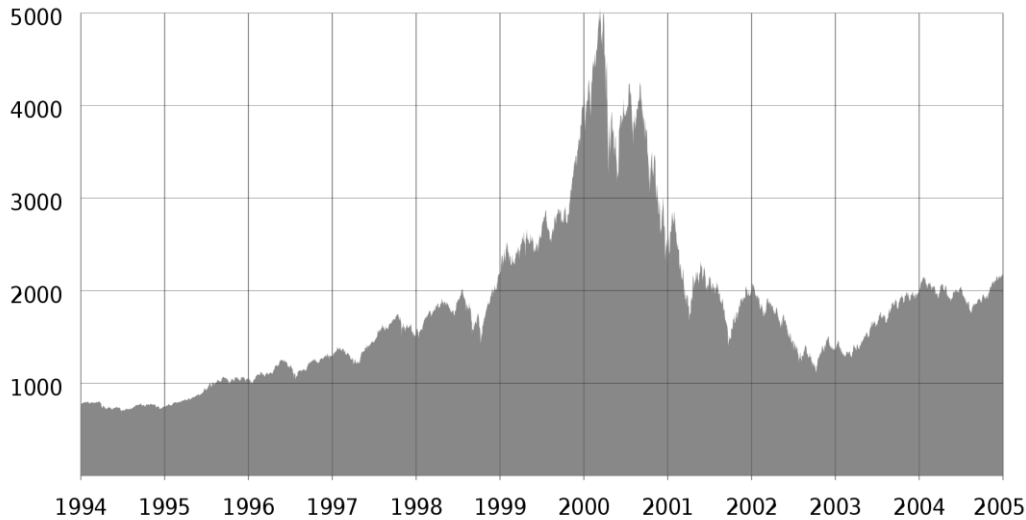
Figure 6 Dotcom index

Bid-ask spread and reimbursed dividend

Bid-ask spread affects all investors, but especially crucial it is to short sellers. Since the profit of a short selling position is $(P_t - P_{t+1})$ it is important to notice, that the bid-ask spread is affecting negatively to the profit of the short position. Table 5 presents an example of a bid ask spread.

Table 5 The Bid-ask spread

Bid	Ask
€ 20	€ 21

The short seller has to sell the stocks first at bid price (€ 20). And when the short seller wishes to buy the stocks back the ask price is needed to be paid. Thus the short selling position's profits are the profit of a position minus the bid-ask spread. This creates an interesting dilemma for short sellers. The larger spreads deduct the profit made from a short position and thus might give less incentives to go short. On the other hand the larger spreads are often associated with uncertainty as the market participants are disagreeing with each other of the true value of certain security due to asymmetric information. These uncertain times give opportunities for the well-informed short sellers to make profitable investments. Luckily for the short sellers, the bid-ask spread is rarely so extreme as it is

in the example of table 5. More usual spreads are around few cents. (Boehmer & Wu 2013, 296, 299; Diether et al. 2009, 577).

Dividends create also generally undesired situations for short sellers. Since the short seller just borrows stocks from the original owner, the original owner is still entitled to the dividends paid by the company. Thus the short seller is obligated to reimburse the dividends for the original owner from his or her own pocket. This creates extra transactions and extra costs for the short seller. There is usually less short selling just before the dividend dates. (Dechow et al. 2001, 80.)

All in all it is fair to say that short selling includes more risks and especially more specific risks than regular stock trading with long positions, as the only risk for the long position is that the investor might lose the invested amount whether the price of a certain security happens to go to zero. The short sellers face the risks of increasing market prices, the possibility to infinite losses, short squeezes can really hurt short sellers, margin accounts create further costs for short sellers and due to the margin calls the short sellers may be forced to close their positions too early. Also the bid-ask spread and the dividends create unwanted risks for short sellers. On top of all these problems, the short sellers need to be the masters of timing in order to be profitable. When all of these risks are included in the evaluations, it is almost a wonder that short selling is a popular tool for some investors. And even greater amazement is that the short sellers are able to beat the index return consistently as shown in the previous section. (see e.g. Khan & Lu 2013.) The short sellers thus indeed are informed investors. The next section of this study is focusing on, from where is that information advantage originating from according to academic literature.

2.3 Predictive and reactive short sellers

Since short selling includes so many risks, then why would anyone want to practice it? One argument is that short selling is an excellent way to practice hedging. However, short sales done in hedging purposes cover only one part of all the short sales conducted. There are large numbers of short sellers who try to profit and do profit purely from short sales themselves. As mentioned earlier, short selling is a way of making profits when the market prices are falling. In the history, the development of stock prices has been positive in the long run as a whole as was noticed in the previous section of this study. Combining that with the possibility of infinite losses for short sellers, should the prices continue soaring indefinitely and well, one could predict challenges for the short sellers. Not to even mention other risks, which were covered earlier. However, every now and then the whole

indices take setbacks not to mention what kind of price drops the stocks of single companies may undergo. Those falling stock prices create opportunities to make profit for enlightened investors in the form of short selling. And according to academics, the short sellers seem to be those enlightened or well-informed investors, who are able to make profits despite the positive trend in development of stock prices in the long term history. (See e.g. Khan & Lu 2013; Drake et al. 2011; Boehmer et al. 2010; Christophe et al. 2010; Desai, et al. 2006).

According to Khan and Lu (2013, 1743) short sellers can be considered as: 'particularly well-informed and sophisticated investors.' The reasoning behind that idea is based on the following concept. As short selling is more risky and includes higher costs, it is not in the incentives of the relatively less-informed investors to go short in other than hedging purposes. Thus the only counterparts that benefit from profit targeting short selling are the ones with strong beliefs of negative price development, i.e. the well-informed investors. The uninformed or less-informed traders are thus unwilling to sell short. (Diamond & Verrecchia 1987, 279–280). And that reasoning appears definitely to make sense since the short sellers seem to be able to beat the market index consistently.

Short sellers seem to be able to do two things especially well or skillfully. Firstly, the heavily shorted stocks indeed have negative returns. But secondly, and more significantly the short sellers seem to be able to identify stocks that are perhaps undervalued because the stocks with low short interest or no short interest at all appear to have great positive abnormal returns. (Boehmer et al. 2010, 80). To speak in concrete numbers, in the NYSE during the year 2005 the increase of short selling by 10% of share volume seemed to decrease the future returns of that stock by 0.94% per month. A trading strategy that combined the low and high short-interest stocks by buying the low short-interest stocks and by short selling the high short-interest stocks developed an abnormal return of 1.39% per month. The figures were quite similar for Nasdaq stocks. (Diether et al 2009, 576).

But where does the information advantage of short sellers lie? When examining the capability of short sellers there are two specific types of short sellers who seem to differ substantially from each other. Short sellers can be either predictive or reactive. Short seller is thought to be predictive if the short position is taken before significant information announcements such as quarterly earnings announcements or insider sales information are published. Thus the short seller is trying to predict the upcoming information or has private information considering the company, of which he or she is trying to benefit. A reactive short seller reacts to public information and takes short positions after a piece of significant public information has been released. Although the short sellers are generally thought to be sophisticated investors, it looks like the sophistication is based on different arguments among different short sellers. (Alexander et al. 2014, 255).

The predictive short sellers or speculative short sellers as they are sometimes called are the ones that try to anticipate events beforehand and make profit with correct predictions. The predictive short sellers could actually be divided further into two subgroups. Those groups would be the purely speculative short sellers and short sellers who have access into some kind of privileged private information. The purely speculative short sellers are the ones that try to make predictions of future negative news based on the public information available to everyone. The predictive short sellers that make their investment decisions based on private information are a more complex group to approach. As the stock markets are heavily regulated and e.g. trading on inside information is punished, some might wonder what kind of information these "informed predictive short sellers" are able to exploit. Khan and Lu (2013) studied this subject. They were able to notice that short selling activity increases significantly just days before a large insider trade and is at its greatest just before a large insider trade is conducted. They named this phenomenon as front-running insider sales.

There are many ways to front-run insider sales. Most of these are illegal or at least unethical procedures and include information leakages in one way or another. Khan and Lu (2013, 1744–1745) listed these procedures. They claim that the methods to front-run insider sales are through order exposure, by using squawk boxes, by snooping confidential emails or by delaying insider clients' orders.

Order exposure is a problem for large trades and block trades. As some (insider) trading orders are too big to be executed immediately they need to be shopped around in order to find enough demand and counterparts to execute the trade successfully. Especially problematic are the large orders in less liquid stocks or smaller companies. While being shopped around different brokerages in order to be filled, the order is revealed to many people. Some of these people might use this information themselves in trading or even hint others of this revealed insider trading order. This is the first method of how to front-run insider sales. (Khan & Lu 2013, 1744).

Another way to gain information advantage from the insider trades is to use the so called 'squawk boxes'. Squawk boxes are specific types of telecommunication devices that connect multiple parties with each other. Some brokers have placed these squawk boxes in such a way, that all the information that a client gives from an upcoming insider sale e.g. via telephone to the broker, goes at the same time to traders. By using this kind of method the information that e.g. an insider gives through telephone for the broker goes at the same time for traders that can use this information in trading. Thus the traders can rapidly trade ahead before the actual insider trade ever has taken place. (Khan & Lu 2013, 1744–1745).

One of the more easily understood procedures to front-run insider sales is by simply snooping confidential emails. By snooping corporate insiders' confidential emails, previ-

ously unknown information from not only insiders' planned trades but also from the company itself can be revealed. It goes without saying that this type of action is not only unethical but also illegal and severely punished. However, despite of that the email breaches are nowadays more and more common and every now and then people are found guilty of snooping emails and using that information in their trading. (Khan & Lu 2013, 1744–1745).

Finally, the last thing in the list of Khan and Lu (2013, 1744–1745) is the delaying of clients' orders. This procedure happens, when a trader or broker delays the orders of a client in order to be able to trade ahead of them. This procedure differs from the second procedure (using squawk boxes) on the list because in that procedure the information was just leaked to other parties in real time and no deliberate delaying was necessarily happening.

Even though theoretically the differences between different predictive short sellers are easily understood, it is difficult to separate the short sales done by purely speculative predictive short sellers from the short sales done by informed predictive short sellers. Thus the short sellers are categorized into a larger 'predictive' group based on the timing of the trade. Less surprisingly the predictive short sellers are able to beat the market return as a larger group. (Alexander et al. 2014).

Reactive short sellers are short sellers who instead of predicting public information react to the released public information. Thus they are using the exactly same information as other non-privileged market participant groups. Perhaps even a bit surprisingly the reactive short sellers seem to beat not only the market return but also the returns of the predictive short sellers. The predictive short sellers are also able to beat the market return but not even they are able to beat the reactive short sellers' returns. Thus the superiority of short sellers does not occur only from obtaining some private information prior to earnings or other important announcements but also and even more because of other factors. (Alexander et al. 2014, 255).

This result puts the short sellers under a new examination. How is it possible that the reactive short sellers are able to beat the market return and the predictive short sellers if the information used is public information available to everyone? Engelberg et al. (2012) offer a reasonable explanation to this phenomenon. It is not the information that the short sellers obtain prior to important announcements that makes them superior investors. It is the capability to process that public information in an overwhelming manner. So instead of being just lucky speculators or some kind of privileged investor group that has access to different private information before others, the short sellers' superiority is derived from their analyzing skills of the existing data. If this truly is the case, then the stock market efficiency can be questioned.

As short selling is risky and there are economies of scale in short selling, short selling is mostly practiced by large institutional investors. Those institutional investors have

more resources and knowledge to exploit the public information in order to reach profits. One way to think of those abnormal returns is that the institutional investors exploit noise traders'[14] lack of knowledge and willingness to trade. Even though the information advantage of short sellers is acknowledged, very little of those tools or ways to reach that advantage is known. Some patterns of short seller's behavior has however been recognized and those patterns or short selling strategies will be covered in the next section "short selling strategies".

2.4 Short selling strategies

As noted on the previous section, there exists different kind of short sellers. These different short sellers also follow different short selling strategies. Although the short sellers are generally thought to be sophisticated investors, it looks like the sophistication is not equally distributed among different short selling strategies with different short sellers. Zhao (2014) listed different short selling strategies found by academics. These short selling strategies include the use of the superior knowledge of the fundamental information i.e. the informed trading strategy (e.g. Boehmer et al 2008; Cohen et al. 2007), but also other strategies like contrarian strategies (Diether et al. 2009), liquidity providing strategies (Diether et al. 2009), market trend chasing strategies (Lamont & Stein 2004) and opportunistic risk taking strategies or pure speculation, where short sellers are just taking their chances in uncertain situations (Diether et al. 2009). On top of that, short selling is also used as a hedging tool in order to reduce risks with offsetting positions. All of these strategies are based on different levels of information and some short positions are far more informative than others. Thus it is important to know that even though short sellers as a unified group seem to be well-informed there most definitely are better and worse informed short sellers and short positions among them. Thus the separation of those better and worse informed short sellers should be considered. (Boehmer et al. 2008, 492).

There is plenty of evidence that short sellers are sophisticated investors and are able to reach high abnormal returns. The informed trading strategy is the strategy used by the sophisticated short sellers. This short selling strategy covers all transactions that are based on being better informed than other market participants. It means that also the illegal short selling activities based on e.g. inside information are a part of this category. Even though the stock markets are well regulated and trading on inside information is harshly punished, inside information based short sales cannot be entirely excluded even though their existence is hard to prove. In this informed trading strategy the short selling transactions

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[14] Noise trader is a trader who does make trades based on actual fundamental information, but based on noise. (Black 1986) More on noise trading in the section 3.2.4 of this study.

are based on the utilization of the public and private information to target overvalued stocks and on the other hand to avoid relatively undervalued stocks. This strategy is based purely on the information advantage that the short sellers have due to different factors that were also at least partly covered in the previous section of this study. Short sellers that have information advantage tend to be extremely profitable investors. Informed short selling is practiced by different groups, but the most informed short positions are the non-programmed institutional short positions. (Boehmer et al. 2008).

Another recognizable short selling transaction pattern or strategy is the contrarian short selling strategy. Diether et al. (2009, 576, 604) notice that the short selling activity or volume seems to be highly dependent on the short-term historical returns. The higher (lower) the short-term historical returns are, the higher (lower) the short selling activity tends to be. This points out that not every short seller trades purely based on the fundamental information. At least some short sellers are using more technical tools in order to make profits. In this case the contrarian investors are trying to predict short-term irrational price increases with technical analyses and try to profit from those price fluctuations. The returns of contrarian short sellers are also significantly positively abnormal.

One short selling strategy is the liquidity provider strategy. In this strategy the short sellers are acting as voluntary liquidity providers during the times of high buy-order pressure. When the buy-order pressure is high for a certain stock, the value of that stock increases on that day. That price increase is not based on any fundamental changes in the company but it is based on the liquidity effects. As the buy-order pressure is high, there is not enough supply for that certain stock and thus the stock price undergoes volume based increases. It is in these situations when some short sellers step up and provide liquidity in the form of short selling. Later, when the buy-order pressure has declined and the value of that stock has reverted close to its intrinsic value the short sellers buy the stocks back and close their positions. Voluntary liquidity providers are also profitable short sellers. (Diether et al. 2009, 577, 581).

Unlike the contrarian short sellers there are short sellers that try to follow the market trend with market trend chasing strategies. Investors following this short selling strategy tend to go short more (less) often when the stock market has been decreasing (increasing). Whereas the contrarian short sellers follow more single stocks and irrational fluctuations within their prices, the market trend chasers follow entire indices. When the entire market starts falling the short sellers try to catch the current market trend and perhaps cause even greater panic with increasing short selling and thus try to profit from further falling prices. The market trend chasers are a lot like momentum traders. (Lamont & Stein 2004)

Another recognizable short selling pattern is the opportunistic risk bearing strategy i.e. the speculative short selling strategy. This type of short selling happens during times of uncertainty. When the market participants are agreeing on prices and there is not much of uncertainty in the air, the price volatilities will diminish to almost nonexistent levels.

These situations are not attractive to short sellers as the stock markets are most likely reasonably priced. However, during uncertain times the opposite happens. As the opinions on the stock market differ strongly, there will be high intraday price volatilities. It is during those times, when some short sellers become active and try to benefit from that uncertainty. (Diether et al. 2009, 577).

Even though Diether et al. (2009, 577, 602–604) admit that all of the short selling strategies or patterns mentioned above do exist, they cast some doubts over the existence of opportunistic risk bearing short sellers. In their study they found out that the evidence for the existence of such short selling strategy is only weak. Also they suggest that instead of acting as voluntary liquidity providers during high buy-order pressure, the short sellers are willing to provide liquidity only during times when the stock price exceeds the fundamental value of that stock. Thus the information advantage that the short sellers have over the company fundamentals is actually the source of such short selling instead of acting on a voluntary liquidity providing basis.

One last short selling strategy is the uninformed strategy. This strategy is not practiced to reach profits with short sales. It is a tool for hedging in order to safeguard profits elsewhere. Short selling gives unique opportunities for hedging and it is quite popular tool in hedging. When short selling is practiced in hedging purposes, the short seller is not interested whether the shorted security is overvalued or not. The name of this strategy (uninformed strategy) should not be interpret too malignantly as the hedgers are most certainly not stupid. They just are not that interested how the short position performs. (Boehmer et al. 2008, 492).

Briefly, there are different kind of short sellers. Those short sellers also follow different kind of short selling strategies. The strategies vary from using the information advantage in the form of informed trading strategy, to more technical analysis based strategies. The short selling strategies, which are formed more on the basis of the historical price developments by using different technical analyses are the market trend chasing strategies and contrarian strategies. The informed trading strategy on the other hand is based purely on being better informed and using that information advantage. Somewhere in the middle between these two ends is the liquidity provider strategy. Additionally, the academics have been able to recognize at least some forms of purely speculative short selling in the form of opportunistic risk bearing strategy. On top of all these profit targeting short selling strategies, short selling is also used as a tool for hedging in order to protect profits elsewhere.

3 MARKET EFFICIENCY

3.1 Rational expectations asset pricing

The ruling paradigm in the finance is still the neoclassical side of finance, not least because of the efficient market hypothesis. The neoclassical finance has received some firm criticism in the past decades e.g. for trusting the markets and people operating on them for ability to make always rational decisions. However, it has endured quite well and still usually is for example the first financial theory that is taught for finance students in universities all around the world.

The neoclassical side of finance believes that markets are efficient and the counterparts operating in the marketplace are both rational and have full information about the fundamentals of the securities. It means that the assets and securities are priced rationally on rational expectations. And that is true in many cases. Even the critiques of neoclassical finance agree to some extent with that. For example Black (1986) stated that in his opinion the markets are most of the time efficient with most of the time meaning around 90% of the time.

How is the efficiency and the rationality in the marketplace then judged? Well, the prices should always reflect the available information and thus the prices should be at rational level all the time in order the markets to be efficient. At the current moment it is almost impossible to evaluate whether the prices are rational or not but when the historical prices are examined, the efficiency or the lack of efficiency in the marketplaces can be estimated.

In the finance it is vital to evaluate the intrinsic value of a certain security. That is, in order for the marketplaces to be efficient, the market participants should be able to value securities close to their intrinsic values. One tool for this kind of evaluation is the dividend discount model, i.e. the Gordon growth model, which is also the first model taught to finance students all around the world. The dividend discount model uses dividends as a representation of free cash flow and discounts the value of the future cash flows. In the dividend discount model there are three factors that determine the price of the security (=P) now. Those three factors are the dividend one year from now (=D_1), the cost of the equity capital (=k) and the constant growth rate for dividends (=g). Thus the model equals as following:

$$P = \frac{D_1}{k - g}$$

From those factors, the growth rate, g, is the one that the market counterparts are trying to evaluate through price discovery and information gathering to be able to value the securities correctly. The success of the market participants in the evaluation of the growth rate is the factor that either makes markets efficient or inefficient. If the market counterparts are able to give an optimal estimate of the growth factor the markets will be efficient. It is important to notice that in order the markets to be efficient the estimation of the growth rate does not have to be 100 percent correct, just close to its true value. However, if there are big mistakes in estimating the growth factor, it will result as market inefficiencies and pricing mistakes. (Gordon & Shapiro 1956; Shiller 2003, 85).

The process of evaluating the growth factor g is called the price discovery process. Price discovery process is the main function for all working marketplaces. It is a dynamic process through which the buyers and sellers are pricing the securities in the marketplace. The more efficient the price discovery process is, the more efficient the prices and thus the marketplaces are. Short selling is a tool to quicken the price discovery and thus a tool for making the markets more efficient. Short sellers are able to correct potential short term overpricing in the stock markets quickly and thus make the price discovery process more efficient. (Diether et al. 2009, 605).

3.1.1   *Efficient market hypothesis*

Ever since the efficient market hypothesis (EMH henceforward) was first published (Samuelson 1965) and shortly after enhanced to its better known form (Fama 1970) it has become one of the most famous and often cited theories among finance. When applied to the stock market, the EMH suggests in a nutshell that the stock markets are truly efficient if the stock prices are fully reflecting available information at any given time. Thus the actual price of a security at any point of time is a good appraisal of the intrinsic value of that certain security. (Fama 1995, 76).

In the EMH the market efficiency is divided into three forms. Those forms are: weak form, semi-strong form and strong form. These subsets or categories are set to allow the academics to observe different levels of information that the stock prices 'fully reflect'. In the weak form of market efficiency the stock prices are assumed to fully reflect the historical stock prices. In the semi-strong form of market efficiency the stock prices are assumed to fully reflect the publicly available information. Finally, in the strong form of the market efficiency the stock prices are assumed to reflect all information, even the information that different privileged investor groups have such as the ones with inside information. (Fama 1970, 383, 388).

When the stock prices fully reflect a certain subset of information it means that there are no possibilities to beat the market return by using that subset of information. In the

case of the weak form of market efficiency, the use of the historical stock price information will not allow any investor to beat the market return. This would rule out the claims that just the use of technical analysis[15] could help investors to beat the market return. (Fama 1970)

In the case of the semi-strong form of market efficiency there is not any publicly available information that could help the investor to beat the market return. Thus making investment decisions based on publicly available fundamental information of the company would not help the investor beat the market return since all the publicly available fundamental information is already included in the price of a certain security. However, different privileged investor groups such as ones with inside information are able to reach abnormal profits in the semi-strong efficient markets. The semi-strong form of market efficiency covers also the weak form of market efficiency and thus rules out the same things as the weak form of market efficiency does. (Fama 1970)

In the strong form of market efficiency the market return is practically unbeatable. Thus not even the use of inside information or any other existing information could help the investor to beat the market return. It means that not the use of historical price information (weak form), present public information (semi-strong form) nor the use of unreleased future information (strong form) could help the investor to beat the market return. (Fama 1970).

As already mentioned, the key into the efficient markets is that the prices should fully reflect different kind of information. In order the prices to reflect all that information, the marketplaces require a large number of rational investors competing in the stock markets. While competing and trying to beat other investors they are searching all possible information that might have an effect to the future market prices and thus they are searching for information that might give them edge compared to other market participants. Thus whenever any new information becomes available it will instantly be transformed in to the stock prices by these competing skilled entities. This competition between these capable entities will lead to a scenario where the market prices at any given time are fairly good estimates of the intrinsic value of the securities. (Fama 1995, 76).

Grossman and Stiglitz (1980, 393) observed that in order the markets to be perfectly efficient, there should be no arbitrary profits or benefits. However, at the same time the market efficiency requires plenty of different entities that are gathering information that are rational and try to reach even arbitrary profits. And as that gathering of the information is costly at least in some form, and at the same time arbitrary profits from gathering that information should not exist, there would be no incentives for those rational entities to

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[15] Technical analysis is an investment strategy or a tool pack that investors use by trying to make profits by searching repeating and predictable patterns in stock prices. (Bodie et al. 2011, 376)

gather the information. This leads to a problem. If the entities gathering the information about companies and securities are rational, they would not perform the costly action of gathering information if there are no possibilities of benefitting from that action. Thus actually all of these entities would stop gathering information and begin free riding[16] by letting others do the costly action or gathering information. However, then there would be no entities gathering the information and thus the efficient markets would not exist. As this would mean that the preconditions behind the EMH would destroy the hypothesis itself, an economically more reasonable version of the EMH has been developed. That more reasonable version claims 'that prices reflect information to the point where the marginal benefits of acting on information (the profits to be made) do not exceed the marginal costs'. (Fama 1991, 1575).

The efficient market hypothesis makes two assumptions of the investors operating in the marketplaces in order to be fulfilled. First, the investors or the decision makers should be completely rational in their decision making. It means that the investor is a homo economicus, a wealth maximizing self-interested human being. Second, the investors or the decision makers should have complete knowledge of the fundamentals in the market. If those two assumptions are valid, then the efficient market hypothesis should also be valid even on its strongest form. Whether that actually is the case is another debate. There is some legitimate criticism towards those assumptions, and more about can be found in the section 3.2 of this thesis. (Brav & Heaton 2002, 575-576).

The EMH at its ultimate is an extreme null-hypothesis that cannot come true in its most literal form. This fact sticks out for example, when considering trading in the stock markets. If every counterpart in the stock market had perfect knowledge of the fundamental information of every stock in the market, there would be almost no trading at all. If the true value of a stock would be exactly €10 and everybody in the stock market agreed with this, then nobody would sell that stock for any less than 10€ and on the other hand no one would be willing to pay more than exactly 10€ for that stock. However, with the existing trading costs, there would be no trading at all. Thus the markets need some kind of inefficiency in the form of noise in order to be liquid and well-functioning. Noise trading is covered more specifically in the upcoming section 'Noise trading and irrational investors' of this thesis. (Black 1986, 530–531).

The EMH has received plenty of attention ever since it was presented. Since all of the forms clearly put a shadow above importance of the professional portfolio managers, the empirical testing of those three forms has perhaps been the main concern in the academic financial literature in the past decades. (Bodie et al. 2011, 384–385). Testing of the different forms of the EMH happens through event studies. Event studies focus on a certain

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[16] Free riding refers to the idea of enjoying the benefits of other people's actions without taking part into the costs. (Begg et al. 2011, 321.)

event like on the ex-dividend date and a short window around that event and try to find abnormalities on the stock price development or returns around that date. (Fama 1998, 283–284). On the figure below is an example of a notional event study. In this case the event is significant positive news like a purchase offer from another company. The information is not priced on the stock before the event since the stock price increases remarkably on the event date. However, as the market is able to price the news immediately correctly and there is very little price variation after the event, the market reaction can be seen as an efficient one.
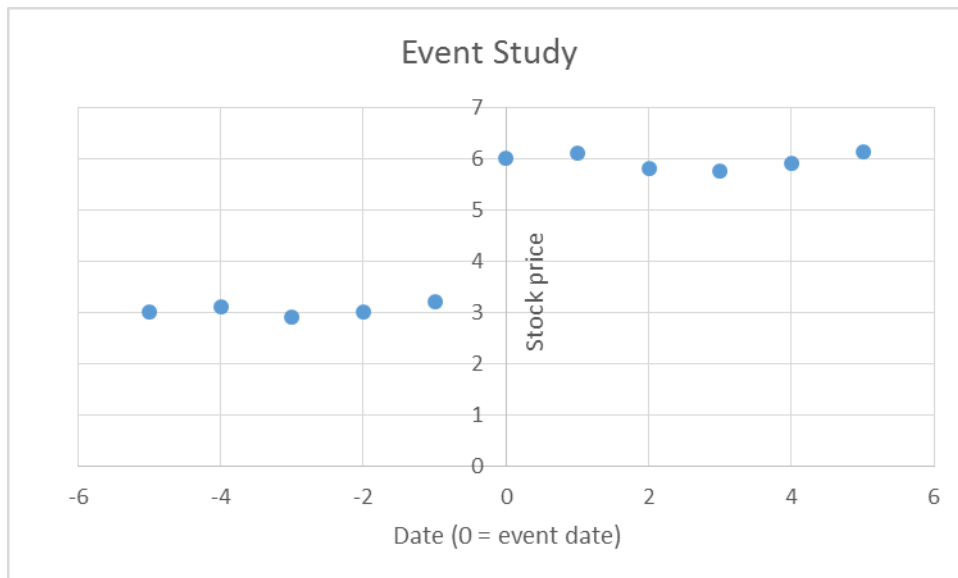
Figure 7 Example of an event study in an efficient marketplace

The EMH has been tested comprehensively and it has been publicly accepted as the strongest and most convincing theory to explain the functionality of stock markets. As explained earlier, the weak form tests focus on whether the historical prices or the use of only technical analysis can help investors to beat the market return. Even though some studies have been able to find different financial anomalies that challenge the efficiency of the markets in the weak form, most academics agree that the markets are generally thought to be efficient in the weak form. The semi-strong form tests have also been found as supporting the EMH. The semi-strong form tests focus on how quickly do the prices adjust to recently announced public information. Even though the academics have found some time lags in some cases, most of the test results have been favorable for the EMH. However, the strong form tests have perhaps even expectedly proven that the markets are not efficient on the strongest form of market efficiency. E.g. insiders are able to reach abnormal positive returns. (Fama 1991).

As we examine the forms of market efficiency with short sellers, it is noticeable that as the short sellers seem to be able to beat the market return, the markets are not efficient anyway on the strongest form of market efficiency. Also as Alexander et al. (2014) and

Engelberg et al. (2012) noticed, the short sellers are able to beat the market return by using and analyzing efficiently public information. It means that the markets are not truly efficient even in the semi-strong form of market efficiency at least not in those cases. There is not any evidence regarding to short selling that the markets were not efficient under the weak form of market efficiency. The short sellers are ought to gain their superior knowledge of the intrinsic values of securities by other measures than using only technical analysis.

The EMH has received plenty of criticism especially after serious stock market collapses. Though some of the criticism is legitimate and it will be covered at some parts in the section 3.2 of this study, there is some criticism that is not justifiable. That kind of criticism is usually based on misunderstandings about the EMH. The most common misunderstandings of the EMH have to do with the following three factors: stock price deviations, rationality of the marketplace and beating the market return. (Clarke, Jandik & Mandelker 2001).

Firstly, the EMH does not state that the stock prices will not deviate from their intrinsic value. The stock prices can endure even large scale deviations but those deviations have to be random and unpredictable. And actually some of the price deviations are the result of markets being efficient, as the recently released information is being priced on the securities. Also as stated earlier, the markets do not have to be perfectly correctly priced all the time. In order the markets to be efficient, it is enough that the securities are priced close to their intrinsic values. This means that there can be some 'irrational' price movements and the marketplace can still be seen as efficient in its entirety. (Clarke et al. 2001, 11).

Secondly, the EMH does not state that every single participant in the marketplace is a rational one. The EMH is sometimes accused of being an unrealistic assumption since not every single market participant can be fully rational decision maker. The EMH however, does not state that. The EMH states that the marketplace as a whole is rational. This means that there can be irrational participants, but the rational participants are the ones that make the market rational as they benefit from irrational participants decisions. And the more there are irrational decision makers, the more that marketplace will lure rational decision makers to reach arbitrary profits and as a result the marketplace will become priced rationally. (Clarke et al. 2001, 11–12).

Finally, some people have a misunderstanding that in order the stock markets to be efficient no investor should be able to beat the market return at any time. The fact is however that usually about a half of the marketplace will beat the market return at any given point of time. A simple example to demonstrate this would be a stock market that consists of equally weighted two companies A and B. If on a given day the return of the stock of the company A would be -1% and the return of the stock of the company B would be +1%, the market return as a whole would be approximately 0% on that day. However

the investors owning company B would make a profit of +1% and the investors owning company A would make a loss of -1% on that day.

When the time period of the investment return is broadened from a given point of time to longer term there might be some investors beating the market return still. However, EMH states that in this case it is not because of superior skills or investment strategy. It is just pure luck combined with the probabilities. Since there can be countless amounts of investors in the marketplace it is only likely that some investors from that huge crowd are able to beat the market return. This is just probabilities combined with luck like in the lottery. Even though most of the people playing lottery will lose there is almost always someone who is able to win the jackpot. It does not mean that the winner had better 'lottery skills' or some kind of superior strategy compared to all the other lottery players. The winner just got lucky. The same goes with beating the market return according to EMH. There should not exist any superior investment strategies to beat the market return. The ones who are able to do that in a long run are just lucky according to the supporters of the EMH. (Clarke et al. 2001, 7–8).

3.1.2 Random walk theory

Random walk is used as a term to describe the stochastic, unpredictable nature of future returns. The main proposition behind the random walk theory is that the stock prices should follow so-called random walk. It means that consecutive stock returns should be independent and identically distributed. In other words the stock price changes should be both random and unpredictable. (Fama 1970, 386; Bodie et al. 2011, 372).

Although the random walk theory has been noticed for a longer time period it was not until the year 1973, when Burton Malkiel released the first edition of his 'what would become an international bestseller' "A Random Walk Down Wall Street". The message of that writing was that a passive holding strategy of all the stocks i.e. index investing would be a superior investment strategy compared other active strategies and professionally managed funds. This makes the random walk theory as a theory that supports the EMH or is even a part of it. (Malkiel 1999, 13).

The biggest contribution that the random walk theory provides for investors all around the world is that it emphasizes the superiority of index investing. Surely some portfolio managers are able to beat the market return even in the long run but according to the random walk theory it is just about luck and chance and not about skills. Thus the beating of index can be explained at least to some extent with the lucky event issue. For example the expected outcome for 100 coin flips is 50 heads and 50 tails. Yet if large enough group of people are flipping coins, some of them will most likely reach results of 60 heads and 40 tails. That however does not necessarily imply that those people are more capable of

flipping heads than others. More or less it just implies that those people were lucky. (Bodie et al. 2011, 384) This statement puts the short sellers under pressure. If long position index investing is a superior investment strategy compared to any other strategy, then short selling would not make any sense in any scenario.

However, as any other theoretical proposal also the random walk theory should not be taken too literally. As Fama (1995, 76) stated:

> "It is unlikely that the random walk hypothesis provides an exact description of the behavior of stock market prices. For practical purposes, however, the model may be acceptable even though it does not fit the facts exactly." (Fama 1995, 76).

3.2 Behavioral finance

Behavioral finance is a competing financial school of thought for the neoclassical finance. The theories included in the behavioral finance can often be seen as criticism towards the neoclassical finance and the EMH. Even though there is some firm evidence supporting the arguments of behavioral finance, there are still clear and visible borderlines between the two sides or camps. The neoclassicals, do not too often concur with the behaviorals and vice versa. The both sides do agree that market returns can be predicted to some extent, but whereas the behavioral economists call irrational behavior as the roots of bubbles and crashes, according to the neoclassical economists there is no such thing as irrationality in pricing of the securities. Eugene Fama, the father[17] of the efficient market hypothesis, shook the world in an interview shortly after the financial crisis, when he expressed his opinions on the recent discussion of the collapsed stock markets in an interview.

> "I don't know what a credit bubble means. I don't even know what a bubble means. These words have become popular. I don't think they have any meaning." (The New Yorker, 2010)

Those words are quite contradictory to the public discussion about the financial crisis and they were widely noticed. Of course one could, even perhaps justifiably, argue that people might express themselves in somewhat sloppy or unintended way in interviews but after he clearly attacked against these expressions again by stating:

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[17] Engsted (2016, 370) refers to Fama even as the 'father of modern finance'.

"…at least as the literature now stands, confident statements about "bubbles" and what should be done about them are based on beliefs, not reliable evidence." (Fama 2014, 1475)

It shows out that not everyone believes in pricing mistakes such as bubbles and other words that don't 'have any meaning'. Those terms have however gained noticeable foothold in the world of finance. And as that is the case it is important to know where and when the questioning of neoclassical finance and the EMH began and which arguments were the groundbreaking arguments for behavioral finance.

The EMH was the ruling financial proposition throughout the 1970s but in the end of that decade alternative propositions were introduced. Such propositions included e.g. Lucas' (1978) writing "Asset Prices in an Exchange Economy" which suggested that rational asset pricing theory might include some elements that are predictable instead of being unpredictable as the efficient market hypothesis states as its finest. In the 1980s the EMH was challenged more severely when academics began questioning the excess volatility of asset prices. (Shiller 1981; Leroy & Porter 1981). The prices were seen to fluctuate way too much to be explained just with the changing expectations based on fundamental information.

When the terms like mass psychology and animal spirits were introduced more permanently in the financial literature and were considered to explain the irrational security price fluctuations and anomalies, the theoretical framework of behavioral finance was starting to build up. In the 1990s the psychological part of the finance markets became more and more popular and the field of behavioral finance developed close to its current form. After the dotcom bubble burst in 2000 the behavioral finance was noticed as a major theoretical framework and in the 21st century some behavioral economists have even received Nobel prizes. (Shiller 2003, 83–91).

3.2.1 *Bubbles, crashes and anomalies as the foundation of criticism towards market efficiency*

The EMH claims that the stock markets are fairly well estimating the true intrinsic value of securities at any given time. That claim has caused plenty of controversy among investors and academics and not everyone agrees with the terms proposed by the supporters of the EMH. The terms such as bubbles and crashes are perfect examples of questioning the EMH. If the claims of the EMH are true, then such irrational pricing mistakes as bubbles and crashes should not exist. This was also an argument of Robert Shiller (1981), when he was one of the first economists to wonder how is it possible that the stock prices move so much even in fairly short time period, if the valuation of the securities is truly based

only on the future cash flows, in this case the dividends. Haugen (1999) goes even a couple steps further. He notices that there is clear evidence, which proves the reality to be almost the opposite of the efficient market hypothesis' claims. He claims that the market makes huge irrational mistakes in pricing of the stocks and other securities and thus the market is almost everything but efficient.

The claims like the ones suggested by Haugen (1999) are serious ones. But do those claims have any evidence for? Or are they just some retorts without any true arguments? As a matter of fact those claims are not just radical statements without any empirical evidence. The researchers have found in their studies different kind of predictable irrationalities in pricing of the securities i.e. the financial anomalies that challenge the basic concepts of efficient market hypothesis and the neoclassical finance's foundations. The basic arguments against market efficiency include usually different financial anomalies.

Financial anomalies or market anomalies are usually related to different psychological factors such as behavioral biases, structural factors or calendar effects. Some of them also seem to last in the market pricing through time, even though that should not be possible according to the neoclassical finance's and efficient market hypothesis' expectations. This means that the market return seems to be beatable with active investing strategies that follow different anomalies. (Marquering, Nisser & Valla 2006, 291).

As mentioned earlier, the efficient market hypothesis and the neoclassical finance makes two assumptions of the investors. First, the investors or the decision makers should be completely rational in their decision making. Second, the investors or the decision makers should have complete knowledge of the fundamentals in the market. If those two assumptions are valid then there should not exist any anomalies. However, that is not clearly the case since financial anomalies do exist. Thus the existence of financial anomalies can be explained by three reasons that are associated with those assumptions made from the investors. Firstly, the investors might not be completely rational decision makers. The investors might behave irrationally e.g. because of cognitive biases or psychological behavior models like herding or contrarian behavior as explained later in this study. Secondly, the investors might lack information crucial to the decision making. This shows out as irrational expectations. The investors thus might make rational decisions but since their knowledge is incomplete, their decisions are based on irrational expectations. Thirdly, the existence of financial anomalies could also be explained if both of those assumptions are not valid. In this scenario the investors are making irrational decisions based on insufficient information. In the stock markets the irrationality or information asymmetricalness appears as anomalies, bubbles and crashes. (Brav & Heaton 2002, 575-576).

3.2.2   *Financial anomalies*

The basic arguments for behavioral finance are the financial anomalies. Brav and Heaton (2002, 575) define financial anomaly as

> "…documented pattern of price behavior that is inconsistent with the predictions of traditional efficient markets, rational expectation asset pricing theory."

This is perhaps best understood when compared to the concept behind random walk. The random walk theory stated that stock returns should be both random and unpredictable. (Fama 1970, 386; Bodie et al. 2011, 372.) Thus we can define financial anomalies as documented price pattern behaviors that are not random but systematic and predictable and thus work against the rational asset pricing theory.

The financial research has been able to identify plenty of price patterns in the common stock returns i.e. anomalies. More known and well tested among these different anomalies are e.g. small firms anomaly (Banz 1981), book value anomaly (Rosenberg et al. 1985), low P/E-ratio anomaly (Basu 1983), January effect (Keim 1983), long-term past returns (DeBondt & Thaler 1985) and short-term past returns (Jegadeesh & Titman 1993) anomalies. These are fine examples of some of the more known anomalies that have been tested and proven correct numerous of times. These anomalies have thus lasted through time, which is also something that the supporters of the EMH usually doubt in case of newly found anomalies.

The anomalies mentioned previously provide investors opportunities to make abnormal profits with proven and documented investing strategies. The small firm anomaly states that the smaller firms have higher returns than the larger firms. The January effect is named after the fact that the stock markets give higher returns in January than during any other month. The short-term past returns anomaly proves that the higher short-term past returns correlate with higher short-term future returns. As these anomalies are widely known and accepted in the marketplaces, it is puzzling and irrational that they still exist. If the markets were truly efficient, they should react to the anomalies in a way that the anomalies or inefficiencies would disappear. Some anomalies have indeed become weaker during time or even vanished entirely. However, some anomalies like these examples tend to endure through time.

Boehmer et al (2010, 80) noticed that the stock markets adjust very slowly to public short interest data in the marketplaces in the United States. It means that even though the short sellers are informed investors and the stocks with higher short-interest have significantly smaller returns than the stock with less short-interest or no short-interest at all, the market participants do not tend to react quickly to short selling information. Thus the

slowly adjusting market prices create opportunities for investors to anomaly returns. As the short-interest data is frequently updated, the investors could copy the short sellers' investment strategies and gain the same returns. It is interesting to see in the empirical part of this thesis whether these observations are also valid in the Finnish stock market. The fact that the market prices adjust so slowly can be explained e.g. with different psychological explanations like herding behavior or contrarian behavior. Those behavioral models will be introduced and explained in the next section of this study.

3.2.3   Herd behavior and contrarian behavior

As mentioned earlier, usually financial anomalies can be explained with different psychological and cognitive biases. Such psychological and cognitive biases can be e.g. overreaction and overconfidence among others. The more interesting psychological and cognitive factors regarding short selling and this thesis are the herding behavior and the contrarian or antiherding behavior. It is through different investor types, institutional, and individual that herd behavior and contrarian behavior are linked to short selling. As most short sales are conducted by institutional investors, the psychological behavior models that guide those traders' trading are also the key behavior models that guide short sellers' trading. On the other hand the rest of the market consists of individual traders. And the key behavior models that guide the institutional and individual investors' trading are the herd behavior and the contrarian behavior. (Daniel et al. 1998, 1841; Grinblatt & Keloharju 2000, 43; Olsson 2014, 1766; Park & Sabourian 2011, 973).

Herding or herd behavior in the stock market is behavior, where the investors in the market start following the crowd or as a crowd some other investors. Following the crowd means that investors put aside or modify their own expectations of the market price developments based on the behavior of other investors and agents in the stock market. Thus even an investor with considerable private information about a certain company modifies the expectations of that company's future performance based on the transactions (sell or buy) of other agents considering that company. Thus an example of an investor that might have been willing to invest to a certain company but decides not to do so after finding out other investors' decisions, is a perfect example of herd behavior. Alternatively an investor not willing to invest but decides to invest after finding out that other investors are investing is also herding. Herding is one example of social learning[18]. Herding usually leads to more volatile stock prices and lowers the liquidity in the stock market as most of the investors act as one and attempt to either gain possession of certain securities or to get rid

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[18] Social learning happens, when individuals alter and adapt their behavior based on other entities actions. (Park & Sabourian 2011, 973.)

of them as a large united group. (Bikhchandani & Sharma 2001, 280; Park & Sabourian 2011, 973–974).

Herding results as a correlation between the demand for a security in period t and period t+1. The demand for a stock in period t+1 is positively correlated with the demand in period t. Thus herding leads to continuously increasing prices in bull[19] markets and decreasing prices in bear markets. For this reason it is important not to mix up herding with the concept of 'market participants agreeing on prices'. When market participants agree on prices, they agree on the intrinsic financial value of a certain security, whereas herding often leads to false expectations about the future. Thus herding is one of the key psychological behavior behind the 'bubbles and crashes' if one wishes to use such expressions from extreme price fluctuations. (Choi & Skiba 2015, 246; Thoma 2013, 46.) Grinblatt and Keloharju (2000) point out that the herd behavior is also an existing scenario in the Finnish stock market among the institutional investors.

In the viewpoint of this study there is a certain type of herd behavior that seems to be especially interesting. That is reputational herding. Reputational herding refers to the idea that institutional investors and fund managers tend to herd in order to protect their reputation and future status. (Boyson 2010, 283). The disclosed short selling information gives tools for the institutional investors to do exactly that. As the short selling is conducted mostly (75%) by the institutional investors (Boehmer et al 2008, 510) and these short sellers are mostly well-informed institutional investors there can be a pressure for other institutional investors to herd and not to act contrarily in the fear of losing one's reputation. (Trueman 1994; Choi & Skiba 2015)

There is also other kind of herding, which actually can be seen as fulfilling the assumptions behind the EMH. That kind of herding is herding towards true intrinsic values of securities. Herding towards true intrinsic values of securities or rational herding means that the less-informed market participants herd based on the better informed participants transactions. Rational herding leads into the situation where the security prices move towards their true intrinsic values and thus it is a perfect example of efficient herding. As Park and Sabourian (2011, 973) notice, rational herding is thought to occur only in exceptional cases.

Another example of social learning is contrarian behavior[20]. Whereas in the herding behavior investors start following some specific investors as a crowd or herd, in contrarian behavior investors or agents start behaving contrarily. In contrarian behavior an investor willing to invest decides not to after finding out that other investors would be willing to invest. Alternatively an investor not willing to invest but decides to invest after

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[19] Bull market is a notion used to describe increasing prices in the security markets.

[20] Contrarian behavior is sometimes called as 'antiherding' or 'adverse herding'. (Effinger & Polborn 2001; Bohl et al. 2014.)

finding out that other investors would not invest is contrarian investor. Thus the contrarian behavior results as contrary decisions when compared to the decisions done after herding behavior. (Park & Sabourian 2011, 974).

Contrarian behavior is generally believed to lead to less volatile prices as the opposite opinions and transactions should cancel each other's price effect. However, Park and Sabourian (2011, 973) noticed that like herding, also contrarian behavior leads to more volatile prices. Grinblatt and Keloharju (2000, 43) point out that also contrarian behavior is distinctive for Finnish stock market. However, unlike the herding behavior, the contrarian behavior is more often practiced by individual investors.

Contrarian behavior is riskier for experts' reputation such as institutional investors or fund managers. For this reason the individual investors are more often herding than the institutional investors. On the other hand the rewards for successful contrarian investing are higher. As the value of a single expert is depending on two factors: on the capability of an expert and also to the amount of other capable experts. The value of a capable expert is higher than the value of an incapable expert. That is often cited as the reason for experts' herding. However, as the value of the expert increases when the number of other capable experts decreases there are incentives for a risk appetite expert to behave contrarily to other experts. This is interesting to notice relating to this study. As the short sellers often are institutional investors[21], the decisions done by short sellers might cause opposite decisions from other institutional investors. In this thesis it would mean that the market might react oppositely to the short selling information and the price reaction on the event date might thus be positive for the shorted stocks. (Effinger & Polborn 2001, 386).

Herd behavior and contrarian behavior are important behavior models regarding to significant short sales since the significant short positions are published frequently to all market participants. The information included in the significant short positions publications are e.g. the position holder, the size of the net short position and the date of the position. This means that an investor can modify his or her future transactions for example based on the short position information. If e.g. an institutional investor decides to follow a certain fund manager's transactions he or she can also go short on the same stock. If an institutional investor is keen to beat a certain fund manager, he or she can decide to have a long position on the stock. The same opportunities are there of course for all the other market participants including the individual investors.

Briefly, the disclosed information of the significant short positions creates opportunities for other market participants to practice certain types of social behavior in the market in the form of herding and contrarian behaviors. Herding is the phenomenon, which leads

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[21] "For example, Boehmer, Jones, and Zhang (2008) find that about 75% of all short sales are executed by institutions, while individuals represent less than 2% (the rest are specialists and others)." (Diether et al. 2009, 576).

to more volatile prices as it results as correlation in prices between time period t and t+1. Contrarian behavior on the other hand includes higher risks for institutional investors, but on the other hand the rewards for a single contrarily behaving institutional investor are also remarkably higher. Both of these behavior types exist in the Finnish stock market, but generally they are thought to be practiced by different investor groups.

3.2.4   Noise trading and irrational investors

Black (1986) presented an idea about noise in stock market trading. Stock prices are generally thought to reflect the discounted value of the future cash flows. In Black's definition that kind of information is 'actual information'. However, Black presented an idea that stock prices reflect both the actual information and also other factors that do not affect the future cash flows, but do affect the stock prices and their formation. That incorrect information, which does not affect future cash flows, but does affect the stock prices is called 'noise'. Noise in Black's definition represents information that should not be considered as actual information but is treated on stock trading as actual information. (Black 1986, 529).

While competing and trying to beat other investors the market participants are searching all possible information that might have an effect to the future market prices and thus they are searching for information that might give them edge compared to other market participants. (Fama 1995, 76.) While doing that, the market participants are exposed to noise. If they are unable to filter the noise from the true fundamental information, they will most likely be trading on noise at least in some levels.

Noise is vital for stock markets, because without noise there would be almost no trading. Trading occurs because different investors have different preferences or beliefs. One example of these different beliefs is the difference of a stock price appraisal between two traders. (Grossman & Stiglitz 1980, 402). Noise is the factor that makes stock price appraisals differ from each other and thus noise is the factor creating liquidity to the marketplaces and making trading possible. (Black 1986, 529). Another viewpoint to noise traders is that they are as a matter of fact the fuel that keeps the stock market working. As Grossman and Stiglitz noticed that without the possibility to arbitrary profits or to rent there are no incentives for institutional investors to gather information and thus eventually the stock markets would become inefficient. The noise traders can be seen as providers of that rent for gathering information. (Lo 2004, 17–18).

The EMH states that the stock prices fully reflect available (relevant) information and thus the stock prices are at any given time good estimates of the true intrinsic value of those companies. Black (1986, 532) offered his view that the stock prices do reflect information but the information that is reflected in the stock prices is actually both actual

information that the informed traders trade on and noise that the noise traders trade on. As a result, the stock markets are most of the time correctly priced, but every now and then there are even huge pricing irrationalities because of noise.

Noise includes all of the information that has an effect on the stock price but does not actually affect the future cash flows of a company or a stock. So noise traders or irrational investors treat noise as actual information even though noise has nothing to do with actual information. Noise more often than not is small events that as a larger group might have even a strong effect on the stock prices. This means that noise is one of the reasons for inefficient asset pricing. Usually individual traders are considered as more vulnerable for noise trading than for example larger institutional investors. (Stambaugh 2014, 1415.) That is seen to result from two different factors. Firstly, the individual traders have a tendency to treat noise more easily as information than the better informed institutional investors. Secondly, even unprofitable trading gives individual traders more pleasure than staying out of the stock markets. The institutional traders might lose their jobs if they are trading unprofitably. The individual traders however have to respond only for themselves and thus they continue doing unprofitable trades even though rationally thinking they should stay outside of the stock markets. Instead of stopping trading they continue it, because they experience for example emotional perceived investment value[22]. (Black 1986, 529, 531; Puustinen 2012, 7).

French (2008, 1539) presents the idea that the share of noise traders has been declining in the stock markets. As institutional investors are generally thought to be more sophisticated investors than individual investors, individual investors are thought to practice noise trading. However, the share of individual investors has been decreasing significantly in the stock markets and thus the amount of trading on noise and at the same time market mispricing should have decreased as well.

A good example of a famous noise trading case is the development of the EntreMed stock price in May 1998. New York Times published an article considering the company's potential cancer curing drugs in Sunday May 3rd. And when the Stock market opened on Monday May 4th, the stock of EntreMed soared from $12 to peak at $85 and close at $52 as can be seen from the following figure. In the following three weeks the EntreMed stock closed above $30. On top of this, other biotechnology companies stocks' increased remarkably. The only problem with this sudden price rocketing was that even though it was based on the New York Times news article it was actually not entirely news at all. The article was based on information that was published already in the end of 1997.

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[22] Perceived Investment Value is the concept that covers all the values that a non-institutional investor receives from investing activities. It is based on non-institutional investors' subjective and individual experiences and the values experienced vary between investors. (see e.g. Puustinen 2012)

However, at that time the stock market underreacted to that information. When the news was published in larger scale in May 1998 the public overreacted to those news and thus the price peak of over $50 was short lived. The first time the news was published it could have been partly covered by noise and thus the first reaction was way too moderate. On the other hand, as there was already a price reaction to the original news, the second price reaction was based a lot on noise. Eventually the EntreMed stock price decreased to the level of $25 so the news was not entirely noise but it was not entirely actual information either. These kinds of situations of overreaction create opportunities to profit for informed investors e.g. in the form of short selling. (Huberman & Regev 2001, 387–388).
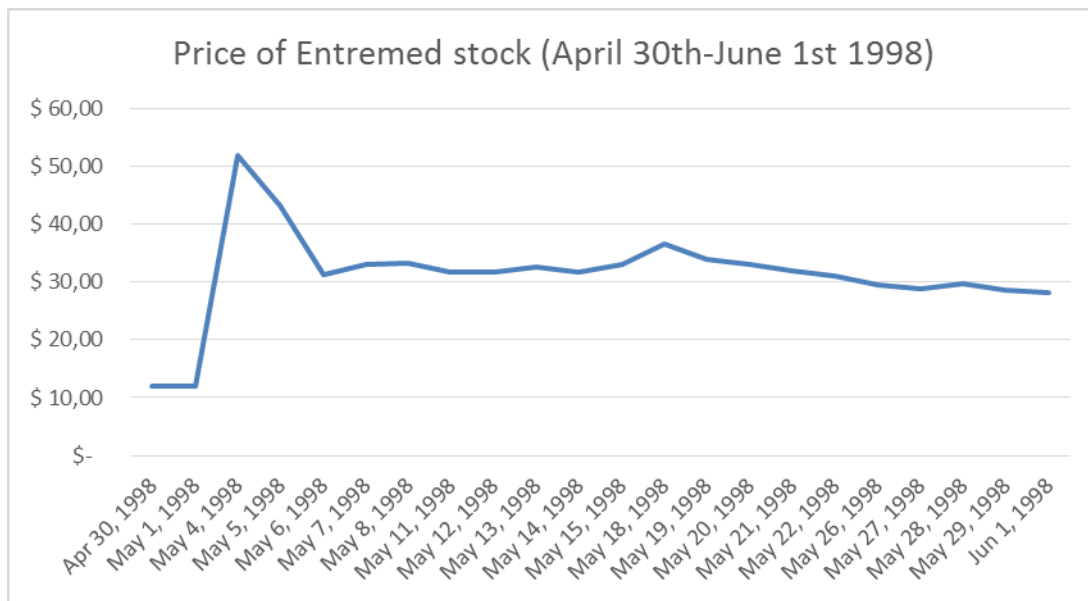
Figure 8 The development of the EntraMed stock price from May 1st to June 1st in 1998

Short selling is done mostly by institutional investors. Individuals are estimated to be accountable for less than 2% of all the short sales conducted. (Diether et al. 2009, 576). Short selling could thus be a way for the sophisticated investors to benefit from the individual investors' irrationality such as noise trading in the case of EntraMed. The fact that institutional investors and other specialists represent such a large share of the short sellers might be one explanation for the high returns of short sellers. Even though short selling is mostly practiced by institutional investors, it is important to notice that those few individuals that practice short selling are more often extremely likely possessing considerable private information. Thus it cannot be stated as a universal truth that the individual traders are always less informed than for example the institutional investors. (Boehmer et al 2008, 492–493).

Short selling is a perfect tool for exploiting overpricing that stems from noise trading. However, sometimes short selling information can be noise as itself. Even though short sellers are considered as a sophisticated group as a whole, there are different kind of short

sellers out there. As explained in the section 2.4 sometimes there are uninformed short positions like the short positions done in hedging purposes. If the information of the significant short positions that are uninformed is interpret as informed short positions, some investors might create further short positions that are actually based on just noise as they are based on the uninformed short positions. Also regarding to this study, it is important to find out whether the shorted stocks underperform other stocks in the Finnish stock market or otherwise the significant short position information could be just noise itself. However, it is important to notice that an irrational investor can treat fundamental information as noise as well.

3.3 Short selling regulation and market efficiency

Even though short selling and short positions can be viewed just as an ordinary stock market transactions, and perhaps to some extent should be viewed just as that, that has not been always the case. Due to the nature of the short positions with negative expectations, short selling has gained adverse reputation and plenty of criticism. The criticism is often based on the reasoning that short sellers profit from other market participants' suffering and thus have incentives to create and cause more of that suffering. Other market participants have thus reacted to short sellers sometimes even with a hostile attitude. E.g. Napoleon named short-sellers as the enemies of the state and after the financial crisis in 2008 there was plenty of criticism and regulation to restrict short selling. That hostile reaction to short selling and adverse reputation of short sellers among other market participants could be understood in some level, since short selling is predicting negative price developments in the market. (Angel & McCabe 2009, 239; Bodie et al. 2011, 111).

Still, even though the short sellers are predicting decreasing prices and thus being the messengers, who bring bad news to others in the stock market it is essential to separate the messenger of the bad news and the actual agents who are responsible for the bad news occurring in the first place. By reacting hostilely to the short sellers the other market participants are sometimes 'shooting the messengers' who try to inform other market participants about overpricing or some troubles that might be realized in the future concerning the company. Thus the short sellers could be viewed as a tool for others to recognize overheating and overpriced markets, obscure financial situations or even scandals in some companies. When taking this opinion into consideration the restrictions that short selling has been facing is confusing. By for example banning short selling, the financial authorities are not just banning a certain transaction in the stock market but also shackling the providers of different information that could be essential in the viewpoint of market efficiency. (Bodie et al. 2011, 111).

However, the reasons behind short selling might not always be based on solid facts about different financial hardships. Since it is in short sellers' interests that the stock prices are descending or even slumping, the short sellers can be seen to have incentives for unethical activities. They could manipulate the markets with false accusations, gossips and rumors. Sometimes even large short positions could be seen as bad rumors or bad news concerning the company. And as short selling is creating that downward pressure to the stock prices, the short positions can become self-fulfilling prophecies as themselves. Short selling also provides bears tools to manipulate market to e.g. raid[23] a single stock. Short selling indeed faces some legitimate ethical and practical criticism and from this point of view short selling bans and other regulation concerning short selling might be justifiable. These restrictive actions could be seen as enhancing market efficiency by removing the troublemakers from the stock markets. (Angel & Mccabe 2009, 243).

Recent research however puts under suspicions the rationality of those banning actions and that kind of hostile mindset towards short selling. As noticed earlier in the section, restricting short selling does not remove the opportunities for market irrationalities. Quite contrarily the activity of short sellers seems to make the markets more efficient. Short selling bans remove short selling from the marketplace and thus the stock market will lack those functions (providing liquidity, quickening price adjustments and preventing overpricing) that short selling provides. Beber and Pagano (2013, 343, 379) studied short selling bans empirically and their conclusion was that the costs of short selling bans seem to outweigh the possible benefits of those bans.

Especially damaging these bans seemed to be in three perspectives. Firstly, the short selling bans were malignant to the liquidity in the stock market. More specifically this was harmful for smaller capitalization stocks. Secondly, the short selling bans slowed the price discovery process and thus made the market more vulnerable for pricing mistakes. Thirdly, the bans were unable to protect the market prices from falling elsewhere except in the United States. And in this case the United States could be seen as an exception instead of being a rule. When considering all of these factors the bans have been harmful as a whole.

A number of studies (Alexander & Peterson 2008; Diether et al. 2009b; Boehmer & Wu 2010; Chakrabarty et al. 2011) agree with Beber and Pagano and notice that even though short selling is often accused of various unethical actions, a large number of studies point out that there is no evidence that short sellers are using abusive or unethical practices. Quite contrarily, multiple studies agree that short sellers are an important part

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[23] Bear raids are events, where a large amount of short sellers attack as a group a single stock and depress the stock price. These raids diminish market efficiency since they do not need any solid financial reasons to be based on. They need just a large enough crowd of short sellers. (Angel & McCabe 2009, 243).

of the marketplace by enhancing price discovery and market efficiency. For example, Boehmer and Wu (2013) state that the greater the activity of short sellers is the more efficient the markets are. Also Saffi and Sigurdsson (2011) notice that the relaxed supervision of short sellers does not cause neither extreme negative returns nor increasing stock price volatilities.

Short sellers are often treated as if they were the reason for irrational prices or the source of panic during turbulent times in the marketplaces. Thus one might easily think that the existence of short sellers provides new opportunities for market crashes and the removal of such market participants would remove or at least deduct opportunities for market crashes. Such has also been the mindset of financial regulators from time to time as they have restricted or even entirely banned short selling. That as shown in the previous chapters is not perhaps reasonable at all.

On the other hand there are other regulation options instead of banning short sellers. One option is to make the short sellers' transactions more visible by enhancing market transparency. This is what e.g. the European Union did with the regulation EU 236/2012. Usually the enhancing of the market transparency is done in order to make the markets more trustworthy and more efficient. As the lack of transparency was seen as one of the major reasons behind the financial crisis, the regulators have been ever since trying to make the markets more efficient. The greater transparency does not however mean that the market inefficiency would completely disappear from the stock markets. (Oikonomidis et al. 2015, 59–60).

In order the markets to be efficient there should be no continuous way for anomaly returns. In the case of short selling information this should mean that the market should adjust to the short selling information immediately and correctly. If the market prices do not adjust themselves according to the released information either correctly, immediately or at all, the markets are not efficient. As the short sellers are able to beat the market return continuously the markets are not efficient at least on the strongest form as this special investor group is able to beat the market return.

However, that does not imply that the stock markets would be truly inefficient. As the high returns of short sellers can be explained with the information advantage they have, the markets could still be efficient in the weaker forms of market efficiency. The question then looms how quickly is the market adjusting itself to short selling information. If the information of short sellers' transactions allows other investors to beat the market return, then the efficiency of the marketplace can be contested as the market is not adjusting to the information. That among other things will be tested in the chapter 4 which is the empirical part of this study.

4 DATA AND EMPIRICAL RESULTS

4.1 Hypotheses formulation

Usually the studies considering financial phenomena testing are focused around a clearly dated event. An event can be almost anything from an ex-dividend date to quarterly earnings announcement. This type of testing is preferred since the daily expected returns are generally thought to be around zero. (Fama 1998, 283). Since this thesis focuses on short selling the event is the publishing date of the significant short positions.

In this study the data sets out some limitations. As the data available does not include the end date of the significant short selling positions, the only reasonable event or date to use with this data is the release date of the short position information. Thus the empirical part of this study focuses primarily to examine the impact that the stock market experiences from publishing the significant short position information. As there is no data available on when the short sellers cover or close their positions this section is not focusing on how profitable the short sellers' are. Instead this part is studying how the shorted stocks develop in price during time. As the position covering or closing information is not available studying the profits (losses) of the significant short selling positions is even at the best just an estimate. The results of will show only whether the short positions potentially could have succeeded.

This section consists of the following parts. Firstly, the speed of the market reaction to short selling information is examined. The academics (see e.g. Boehmer et al. 2010) have been able to notice that even though the short sellers generally seem to be correct with their evaluations, the rest of the market participants do not react to short selling information immediately. In the first section of the empirical part it is examined whether the stock market as a whole reacts on the event date to the short selling information in the Helsinki stock exchange. For this dilemma the null-hypothesis is formed as following based on the previous academic studies:

H1: The stock market does not react immediately to the short selling information

Secondly, the market might not react to the short selling information considering all shorted stocks. However, as the larger short positions could be considered as stronger opinions concerning the stock price, the market might react differently to the different sized short positions. To examine this matter the null-hypothesis is formed as following:

H2: The size of the short position does not have an effect to the stock price in the event date

There is yet another way to separate the different short positions from each other. That is by separating the stocks based on the short selling amounts. As noticed on table 1, some companies are shorted significantly more than others. Thus the shorted stocks can be divided easily into thirds: stocks with heavy short-interest, stocks with moderate short-interest and stocks with less short-interest. As the academic literature points out, the stocks with heavy short-interest have lower returns than other stocks. However, as explained previously, the stock market in general responds slowly to the public short information. Thus the null-hypothesis is formed as following:

H3: The short-interest level does not have an effect to the stock price in the event date

Next, as the academic literature widely states, the shorted stocks do perform worse than other stocks after being shorted. If this is the case also in the Helsinki stock exchange, then the stock market perhaps should react to the released short selling information. Thus the next section of the empirical part of this study is focusing on the matter whether the stock market should react to the released short selling information somehow. The shorted stocks are examined as a one group first and then as three subgroups based on the short-interest. Thus the null-hypotheses are formed based on the academic literature as follows:

H4: The shorted stocks perform worse than other stocks
H5: The greater the short interest, the smaller the returns

Finally, in the last section of the empirical testing, the Helsinki stock exchange is examined by using the same methods, which are used in most of the short selling related studies. (see e.g. Boehmer et al. 2010, Desai et al. 2002) These methods are focused around the monthly-level short-interest testing. This is done to be able to compare the financial periphery with the larger and more liquid trading venues. The null-hypotheses for the last section of the empirical testing are formed based on the previous academic literature as following:

H6: The portfolio of heavily shorted stocks is able to beat the index return.
H7: The adjusted index portfolio is able to beat the index return.

4.2 The Returns of shorted stocks on the event date

Boehmer et al (2010, 81) ran into an interesting dilemma. As they among others were able to point out that the shorted stocks indeed have lower returns than other stocks, they

kept wondering why the stock prices do not adjust quickly to the short selling information. That result violates the rules of the efficient markets and gives potential for other market participants to profit from another financial anomaly in the form of following the short sellers' transactions.

If the short sellers are on average right and the information of the significant short positions is public information the markets should adjust immediately to that information and the shorted stocks should decrease in value almost immediately when the short selling information is published. As that was not the case in the data of Boehmer et al (2010) in the United States, it is interesting to see whether similar results could be found in the periphery of Finnish stock market and is there potential for anomalous returns.

4.2.1   The returns of all shorted stocks in the event date

Short sellers are generally thought to be sophisticated investors and the shorted stocks are believed to have negative returns more often than not. If the shorted stocks have negative returns, then the first market reaction to public short selling information should also be negative. As explained earlier that does not seem to be the case in the larger trading venues. In this section, the first reaction in the event date in the Finnish stock exchange are examined. As a significant short position has to be published on the following trading day after the position has been created, the event date in this case is the date when the significant short position of a certain stock is published thus it is the date t+1 and the date t is the date when the short position is created.

As can be noticed in the table 6 below, the returns of the all shorted stocks on the event date seem to follow the random walk. The mean for the returns in the event date is 0,05982%. However, the null hypothesis H0: $\mu=0$ (μ=returns) is accepted since the 2-tailed Sig. = 0,271 > 0,05. Also the 95% confidence interval includes the value of zero so the returns do not significantly differ from zero. So even though there is a slight positive reaction and thus some signals for contrarian behavior, those results are statistically insignificant.

Table 6 The mean of returns (t+1 VS t)

One-Sample Test

| | Test Value = 0 | | | | | |
| | | | | | 95% Confidence Interval of the Difference | |
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
t+1 VS t	1,100	2997	,271	,05982	-,0468	,1665

This means that the stock market does not react at any systematic and specific way to the significant short position information. The returns do vary at the event date, but that variation is quite random. This same can be noticed from the following histogram and line chart. The returns on the event date do vary, as there are returns of above +10% and below -10% in one day. However the frequencies of returns are focused even to an extreme extent around the 0%.
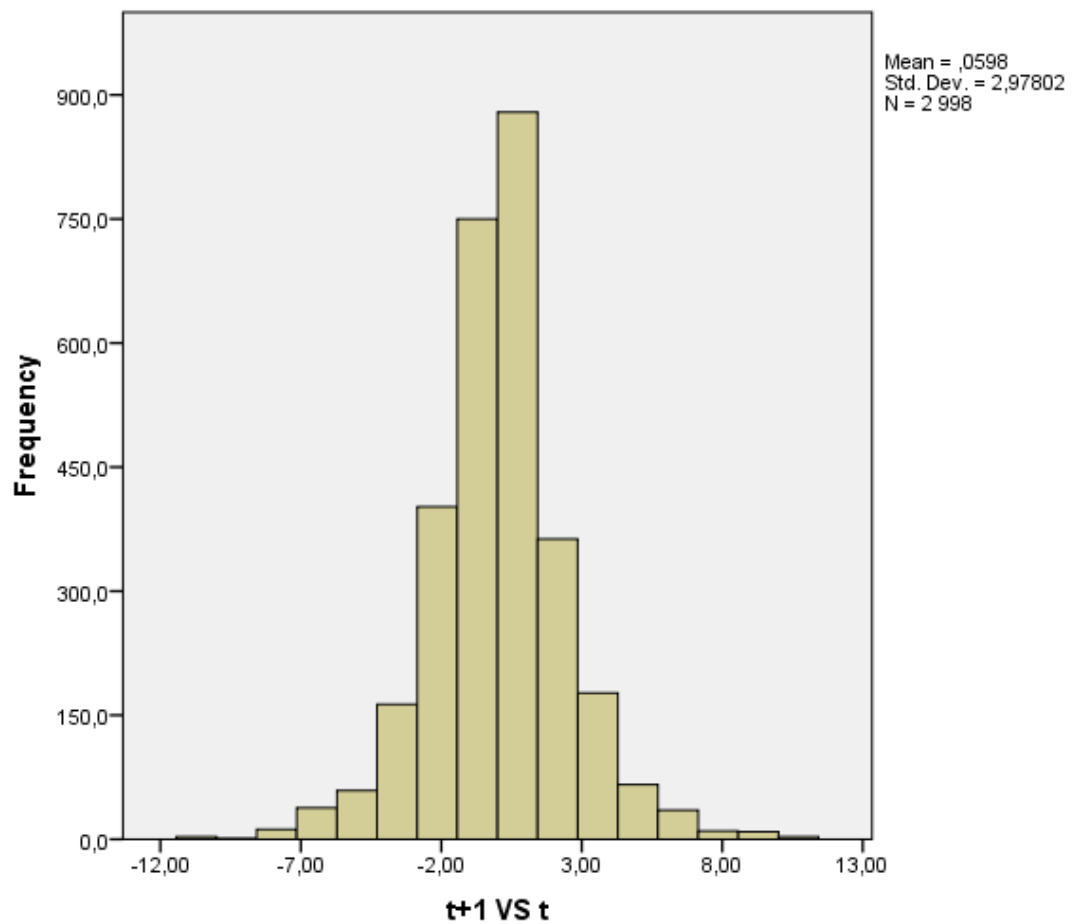

Figure 9 Histogram of the returns in t+1
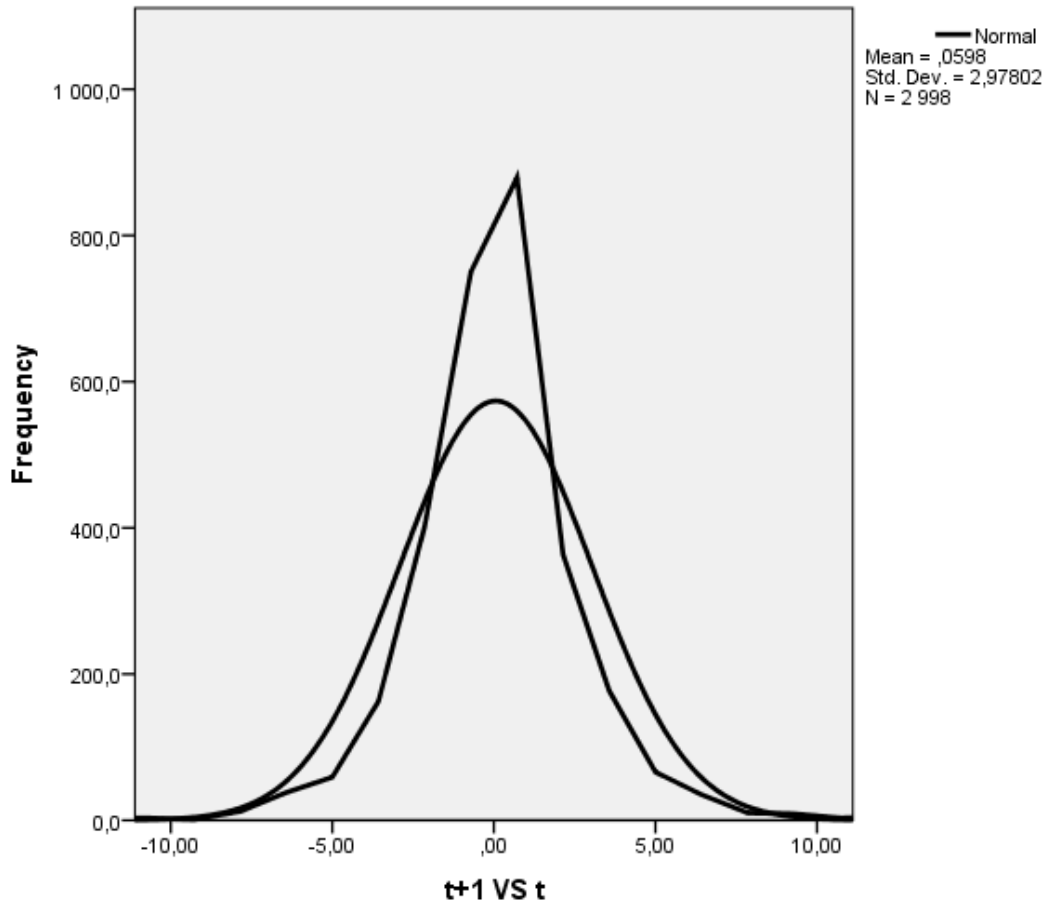
Figure 10 Line graph of the returns in t+1 and the standard deviation line

As we can see from the previous charts, figures and tables, the data of this thesis rams into the same dilemma as Boehmer et al (2010) did in their study. The stock prices do not adjust quickly to the short selling information as a larger group. There is however a possibility that the shorted stock prices on the event date might develop differently depending on the size of the short position or on the short-interest level. These matters will be examined next.

4.2.2 Does the size of the short selling position matter?

The information about significant short positions as a larger group did not affect stock prices on the event date. However, there is a possibility that some short positions could be influencing the market participants' opinions more than other short positions. If short positions and significant short positions were hypothetically thought as (negative) investment recommendations, there is a chance that the larger short positions could be hypothetically considered as stronger (negative) investment recommendations. As the short sellers are able to reach abnormal positive returns, they are at least in this way a similar

group to the star-analysts. The stronger recommendations of star-analysts can cause very large intraday price developments, so it is interesting to see, whether the larger transactions of short sellers can cause any larger price developments.

Even though as a larger group the significant short position information did not affect the prices, the larger short positions could in fact have an effect. The significant short positions are not identical to each other. Among those positions there are larger and smaller positions. As the definition of a significant short position is a net short position that is greater than or equal to 0.2% of the issued share capital of the company concerned. Thus the individual short positions vary in the data of this study from the size of 0.2% to 4.54% of the issued share capital. There is a clear difference between two short positions on the same company that are from other ends of the size spectrum at least when measured moneywise. Thus it is interesting to see whether the size[24] of the short position could affect the returns on the event date.

The first thing to do to check whether the returns on the event date and the size of the short position correlate with each other is to run the Pearson correlation test. The sample correlation coefficient (r) that results from the Pearson correlation test is a coefficient, which gets values between $-1 \leq r \leq 1$. The sample correlation coefficient values close to 1 (-1) mean that the two variables are strongly or even perfectly positively (negatively) correlated. The values below |0.30| mean that there is only weak correlation and the value 0 means that there is no correlation at all between the two variables. (Walpole et al. 2012, 431–433). In this case the Pearson correlation test is run between the two variables, which are the size of the significant short position and the returns on the event date. However, it is important to notice that the correlation $\neq$ causation.

Table 7 Correlation between the position size and the returns in t+1

Correlations			
		Size of the short position	t+1 VS t
Size of the short position	Pearson Correlation	1	-,021
	Sig. (2-tailed)		,257
	N	2998	2998
t+1 VS t	Pearson Correlation	-,021	1
	Sig. (2-tailed)	,257	
	N	2998	2998

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[24] The size of the short position is calculated as a proportional share of the issued share capital of the company. (EU 236/2012.)

The sample correlation coefficient that results from running the Pearson's correlation test is slightly negative at -0,021 as can be seen from table 7. However, the coefficient value is very close to zero and the 2-tailed significance test result $0.257 > 0.05$ means that the results are not statistically significant. So even though the correlation is negative and thus suggests that the size of the short position and the returns on the event date have an inverse relationship, the correlation is statistically insignificant. Thus as a larger unit, there does not seem to be significant correlation between those two variables.

However, it could be reasonable to divide the significant short positions into groups based on the size of the position. If all the smaller short positions develop randomly in price at the event date, the possible specific price development of the largest short positions might be invisible, when testing the short positions as a one group. In order to gain valid results, the groups need to be large enough, but on the other hand there needs to be clear lines between the groups. In order to reach those goals the positions are divided into octiles (size1–size8)[25] in an order, where the first octile (size1) covers approximately the smallest 12.5% of the significant short positions and the last octile (size8) covers approximately the largest 12.5% of the significant short positions.

Table 8 The returns on the event date in different size categories

One-Sample Test

| | Test Value = 0 | | | | | |
| | | | | | 95% Confidence Interval of the Difference | |
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
size8	-1,641	377	,102	-,24556	-,5397	,0486
size7	1,958	364	,051	,35292	-,0015	,7073
size6	,043	396	,966	,00563	-,2527	,2640
size5	,287	368	,774	,04231	-,2474	,3320
size4	,172	366	,864	,02498	-,2611	,3110
size3	-,318	392	,751	-,04258	-,3060	,2208
size2	1,084	381	,279	,19191	-,1561	,5399
size1	1,061	346	,290	,17221	-,1471	,4915

As can be seen from the table 8, the mean returns for the shorted stocks in the all different size categories, are quite close to zero in the event date. None of the returns deviate significantly from zero. Thus the null hypotheses of H_0: $\mu_{size1–size8} = 0$ is accepted. It is still interesting to see that the average returns for the largest size unit on the event date are negative at -0.24556%. The 2-tailed sig. = 0.102, which means that the results are statistically insignificant at the 95% confidence level. However at the 85% confidence

[25] The octiles are divided as following: size1 = –0.49% of the issued share capital; size2 = 0.50–0.56%; size3 = 0.57–0.64%; size4 = 0.65–0.75%; size5 = 0.76–0.89%; size6 = 0.89–1.15%; size7 = 1.16–1.61%; size8 = 1.61%–.

the average returns for the largest size unit in the event date would be significantly nega-
tive. Thus it is interesting to see whether the returns for shorted stocks on the event date
are negative for the very peak of the largest short positions.

In order to test that, the largest size unit is divided into 4 subunits. These subunits are
size categories[26] from Size8.1 to Size8.4 and are divided in a way that they all are quite
equal in size. As one can notice from the previous table 8, the returns on average among
the largest size category were negative even though that result was statistically insignifi-
cant at the 95% confidence level. It means that the returns on these subcategories made
from the largest size category size8 will on average be negative. But how those returns
will be divided? Are the negative returns statistically significant on the largest of these
short positions?

The following table 9 is representing the average returns in the subunits on the event
date. From that table we can observe that the returns are negative in three subunits out of
four. However, the returns are statistically significant only in the size8.2 subunit, where
the returns are significantly negative. However, in the other subunits, the returns are sta-
tistically insignificant. Thus we can observe that there are some differences among the
different size groups but cannot make strong and valid deductions that the market would
collectively treat or react differently to different sized short positions since the results are
for most parts statistically insignificant.

**Table 9 The returns in the event date in the subunits of the largest size cate-
gory**

One-Sample Test

					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
size8.4	-,109	89	,914	-,02901	-,5586	,5006
size8.3	,931	95	,354	,24813	-,2810	,7772
size8.2	-2,434	96	,017	-,76533	-1,3896	-,1411
size8.1	-1,278	103	,204	-,40315	-1,0288	,2225

(Test Value = 0)

4.2.3   Does the short-interest matter?

As was noticed in the preceding section of this study, the size of the short position did not
have any crucial effects to the returns in the event date. However, there is also another
factor, which might have an effect to the returns on event date. That factor is the amount

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[26] The subunits are divided as following: Size8.1 = 1.61–1.81% of the issued share capital; Size8.2
= 1.82–2.16%; Size8.3 = 2.17–2.59%; Size8.4 = 2.60%–.

of the short positions i.e. the short-interest level. As can be noticed from the table 1, some stocks have been shorted remarkably more than others. From the shorted stocks, the stocks with the highest short-interest are Outokumpu and Outotec. Together the short positions for those two stocks form nearly 33% of all the short positions published during the time period, which is covered in this thesis.

In order to study whether the heavily shorted stocks have different returns from other shorted stocks in the event date the price development of Outokumpu and Outotec are examined. This is done by dividing the stocks into thirds[27] based on the short-interest level of each stock. After that, the returns for each third or group are examined.

As can be seen from the following table, the returns for the heavily shorted stocks are negative in the event date. This result differs from the results of Boehmer et al (2010) as that previous study stated that the stock prices do not react to public short selling information immediately. Here we can see the negative price reaction as the mean of returns in the event date for the heavily shorted stocks are negative at -0.20369% and that result is also statistically significant at the 95% confidence level.

Table 10 The returns for the heavily shorted stocks in the event date

	One-Sample Test					
	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Highest short interest stocks returns t+1 VS t	-1,993	980	,047	-,20369	-,4042	-,0032

This result means that there is some kind of herding behavior in the stock market when considering the stocks with the highest short-interest. As this is the case among the heavily shorted stocks, there is a need to re-examine the mean returns for the less shorted stocks as they should be different (higher) from the returns noticed in the section 4.2.1 As can be noticed from the following table 11, it indeed is the case. When excluding the

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Heavily shorted	OUTOKUMPU OYJ	OUTOTEC OYJ		
Mid shorted	METSO OYJ	NOKIA OYJ	NESTE CORPORATION	NOKIAN RENKAAT OYJ
Less shorted	BASWARE OYJ	FORTUM OYJ	METSÄ BOARD OYJ	RAMIRENT OYJ
	UPONOR OYJ	CAVERION OYJ	CITYCON OYJ	CRAMO OYJ
	F-SECURE OYJ	HUHTAMÄKI OYJ	RAUTARUUKKI OYJ	SUOMINEN OYJ
	STOCKMANN OYJ ABP	TIETO OYJ	WÄRTSILÄ OYJ ABP	VALMET CORPORATION
	ELISA OYJ	KESKO OYJ	PKC GROUP OYJ	ORION OYJ
	SANOMA OYJ	UPM-KYMMENE OYJ	KEMIRA OYJ	KONE OYJ
	TALVIVAARAN KAIVOSOSAKEYHTIÖ OY	STORA ENSO OYJ	CARGOTEC OYJ	KONECRANES OYJ
	YIT OYJ			

heavily shorted stocks, the mean returns for the other shorted stocks are positive at 0.18833% in the event date. That result is also statistically significant.

Table 11 The returns for the shorted stocks (excluding the heavily shorted stocks) in the event date

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
The returns (t+1 VS t), excluding the heavily shorted stocks	2,960	2014	,003	,18833	,0635	,3131

This result suggests that when excluding the heavily shorted stocks, there is a statistically significant contrarian reaction among other market participants. This is interesting to notice, since the previous academic studies have not generally been finding any reactions from the market participants in the event date and generally the expected returns for shorted stocks are negative. This result puts both of those assumptions under examination.

Even though, the stock prices do not react to the public short selling information as a larger group or when examined by the size of short position, significant price reactions were still observed, when the shorted stocks were divided into groups based on the short-interest of each stock. However, the price reactions among different groups are quite contrary to each other. As the shorted stocks, excluding the heavily shorted stocks, had a significantly positive price reaction there are possibilities for abnormal returns if the shorted stock prices behave the same way in the periphery as they do in the more efficient marketplaces like NYSE and Nasdaq. That is, if they develop negatively. This raises a question, whether the stock price reactions for each group are correct in the event date or not i.e. should the market react differently to the public short selling information than it did. This is examined by looking at the returns of shorted stocks after the short position has been published. It is interesting to see how quickly the shorted stock prices start decreasing or do they even decrease at all. This matter will be examined in the upcoming sections.

4.3   Development of the shorted stock prices

Most of short selling related studies conducted in the past focus on short interest that is updated on monthly basis. The short selling data is gathered in those studies from month t and then the stock performance in month t+1 is studied. Therefore the studies often only focus on the development of the high short-interest stocks' prices in the following month.

In this study it is possible, thanks to the new and frequently updated short information, to study how the price of shorted stock develops right after the short position has been made. Thus we can focus on the more precise daily-level price development rather than on the price development just on the monthly level.

As was noticed in the previous sections the marketplace did not react in any specific way to the published short selling information when the shorted stocks were examined as a larger group. However, when the stock price reaction was re-examined in a more detailed manner, there actually were significant price reactions among different groups based on the short-interest level. The objective of this part of the thesis is to find out, whether those reactions in the event date were based on noise or not. That is, how do the shorted stocks perform after the short positions have been published. This is examined by comparing the performance of shorted stocks with the index returns. The comparison is done by comparing daily-level price developments from day t+1 up to the day t+50 trading days.

An important issue that is closely related to the previous concern is whether the public short selling data allows anyone to beat the market return. That is, are there any clear patterns in the price development of shorted stocks after the event date. To find that out, there is a need to examine how the short positions perform in the short-run. The data available however restricts this. As there is no data available on when the short sellers cover or close their positions this section focuses on studying how the shorted stock prices develop instead of studying the profits (losses) of the significant short selling positions. This means that the results of this section will show whether the short positions potentially could have succeeded.

If the stock price development of the shorted stocks does not differ from the development of the entire stock exchange, then the different market reactions to the public short selling information can be questioned. If the price development however differs, then it is interesting firstly to find out whether the first market reactions to the short selling information were correct. Secondly, it is interesting to see if there is a slower price adjustment process and how long does it possibly take. Finally, it is interesting to find out how do the shorted stocks as a one group perform and do the different subgroups based on the short-interest perform significantly different. The following figures indicate how the stock prices develop up to 50 days after the event date.

As one can see, the stock groups included in the figure 11 are the two indices (OMXHelsinki index and OMXHelsinki 25) and the group "All shorted stocks", which includes the average performance of all short positions. The OMXHelsinki index is an index that covers all the companies, which are being traded on the main list of the Helsinki stock exchange. The OMXHelsinki 25 index covers the 25 largest companies in the Helsinki stock exchange. Both of these indices are weighted based on the sizes of the companies. The average returns are calculated for each group from the event date up to the

date t+50 trading days. From the following figure it is clear to notice that the shorted stocks as a single unit underperform the index returns.
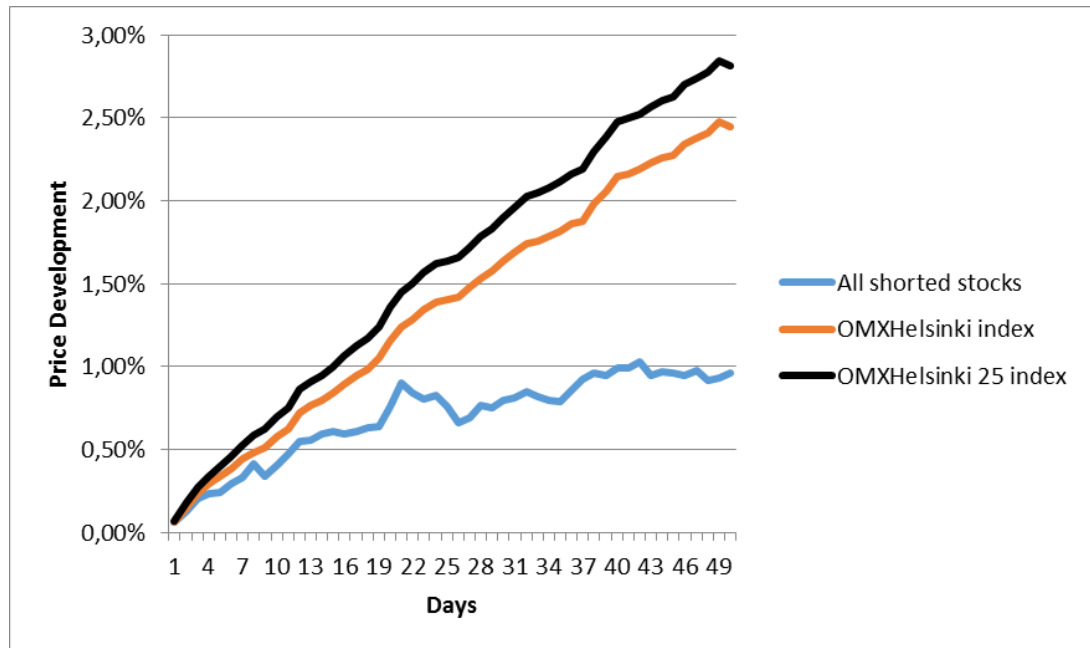

Figure 11 Shorted stocks VS the index development

As noticed in the section 4.2, there was no statistically significant price reaction for the shorted stocks as a larger group in the event date. As can be seen from the previous figure, the shorted stocks' price development is quite similar to the indices development up to 21 days after the short position has been created. After that date on average the positive price development of all shorted stocks slows down remarkably and even turns into negative for a short period of time. As a result, in the date t+50 the returns for all shorted stocks are on average at 0.95% when compared to the event date stock prices. This means that the indices are able to outperform the 'all shorted stocks' approximately with 1.50% (1.49% and 1.86%) in the 50 trading days after the event date. As a total, the short sellers are able to find stocks, which perform worse than the index, but still, the short positions would on average be unprofitable.

From the following figure one can observe even more closely the price development for each group starting from 21 trading days after the event date. On the date t+21 the indices have outperformed the shorted stocks only with 0.34% and 0.55% depending on the index. However, up to the date t+50 the indices have continued to develop as before, but the shorted stocks have gained value on average only 0.05% in those almost 30 trading days.
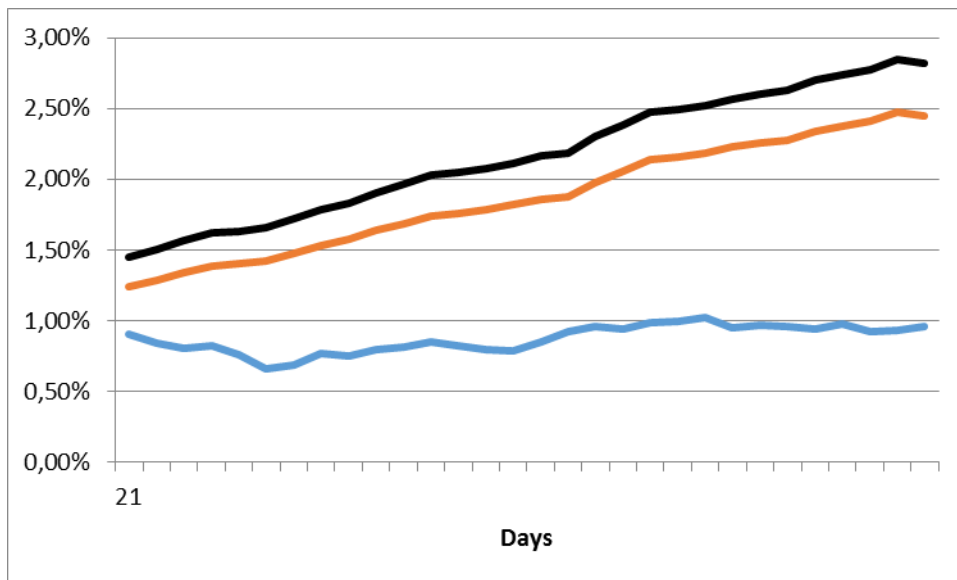
Figure 12 The development of the indices and all shorted stocks from t+21 to t+50

However, not all shorted stocks behave similarly. As was already noticed in the section 4.4 of this study, the stock prices experienced different reactions at least in the event date depending on the short-interest. Thus it is interesting to see whether the stock prices among these subgroups continue to develop differently after the event date also. As one can see, the stock groups included in the figure 13 are the index (OMXHelsinki) and three subgroups of shorted stocks. The three groups are subgroups from the shorted stocks. The subgroups are built by dividing the shorted stocks into three thirds[28] just as they were divided in the section 4.4 based on the amount of short selling positions. Two companies Outokumpu Oyj and Outotec Oyj form one third and as those stocks are the most frequently shorted stocks, they form the group of 'heavily shorted' stocks. The amount of short positions on different companies can be seen from table 1.

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[28] The subgroups of shorted stocks:

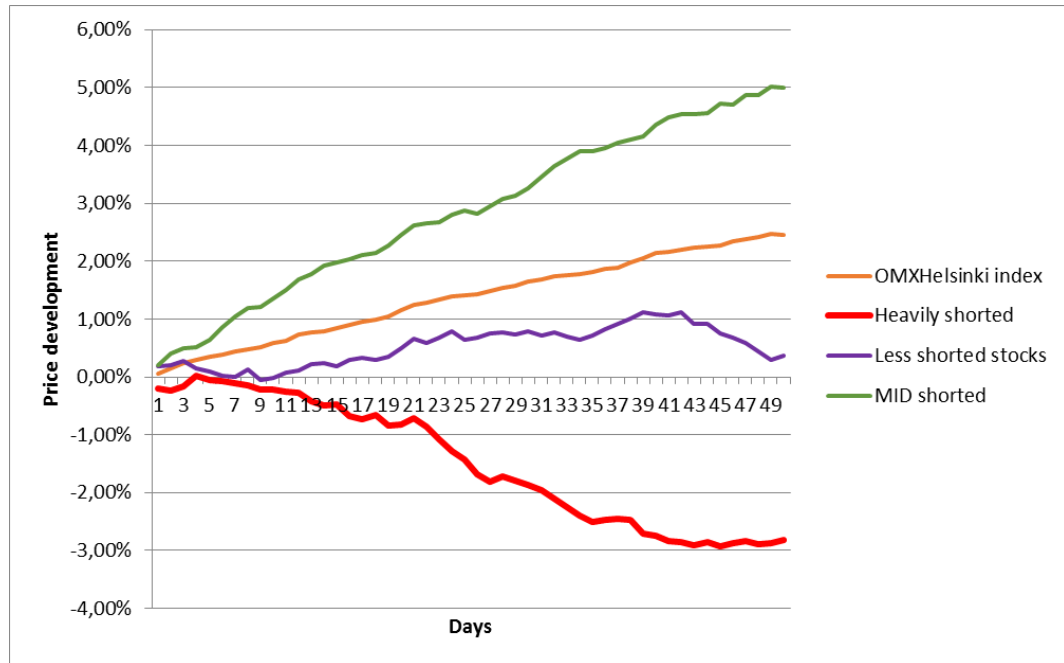| Heavily shorted	OUTOKUMPU OYJ	OUTOTEC OYJ		
Mid shorted	METSO OYJ	NOKIA OYJ	NESTE CORPORATION	NOKIAN RENKAAT OYJ
Less shorted	BASWARE OYJ	FORTUM OYJ	METSÄ BOARD OYJ	RAMIRENT OYJ
	UPONOR OYJ	CAVERION OYJ	CITYCON OYJ	CRAMO OYJ
	F-SECURE OYJ	HUHTAMÄKI OYJ	RAUTARUUKKI OYJ	SUOMINEN OYJ
	STOCKMANN OYJ ABP	TIETO OYJ	WÄRTSILÄ OYJ ABP	VALMET CORPORATION
	ELISA OYJ	KESKO OYJ	PKC GROUP OYJ	ORION OYJ
	SANOMA OYJ	UPM-KYMMENE OYJ	KEMIRA OYJ	KONE OYJ
	TALVIVAARAN KAIVOSOSAKEYHTIÖ OY	STORA ENSO OYJ	CARGOTEC OYJ	KONECRANES OYJ
	YIT OYJ			

Figure 13 The price development of different subgroups

Shorted stocks as a single unit (All shorted stocks) seemed to underperform the index in the following 50 trading days after the event date. However, the different subgroups behave very differently when compared to each other as can be noticed from the figure 13. Less surprisingly the most heavily shorted stocks are the biggest underperformers. On average, those stocks have generated a loss of 2.82% in the 50 days after the short position has been created. As a matter of fact the index is able to beat that group by more than 5% (5.26%) in the following 50 trading days after the event date. One more observation from the heavily shorted stocks is that the negative price development accelerates after 21 trading days. It looks like there is a second price discovery process for the heavily shorted stocks approximately one month after the short positions have been created.

The underperforming exists also in the group of less shorted stocks. This group consists of stocks that have been sold short, but not as much as in the other two groups. The returns for stocks in that group are 0.36% in the next 50 days after the short position has been created. However, the most surprising result is that the middle third of the shorted stocks receive huge returns. The returns for that group are almost 5% (4.99%) in the following 50 trading days after the event day. And perhaps what is even more remarkable, that group is able to exceed the returns of the index by more than 2.5% (2.54%) in the same time period.

From the following figure one can see that the shorted stocks, excluding the heavily shorted stocks, outperform as one group the index return with 0.36% in the next 50 trading days after the event date. The market reaction on the event date was positive for those stocks and that reaction seems to be also just since the returns for those stocks are on average 2.80% in the following 50 trading days after the event. These results mean, that on average the short sellers are informed only in the highest short-interest stocks. Thus

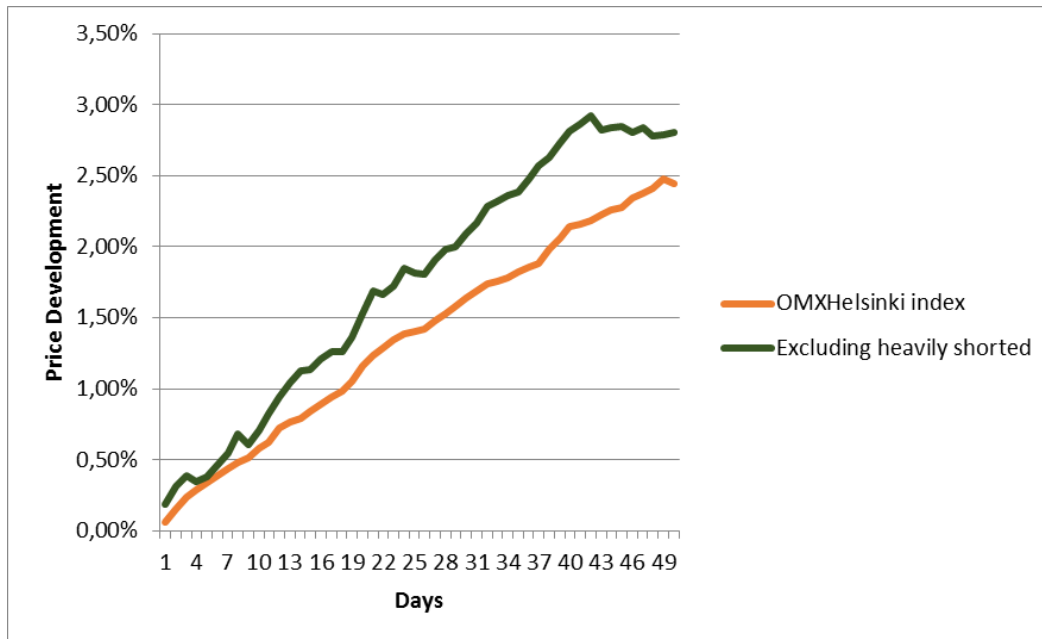only approximately 33% of all the short positions are potentially profitable in the Helsinki stock exchange.

Figure 14 The price development of the shorted stocks, excluding the heavily shorted

From the preceding figures one can observe, that the hypothesis 'the shorted stocks perform worse than other stocks' is true. All shorted stocks underperform the index returns. And as the index includes also the shorted stocks, the other stocks are able to outperform the shorted stocks. However, the hypothesis 'the greater the short interest, the smaller the returns', is not that simply acceptable. The heavily shorted stocks do have negative returns, but on the other hand the least shorted stocks perform a lot worse than the middle third of the short-interest stocks. Thus the hypothesis can be accepted only partly. The stocks with the highest short interest have lower returns than other shorted stocks.

4.3.1 Portfolio A

As was noticed in the previous section, the heavily shorted stocks do perform a lot worse than other stocks. Thus it is interesting to see, how much do the heavily shorted stocks lose when compared to the index returns in the entire period from the November of 2012 until the end of January 2016. In order to do the comparison we create an illustrative portfolio (Portfolio A) from the heavily shorted stocks. This is an illustrative portfolio since it is examining afterwards how the heavily shorted stocks have been perform-

ing. Thus it is not a portfolio that could have been put in practice. The stocks in the Portfolio A are: Outotec Oyj, Outokumpu Oyj, Neste Corporation and Nokian Renkaat Oyj. The proportionate portions of each company in the portfolio can be seen from the figure 15.
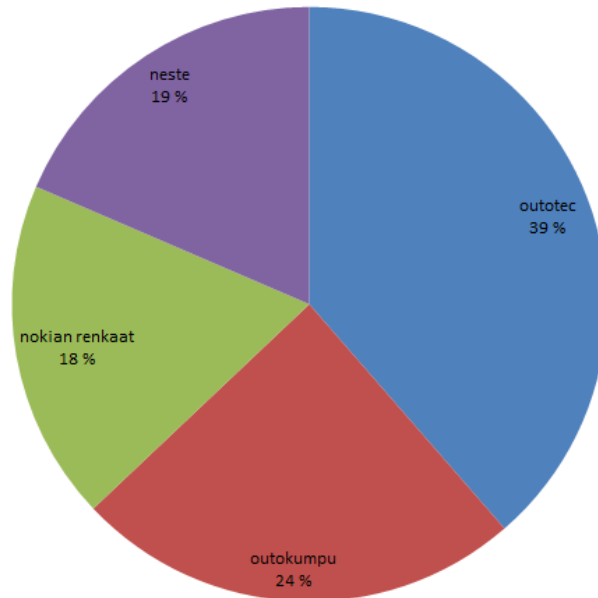
The Portfolio of heavily shorted stocks

Figure 15 The Portfolio and the portions of each stock

As we can see from the figure 16, the heavily shorted stocks underperform seriously the entire OMXHelsinki index. It means that either the short sellers have been correct with their evaluations or they have practiced momentum investing. Most likely the underperformance is a result of both of those actions as both of those are part of different short selling strategies as explained in the theoretical part of this study. Crucially different the price development during that time period is in the end of 2013. during that time the index is increasing steadily in value, but the heavily shorted stocks decrease in value at even more rapid pace. However, as this is just an illustrative portfolio, we cannot make direct conclusions from either of these assumptions unless we examine the shorted stocks' performance further. And that is done in the following parts of this study.
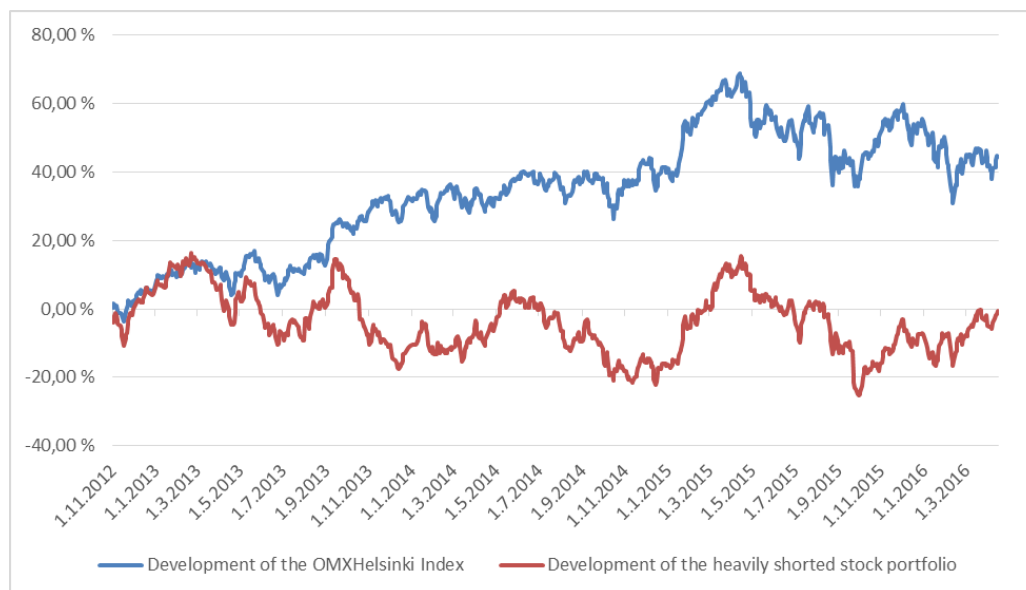
Figure 16 The Portfolio A VS the index November 2012–January 2016

4.4 Monthly-level examination

Does the periphery of Helsinki stock exchange behave differently from other markets when the short selling is examined? In this section the main method of other previous studies i.e. the monthly-level examination of shorted stocks is used in order to get results that are easily comparable with other studies. The academics widely state (e.g. Boehmer et al. 2010, Desai et al. 2002) that the stocks shorted in the previous month have negative returns in the following month.

Two portfolios, Portfolio B and Portfolio C are formed to examine the matter. The Portfolio B examines whether it is also possible in the Finnish stock exchange to reach positive returns by selling short the highest short interest stocks in the following month. The Portfolio C examines whether the adjusted index investing by avoiding the heavily shorted stocks can beat the actual index returns in the periphery of Finnish stock exchange.

4.4.1 Portfolio B

On average there are 21 trading days per month. As can be noticed from the preceding section's figure 11, the group 'all shorted stocks' and the index develop quite similarly the first 21 days after the short position has been acquired. After 21 days however the trend changes as the index continues developing as before but the development of the shorted stock prices slows down significantly. And with the heavily shorted stocks the

price development changes into significantly more negative price development. From there we can deduct that the most heavily shorted stocks could have negative returns in the following month. Thus in this following example portfolio, Portfolio B, the portfolio is updated in the first day of every month. To the Portfolio B only stocks that have been the most heavily shorted in the past month are selected and those stocks are sold short in the first day of the following month. More specifically, the significant short positions acquired in each month need to cover together at least 5.00% of the issued share capital within each month. For example, the portfolio for December 2012 is constituted as following based on the short positions published in November of 2012:

Table 12 The portfolio B in December 2012

Company	Percentage (total) of the issued share capital	Weighting in the portfolio
KONECRANES OYJ	7,41	7,02 %
NOKIA OYJ	25,2	23,87 %
OUTOKUMPU OYJ	17,75	16,81 %
OUTOTEC OYJ	35,4	33,53 %
STORA ENSO OYJ	6,19	5,86 %
TALVIVAARAN KAIVOSOSAKEYHTIÖ OYJ	8,52	8,07 %
UPM-KYMMENE OYJ	5,12	4,85 %
	105,59	100,00 %

After the constituents for portfolio B in each month from December 2012 to February 2016 have been selected it is time to examine, how the portfolio B behaves. The stocks that are selected to the portfolio B are sold short in the first day of every month. This means that if e.g. the stock price of Konecranes Oyj increases in December 2012, the portfolio is making a loss in the case of that stock. Thus the non-cumulative returns for portfolio B in each month are constituted as following.

Table 13 returns for portfolio B in December 2012

Company	Weight in the portfolio	Stock price development	Returns in portfolio B
KONECRANES OYJ	7,02 %	2,53 %	-0,18 %
NOKIA OYJ	23,87 %	14,90 %	-3,56 %
OUTOKUMPU OYJ	16,81 %	10,86 %	-1,83 %
OUTOTEC OYJ	33,53 %	4,44 %	-1,49 %
STORA ENSO OYJ	5,86 %	4,17 %	-0,24 %
TALVIVAARAN KAIVOSOSAKEYHTIÖ OYJ	8,07 %	6,25 %	-0,50 %
UPM-KYMMENE OYJ	4,85 %	1,85 %	-0,09 %
	100,00 %		-7,89 %

As the previous table 11 indicates, the short selling portfolio, Portfolio B, is making a loss of -7.89% in the December of 2012. This means that in December 2012 those stocks, which were heavily shorted in November of 2012, were increasing in price. In the same month, the OMX Helsinki stock index is making a profit of +2.31%. The following scatter plot in figure 12 presents the non-cumulative returns of the portfolio B and the entire OMX Helsinki stock index in each month. From the scatter plot it is easy to observe that

the portfolio B presents every now and then more extreme outcomes than the index does. That makes perfect sense since the portfolio B is less diversified.
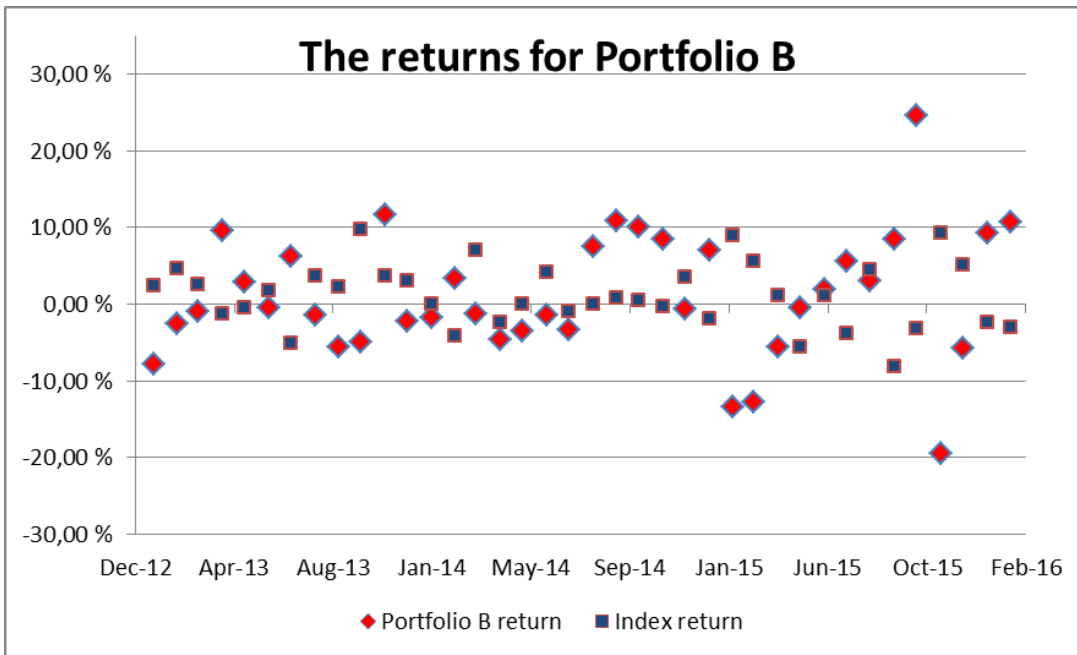

Figure 17 The non-cumulative returns for Portfolio B

On average the non-cumulative returns for OMX Helsinki stock index were 0.948% during the examination period. However, the average non-cumulative returns for the short selling portfolio, portfolio B, were 0.982% during the same examination period. Thus the Portfolio B is able to beat marginally the index return. These results indicate that the short sellers are well-informed investors also in the financial periphery of the Helsinki Stock exchange.

Table 14 The Portfolio B return statistics

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Portfolio B returns	39	,9818	8,19095	1,31160
Index returns	39	,9479	4,22528	,67659

However, it is important to notice that the returns for portfolio B vary remarkably lot between different months. It means that with this small sample (N=39) the results are statistically insignificant as can be seen from the following figure. Thus it would be reasonable to test this kind of portfolio in the future with a larger sample. In this study that is however not possible, since there just is not enough data available yet. However, as

Bodie et al. (2011, 384) notice about the magnitude issue, that if there is a fund manager responsible for a €5 billion portfolio, the monthly return difference of 0.04% would result as €200 000 monthly return difference moneywise. Even though it is statistically hard to measure the contribution difference of 0.04% return, moneywise that difference is easy to measure.

4.4.2   *Portfolio C*

The portfolio C is an adjusted index portfolio. The reasoning behind Portfolio C is based on the idea, which rises from the academic literature, that by avoiding the stocks that have been sold short in the past it is possible to reach abnormal positive returns. However, as was observed in the section 4.4 of this thesis, the less shorted stocks do not necessarily have higher returns than the other stocks. Thus it is interesting to see, whether the adjusted index investing could beat the returns of actual index investing.

The Portfolio C is an adjusted portfolio constructed by adjusting the OMX Helsinki 25 index. The information concerning the index is gathered from the web page of Seligson, which is the company responsible for the OMXH25 ETF[29]. The information needed are e.g. the companies in the index and each company's weight in the index. (Seligson OMXH25 ETF). From the gathered information the ETF OMXH25 is adjusted in such a way that the stocks, which have been shorted more than 5% in the previous month are sold short in the following month with the same weighting as it would otherwise be included in the portfolio as a long position. From the following table 15 the development of the Portfolio C and the development of the ETF in January 2013 can be seen. The adjustments made to the portfolio are based on the short positions published in December 2012.

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[29] ETF = Exchange Traded Fund. OMXH25 ETF is a specific ETF, which is a tradeable fund mimicking the OMXHelsinki 25 index.

Table 15 Formation of Portfolio C in January 2013

Company	Weight (%)	Price development	ETF price development	Shorted > 5%	Portfolio C price development
Amer Sports	1,67	0,043555556	0,072737778		0,072737778
Cargotec	0,87	0,040601504	0,035323308		0,035323308
Elisa	3,15	0,047220562	0,14874477		0,14874477
Fortum	7,71	-0,024028269	-0,185257951		-0,185257951
Kemira	1,49	-0,011007621	-0,016401355		-0,016401355
Kesko	2,08	-0,024626564	-0,051223254		-0,051223254
Kone	9,37	0,088888889	0,832888889		0,832888889
Konecranes	1,62	-0,031311155	-0,05072407		-0,05072407
Metso	5,37	0,029026217	0,155870787		0,155870787
Neste	1,57	0,202661208	0,318178096		0,318178096
Nokia	13	-0,017064846	-0,221843003		-0,221843003
Nokian Renkaat	4,97	0,05282392	0,262534884	x	-0,262534884
Nordea Bank	3,66	0,125690608	0,460027624		0,460027624
Orion	2,68	-0,07213706	-0,193327322	x	0,193327322
Outokumpu	1	-0,040345821	-0,040345821	x	0,040345821
Outotec	2,31	0,093484419	0,215949008	x	-0,215949008
Pohjola Bank	2,74	0,118899734	0,325785271		0,325785271
Rautaruukki	0,63	-0,110738255	-0,069765101		-0,069765101
Sampo	9,38	0,086688578	0,813138866		0,813138866
Sanoma	0,95	0,001344086	0,001276882		0,001276882
Stora Enso	3,74	0,001904762	0,00712381		0,00712381
Teliasonera	4,9	0,035019455	0,171595331		0,171595331
UPM Kymmene	5,8	0,021566402	0,125085131		0,125085131
Wärtsilä	7,03	0,071210269	0,500608191		0,500608191
YIT	2,07	0,096075778	0,198876861		0,198876861
Total			3,816857608		3,32723611

In the earlier studies, the academics have been able to find abnormal positive returns using investing strategies quite similar to portfolio C of this study. However, in this study the results are quite different. As can be seen from the following figure and table, the returns for the Portfolio C are less than the returns for the index in the same investing period. The non-cumulative monthly mean returns for the ETF25 (OMXHelsinki 25) are approximately 1.01%. The mean returns for the Portfolio C in the same time period are just 0.69% per month.

Table 16 The mean returns for Portfolio C

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
OMX Helsinki 25 returns	39	1,0097	4,53459	,72612
Portfolio C returns	39	,6862	3,52407	,56430

This is most likely a result from two factors that the Helsinki Stock Exchange faces. The OMXHelsinki 25 index as well as the entire stock exchange is characterized by being very unevenly balanced in terms of the company sizes. The second factor is that the Helsinki stock exchange is a rather illiquid stock exchange. As the short selling process is possible only for stocks that are quite easily acquired, not every stock can be sold short in large numbers. Either the stocks are unavailable for borrowing or the short sellers are afraid that there might be a serious lack of supply for the shorted stocks, when trying to buy them back. And in the Helsinki stock exchange the number of those easy-to-approach

stocks is very limited. On top of that the Helsinki stock exchange is very unevenly balanced in terms of company sizes. There are just a couple of companies (Nokia, Kone, Sampo) that form a lion's share of the entire index. If some of the short sellers are wrong with only one of these larger companies, it can make the entire group of all short sellers look fallible even though most of them might be correct with their evaluations. Most importantly, the most heavily shorted stocks (Outokumpu and Outotec) are very lightly weighted in the OMXH25 ETF and as a result those two companies are also very lightly weighted in the Portfolio C. From the following figure one can observe how the monthly returns are formulating in each month.
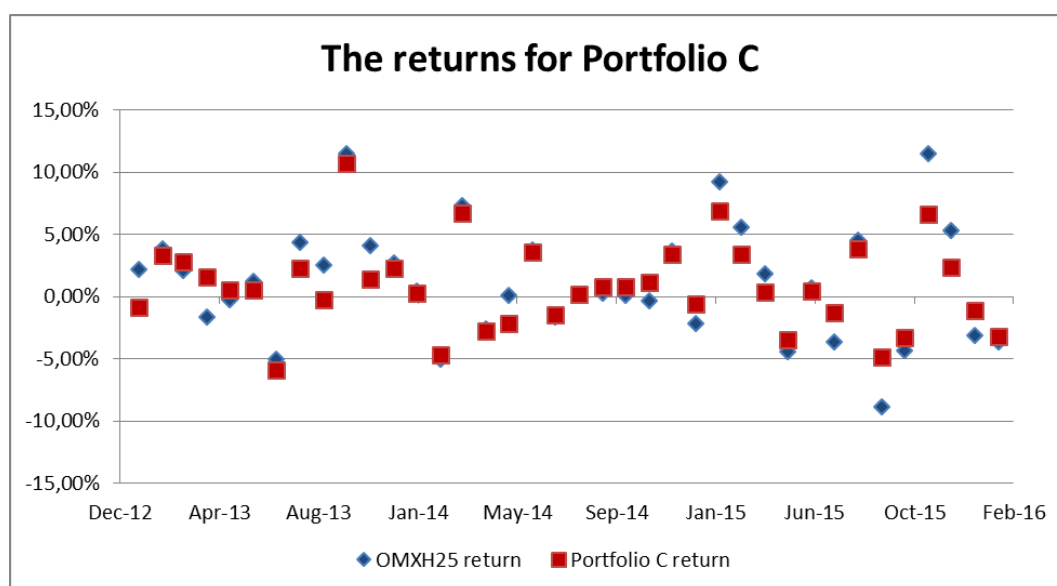

Figure 18 The non-cumulative monthly mean returns

These characteristics and results of the Helsinki stock exchange are just some of the distinctive features that make financial peripheries differ from other marketplaces. The general findings in the finance literature focus almost always on the larger trading venues and the smaller, more distant trading venues often are neglected. That was one of the reasons why this study was conducted in the selected manner and these results that have been found prove that the stock markets have different characteristics and the results might differ a lot between the larger and smaller trading venues.

4.5   Explaining the empirical results

The returns for the shorted stocks on the event date follow random walk as a larger single unit. Thus the prices did not seem to adjust quickly to short selling information and thus opportunities for anomalous returns exist. Neither did the market react to the short selling

information when the size of the position was examined. However, as the matter was re-examined more carefully from the aspect of short-interest there were clear market reactions to different groups of shorted stocks. Stocks with high short-interest faced a negative market reaction to the released short selling information. However, the rest of the shorted stocks faced a positive price reaction. Both of these price reactions were statistically significant and thus the public short selling information indeed has an effect to the stock prices and it is not treated as noise. The next step in the empirical testing was then to examine, whether the stock market should have treated the short selling information as noise.

The results of the empirical testing provide somewhat controversial statements when the performance of short sales and thus the information level of short sellers are examined in the Finnish stock market. On the other hand, there seems to be a group of well-informed, sophisticated short sellers. As the heavily shorted stocks as well as the portfolio B of heavily shorted stocks did point out, the short sellers are able to sell short stocks, which will decrease also in the future. Thus the results of this study concur with the results of most of the short selling related studies. These results also proved that the negative market reaction to the heavily shorted stocks was indeed an efficient one.

However, the majority of short positions seem to be unprofitable in the Finnish stock market. The stocks with lower short-interest did not reach negative returns after the short position was created, but instead e.g. the moderately shorted stocks were even able to outperform the index returns clearly. The positive market reaction to the short selling information in the case of these stocks was also efficient.

These results point out that even though there are extremely well-informed short sellers not every single short position is a well-informed one. Thus the short sellers should not be feared. Even a bit surprisingly, the other market counterparts seem to be able to react properly to the short selling information as they are able to recognize the informed short positions from the less-informed ones.

As the results of the Portfolio B demonstrate, the short sellers are sophisticated also in the Helsinki stock exchange. As the index returns indicate, an uninformed short seller would make on average a loss of 0.95% by short selling stocks randomly. The portfolio B, which mimics the short sellers' transactions is able to reach positive returns of 0.98% by short selling same stocks that the short sellers have sold short in the previous month. This portfolio does not take into account the cost of short selling and thus the actual returns in practice are a bit lower for portfolio B. On the other hand the costs of the index investing have not either been taken onto account. Those costs however are nowadays very low, since different discount brokers[30] have entered the markets and offer sometimes

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[30] Discount brokers offer less services and charge lower fees than a traditional brokerage firms.

even free-of-charge index investing funds. The results that were gathered from the Portfolio B are quite similar to the results of other studies. The higher short interest in month t usually means lower or negative returns for a stock in month t+1 and that was also the case in the Finnish stock market.

However, the results from the Portfolio C were a bit different from the results of other studies. Usually the adjusted index investing strategy is able to outperform the index return. In the case of the Finnish stock market, this was not the reality. The Portfolio C reached mean returns of only 0.69% and underperformed the actual monthly index mean returns with 0.32%. This result just points out that not all of the short positions are informed and the financial peripheries do behave differently when compared to the larger trading venues.

One more important observation from the empirical testing is that even though there is a significant first reaction to the short selling information, there seems to be a second price discovery process among the heavily shorted stocks starting from 21 trading days after the short position has been created. The negative price development turns into a steeper drop after 21 trading days. As there are on average 21 trading days in a month this suggests that either the short sellers are predicting correctly troubles for those shorted companies one month beforehand or there are some larger traders, whose trading strategies are affected by the short selling information one month after those short positions have been created. If the latter is true, then the largest short sellers are in fact bears who are able to create self-fulfilling prophecies.

The second price discovery process among the heavily shorted stocks can be interpret in such way that there is more speculative or predictive short selling than reactive short selling in the Finnish stock market. That predictive short selling seems to be also informed predictive short selling as this second price reaction is increasingly negative and only occurs with the heavily shorted stocks. The assumption of greater amounts of predictive short selling can be supported with further arguments. As Alexander et al (2014) noticed, the reactive short sellers are able to outperform the predictive short sellers, and as the middle third of shorted stocks is performing so well, the relatively high short-interest of the well-performing Metso, Neste, Nokia and Nokian Renkaat could be explained with either large amounts of predictive short sales or large amounts of uninformed short positions done e.g. in hedging purposes. Most likely it is a result of both.

5 SUMMARY AND CONCLUSIONS

This thesis studied short selling and the effects it might have on stock prices in the financial peripheries. The thesis approached the topic of short selling from the viewpoint that the short sellers are indeed better informed investors as the academics widely state based on the reasoning of Diamond and Verrechia (1987). The Finnish stock market has not been examined recently regarding of short selling and as the quite recent regulation (EU 236/2012) made possible to study short selling in a more detailed level also in the Finnish stock market, this thesis is also very current and is able to give answers in a more detailed level than most of the studies concerning short selling.

When examined the short positions at a general level, this study bumped into the same dilemma as e.g. Boehmer et al (2010, 81) noticed. The stock market seems to adjust very slowly to public short interest information also in the Finnish stock market. Thus the market creates an opportunity for investors to anomaly returns. Even though it is publicly known that the short sellers are able to beat the market returns and those abnormal returns are not that often even based on speculation but more on effective analyzing of the existing public information, the other market participants do not adjust their expectations of the future success of certain assets based on the public and frequently updated data that quickly. Perhaps most puzzling that result of slow price adjustments is in the perspective of financial peripheries. Usually in the peripheries there is a problem of overreaction rather than underreaction, but that does not seem to apply in the case of short selling in the Helsinki Stock Exchange. The short selling information seems to be ignored or neglected no matter whether it is concerning financial peripheries or not. Either the size of the short position did not seem to make any difference on the market reaction.

However, when re-examined more closely, there are observable and statistically significant market reactions to the public short selling information. The stock market seems to react differently to the published short information not depending on the size of the short positions, but depending on the amount of the short positions. That is, the higher the short-interest is for a single stock, the smaller the returns are and vice versa. The heavily shorted stocks have negative returns in the event date, which signals that there is a herding effect or herding behavior after the releasing of significant short position information for the heavily shorted stocks. On the other hand, while excluding the heavily shorted stocks, the market reaction for the other stocks in the event date is positive. This suggests that the market participants are reacting contrarily to short seller's transactions when those stocks are considered.

These findings are extremely interesting. As Boehmer et al. (2010) stated, the stock market reaction to the public short selling information is thought to be slow and invisible in the event date. Quite oppositely there actually are quick and visible reactions. The stock market faces both herding and contrarian reactions, but as those reactions are counterparts

to each other they cancel each other in a larger group. What is also significant is that generally the reaction is thought to be either negative or positive. In this study it was proven that the reaction to the public short selling information can be both negative and positive depending on the level of short-interest.

However, these first reactions to the public short selling information are efficient only if the shorted stock prices do behave in a specific manner after the event date. The academic literature suggests widely that the short sellers in general are correct with their evaluations and thus the negative price reaction would not be violating the rules of the EMH, but that would not be the case with the positive price reaction. The data of this thesis pointed out that the shorted stocks indeed perform differently from the other stocks in the Finnish stock market. To make things a bit more complicated, the shorted stocks perform differently also to each other. The shorted stocks as a larger group underperform the index returns in the following 50 trading days after the event date. However, when divided into smaller subgroups there were remarkable differences among those groups. The heavily shorted stocks underperform the index return by nearly 5% in the following 50 trading days after the event. Thus the negative market reaction to the short selling information can be seen as fair and efficient. A bit surprisingly also the positive first market reaction to the short selling information on other stocks can be seen as an efficient one. As the other shorted stocks, excluding the heavily shorted ones, outperform the index return, the positive price reaction on the event date to these stocks can be seen as an efficient one.

Furthermore, the shorted stocks' performance in the Finnish stock market was examined also at the monthly level. This was done in order to make the results of this study comparable with other studies regarding short selling and also to find out whether there are possibilities for anomaly returns by using the monthly level short selling information. As the Portfolio B of heavily shorted stocks was able to point out, the heavily shorted stocks in month t have negative returns in month t+1. On average, by selling the heavily shorted stocks short in the following month, a short seller was able to reach returns of 0.98% in the monthly level. An uninformed short seller would make on average a loss of 0.947% by selling stocks randomly short. However, the adjusted Portfolio C was unable to reach the market return.

As one can deduce, the results of this study were somewhat controversial. The academic literature often holds short sellers as well-informed investors based on the reasoning of Diamond and Verrechia (1987). However, as stated earlier, not everyone agrees with that. E.g. People working on Wall Street according to Desai et al. (2002) expect positive price pressure to stocks with heavy short interest. On top of these two groups, there is one school of thought, which does not believe that the short-interest and the stock price are connected to each other. The results of this study agree with all of these assump-

tions to some extent. Some of the short sellers truly are sophisticated and extremely profitable investors but there is a large share of less-informed or even uninformed short positions. So, actually these assumptions can all be true at the same time even though they are generally thought to be rival and excludable. This is an important finding and it should turn the focus of the academic literature elsewhere from trying to decide, which one of those assumptions is correct.

These results mean that instead of creating confrontations between these three schools of thought, the academic literature should focus more on different things such as identifying the different short sellers representing each group better. The academics have been able to find that there are different kind of short sellers like the predictive and reactive short sellers and also short sellers executing different short selling strategies. However, the more accurate identifying of those different groups is still in progress. This study points out that all of those schools of thought may as well be correct at the same time when the short sellers are scrutinized as a single larger unit, but not when the short sellers are divided into smaller homogenous groups. Thus the future studies considering short selling should divide the short sellers into smaller homogenous units and focus on how to identify those groups more quickly and how do those different groups perform. Also the wider examination of tracing the origin of the informed short sellers' information advantage should become easier, if only the informed short sellers are isolated all in one group.

Briefly, the public short selling information is not treated as noise. There are clear market reactions to the public short selling information and even more significant, those market reactions do not violate the rules of the EMH. Those herding and contrarian first market reactions can thus be seen as fulfilling the assumptions behind the EMH. Thus there seems to be rational herding and contrarian reactions. Park and Sabourian (2011, 973) state that generally the herding and contrarian behavior are thought to be excluded in efficient marketplaces but for exceptional cases. Unlike the general opinion, the results achieved in this thesis point out that the herding and contrarian reactions seem to be efficient and rational in the Finnish stock market when short selling is examined. This conclusion is a rather surprising one as the Finnish stock market is a financial periphery and those areas are generally thought to be more inefficient ones. Also rather surprisingly the majority of the short positions are potentially unprofitable in the Finnish stock exchange. That is also somewhat controversial to the academic literature findings.

As this thesis was able to find out that the stock market does react immediately to the public short selling information, it could be reasonable to make further studies whether the level of short-interest has an effect on the market reaction at the event date in the larger venues also and whether that possible reaction is an efficient one or not. As the amount of publicly available short selling information is increasing all the time, it is rea-

sonable to continue studying short selling more and in more detailed manners. Also regarding the Finnish stock market, it would be interesting to examine more carefully what kind of short selling strategies do the short sellers practice in the Finnish Stock exchange. Furthermore, it would be interesting to examine the reasons for the steeper price drop of the heavily shorted stocks. Finally, as the short sellers in general are thought to be sophisticated and well-informed investors, it was perhaps surprising to find out that the majority of the shorted stocks have on average positive price development after the short position has been published. Thus the more accurate identifying of different short seller groups should continue. As most of the short positions in the Finnish stock exchange were unprofitable, it would be interesting to find out why do those short sellers go short. Are all of those positions created in hedging purposes? Are some of the short sellers just too confident with their skills or is it noise after all, which makes some short sellers go short on wrong occasions? All of these are interesting questions, which need further examination.

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