Bachelor's Thesis in Accounting and Financial Management

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Stock price reactions to the announcement of increases in net short positions

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Abstract

Following the Diamond Verrecchia hypothesis that the publication of increases in short interest in a certain security is a negative signal for markets, our study examines the effects of the publication of significant increases in short positions on stock prices on the Swedish stock market using an event study. The study uses daily data published by the Swedish Financial Supervisory Authority to study the effects of 282 published significant increases in short interest during a 40-month period between 2012 and 2016. Our study finds no significant evidence that the publication of increases in short interest precede abnormal stock returns on the publication day or the 15 days following it and thus we cannot determine that the Diamond Verrecchia hypothesis holds true in our studied market. However, a significant decrease in stock prices prior to the publication date is observed, especially in stocks without publically traded options.

Keywords: Short selling, Swedish Financial Supervisory Authority, Publication of short net positions, Stock prices, Abnormal returns

Table of contents

1. Introduction 4
1.1. Background 4
1.2. Short selling – How does it work? 4
2. Problem discussion 6
3. Purpose and hypothesis 6
4. Institutional setting in Sweden 8
4.1. Regulatory framework 8
4.2. The Short Sale Constitution 10
5. Theory 11
5.1. The efficient market hypothesis 11
5.2. Information asymmetry and Signal Theory 12
5.3. Price manipulation 13
5.4. Behavioral finance 14
5.5. Earlier research 15
6. Method 19
6.1. Event study 19
6.2. Event window 21
6.3. Event definition 21
6.4. Financial Supervisory Authority data 23
6.5. Delimitation 23
6.6. Subsets 23
6.6.1. Stricter event definition 24
6.6.2. High leverage companies 24
6.6.3. Availability of options 24
7. Empirical results 25
7.1. Returns for entire population 25
7.2. Returns for subsets 26
7.2.1. Stricter event definition 26
7.2.2. Highly leveraged companies 27
7.2.3. Stocks without publically traded options 27
8. Discussion 29
8.1. Publication day and post event returns 29
8.2. Pre-event returns 30

8.3. Critical reflexion 31
9. Conclusion 32
9.1. Suggestions for further research 32
10. References 34
10.1. Electronic references 34
10.2. Literature 35
11. Appendix 38
Entire sample data 38

1. Introduction

1.1. Background

Short selling has been a subject of discussion during the last decade, especially fuelled by accusations of the practice having aggravated the global financial crisis of 2007-08. Both media and politicians have at times argued that short sales had a negative effect on the stock prices and that the effect is amplified in times of sharp downturns or instability in the market (SEC, 2008).

On the other hand, there are experts arguing against the accuracy of these accusations, and there exists research indicating positive effects of short selling such as increased market liquidity and information efficiency (Sveriges Regering, 2011/12:175). In recent decades a majority of research has indicated that the negative effects of short sale bans outweigh any positive effects.

In 2008, U.S. regulators imposed a ban on the short selling of financial stocks, fearing that the practice was the cause to the steep drop in stock prices during the crisis. Despite new restrictions, the desired effects of this action were not achieved. The 2008 ban on short sales di not slow the decline in the price of financial stocks, and prices fell markedly over the two weeks in which the ban was in effect and stabilized once it was lifted (Battalio, 2012).

In the summer of 2011, at the height of worries about the sovereign debt in Greece and other European economies, several countries in the European Union introduced restrictions on short selling. Among others, France imposed a ban on 11 of the largest banks and finance companies to prevent negative rumours in the market and to prevent short sellers from increasing turbulence in an already volatile market. Again the results failed to show any indication that the ban had the intended effect of calming markets (Aktiespararna, 2014).

1.2. Short selling – How does it work?

A short sale is the sale of a stock that an investor does not own. Short sales are normally settled by the delivery of a stock borrowed on behalf of the investor. The investor later closes the position by returning the borrowed security to the stock lender. Investors who sell a stock short believe the price of the stock will fall and hope to buy back the stock at the lower price and make a profit by buying it back at a price lower than the original sale price. Short selling

is also used by market makers and others to provide liquidity in response to unanticipated demand, or to hedge the risk of an economic long position in the same security or in a related security. If the price of the stock rises, short sellers who buy it at the higher price will incur a loss (SEC, 2015). Borrowed shares held as part of a short sale transaction, are known as short interest, as opposed to long interest which refers to shares held by their owner.

Brokerage firms typically lend stocks to customers who engage in short sales. Short sellers are subject to the margin rules and other fees may apply such as interest on the stock loan and a broker's commission. If the borrowed stock pays a dividend, the short seller is responsible for paying the dividend to the person or firm making the loan (SEC, 2015).

There are two types of short selling, naked and covered. Covered short selling means that the short seller enters into an agreement with a shareholder during a specific period to borrow a certain number of shares. Naked short selling means that the short seller sells shares without an agreement with a lender. If there is no coverage for the shares sold, the short seller will fail to find any shares to deliver to the buyer. In such cases, the transaction declared void and short seller will be liable for repayment (Finansinspektionen, 2014). The regulation of naked short selling differs between international stock markets. In Sweden, it is permissible if the position is covered by stock lending before the trading day is over (von Schantz, 2016).

Nowadays most short selling is conducted by hedge funds (Pozen, 2009). Hedge funds invest in an effort to make a positive return and use short selling to reduce risk, or exploit arbitrage opportunities. Generally, the funds have a larger long positions in a stock before executing a short position in the same or a similar stock within the same industry. As a consequence, there are no strong reasons to manipulate the stock price by e.g. spreading bad rumours in the market, since they use the hedging strategy to lower potential risk (BarclayHedge, 1999).

Hedge funds are often questioned in times of turbulent markets such as the recent financial crisis. Primarily as hedge fund behaviour can have an impact on the financial markets through a high signal value and speculative attacks against certain companies with high leverage. Hedge funds are often perceived as being well-informed and usually there are many other players on the market following their behaviour (Strömqvist, 2009).

2. Problem discussion

The practice of short selling has a long history of controversy. Some researchers and experts have presented research indicating that short selling can have a positive effect on the stock market, while others tend to have negative opinions on the account of market abuse and aggravated financial crises.

Experts who argue in favour of the positive aspects of short selling generally present the information perspective. If we assume that the stock market does not meet the criteria of Fama's well-known "Efficient market hypothesis" about all information available to the public, short selling could have an informative contribution to investors and thereby increase market efficiency. In this way the short selling may help stocks to be efficiently priced (Fama, 1970).

The possibility of taking short positions also helps provide liquidity to the market. Market makers can quickly respond to customers' desire to buy a particular security if they at the point of sale do not need to have the security available (Sveriges Regering, 2011/12:175).

As demonstrated in chapter 5, previous research indicates that the informative signalling value of the publication of increases short interest can lead to overreactions in the stock market and result in price declines. Banning short selling has, however, not proven to provide the desired effect and questions arise about the alleged negative effects of short selling (Battalio, 2012).

This ambiguity between experts and absence of modern studies on effects of short selling in Sweden is our motivation to examine the actual impact of short selling on the Swedish market. Moreover, the data about short positions have not been available to public before 2012 until the Swedish Financial Supervisory Authority started to publish larger daily positions which has given an opportunity to make a more accurate short selling study on the Swedish stock market than before.

3. Purpose and hypothesis

As a part of the research being conducted around short selling and its effects we aim to map out the effect of the publication of substantial increases of short positions on share prices and returns. We will examine the Swedish stock market and look for systematic trends which indicate an abnormal return, being either higher or lower than expected market return. To extend our study we also aim to find attributes that characterize stocks which are more

affected by short selling than others as outlined in chapter 6. Our goal is to map whether it is possible to make systematic excessive returns due to short selling on the Swedish stock market and if possible, how to maximize the potential return. This carries out to our hypothesis:

> **H0:** The publication of significant increases in net short positions is not followed by an abnormal return of the underlying stock.
>
> **H1:** The publication of significant increases in net short positions is followed by an abnormal return of the underlying stock

These hypotheses will be tested on different subcategories as outlined in the method section.

4. Institutional setting in Sweden

To understand the possibilities of practicing short selling today in Sweden, it is necessary to make a short review of the Swedish regulatory framework and government interventions from the last decades that have resulted in the current market conditions.

4.1. Regulatory framework

During the mid and late part of the 1980s a widespread deregulation of the financial markets took place, both in Sweden and internationally. This change was driven by an increasing confidence in the positive effects of free markets (Petterson Ek, 1994).

In Sweden November 1991 the restrictions on stock lending and short selling were repealed which were formerly regulated in the "Fondkommissionslagen". Short selling restrictions had been in force since 1979, but after decision from the Swedish Financial Supervisory Authority it was now possible to make money through short selling (Petterson Ek, 1994).

The ban earlier regulated in "Fondkommissionslagen" was not a comprehensive ban, short selling was still possible in Sweden but with considerable difficulties. The ban meant that short selling could not be done through the bank's brokerage, neither for themselves or on behalf of others, which was the reason why it was seen as a ban. However, there were still smaller firms who were not classified as banks or brokerage firms and made it possible to place smaller short positions (Petterson Ek, 1994).

In 1991 the Minister of Finance and the Committee of Market for Securities claimed that there was no reason to maintain the ban. The Stockholm Stock Exchange's turnover had increased markedly during the 1980s, from 8 billion in 1980 to 116 billion in 1988 and the turnover could no longer be considered too small. Speculation and arguments about knowledge advantages were not considered as only related to short selling, it was applied to the entire stock market. Through the law “Lag om handel med finansiella instrument (1991:980)” short selling was allowed for all players on the Swedish stock market (Petterson Ek, 1994).

In 1992, stock lending and short selling increased in Sweden leading to an instant discussion of alleged negative aspects and inadequacies in the regulatory framework. The Swedish Financial Supervisory Authority took actions to increase the transparency in the market and in May 1993 a weekly report on the number of shares on loan began to be published (Petterson Ek, 1994).

4.2. The Short Sale Constitution

As a consequence of the economic crisis in 2008, the European Parliament and the Council in March 2012 approved a regulation (EU No 236/2012) on short selling and certain aspects of credit default swaps, the Short Sale Constitution. This regulation aimed to reduce the risks of short selling to create instability in the financial markets (Sveriges Regering, 2011/12:175).

The EU believed that a joint regulation would increase cooperation between member states in this specific area and also found a value in the possibility of one single authority. Through cooperation there is also the possibility of increased transparency (Sveriges Regering, 2011/12:175). The rules for transparency primarily aimed to provide the authorities a chance to check and investigate short selling activities that may create either systematic risks, abuse and disorder in the market. The rules are also intended to provide information to the public so that the effective price formation can take place (ESMA 2013/614). In Sweden, the Swedish Financial Supervisory Authority was proposed as the competent authority when they were considered as the most suitable for monitoring compliance. The regulation meant a reporting requirement and disclosure of larger positions taken. The holder of a net short position in a share shall report the position to the competent authority when the holding represents a value of at least 0.2 percent of the issuer of the share capital of the companies concerned and thereafter for each additional 0.1 percent. When the amount exceeds 0.5 percent of the issued share capital and at each additional 0.1 percent the position will go public (Sveriges Regering, 2011/12:175). The publication of these short positions have been key figures for us to carry out our study.

The data published by FI covers net short positions, this means that shorting which occurs in order to hedge an existing long exposure to a stock is only included to the extent that the short position exceeds the long position.

5. Theory

In this chapter we aim to map relevant theories related to short selling. We focus mainly on the theoretical background about the market conditions for investors to be able to practice short selling in the long run. The theories we look into are: The efficient market hypothesis, information asymmetry and signal theory, price manipulation and behavioral finance. In the end of this section important previous studies are presented with results and conclusions that are useful for the comprehension of our results.

5.1. The efficient market hypothesis

The efficient market hypothesis' view, developed by Fama (1970), is that when information arises, the news spreads very quickly and is incorporated into the prices of securities without delay. No arbitrage possibilities can exist if the market is fully efficient.

The theory is associated with the idea of a "random walk" (Malkiel, 2003). The logic is that if the flow of information is unimpeded and information is immediately reflected in stock prices, then tomorrow's price change will reflect only tomorrow's news and will be independent of the price changes today. But news is unpredictable and thus resulting price changes must be unpredictable and random. As a result, prices fully reflect all known information, and even uninformed investors buying a diversified portfolio at the tableau of prices given by the market will obtain a rate of return as generous as that achieved by the experts.

Since there are no arbitrage possibilities when all information is available to the market and incorporated in the prices, there should be no possibility to beat the market over time, for example through short selling a specific stock rather than short selling the market. Fama (1970) developed three criterions have to be fulfilled in an efficient market: No transaction cost, all information is available to the public and investors are rational and value the information homogenous.

Fama (1970) also argues that the outlined criterions cannot be fulfilled in practice and thus that perfectly efficient markets cannot be found in reality. The criterions are more frequently used as guidelines. Normally a market is considered efficient when the most influential investors are well informed. Fama further ranks the efficiency based on its information flow in the market. There are three different forms, the weak form, semi- strong form and strong form. The weak form reflects only historical information in the share price. The semi-strong

form includes, in addition to historical information, all current public information. Finally, the strong form also assumes that all private and public information is reflected in stock prices.

If the Swedish market hypothetically exhibited a strong form, the publication of short positions would not have any impact on the stock prices and volatility. Stock prices would respond to all available information and therefore constantly been properly valued. Thus, there had not been any incentive to speculate on decline for a certain stock since the return would follow the market index. To beat the market there must exist inefficiency and investors with information edge about a stock over other investors. Therefor our study is largely undertaken with the assumption that the market efficient hypothesis is not fulfilled and that markets are efficient in a semi-strong form.

5.2. Information asymmetry and Signal Theory

Diamond and Verrecchia, 1987 demonstrated that short sales can have a signal value on markets and can be compared to the publication of previously asymmetric information.

Asymmetric information implies there is a difference in the information holding between buyers and sellers. Buyers benefit from having full information regarding why the sellers do this and the sellers have the incentive to be cautious with this information, as there may be a benefit to do so. This asymmetry creates conditions for a market and affects its efficiency, depending on the extent (Leland & Pyle 1977).

Efficient markets require efficient information flows. In order to increase or maintain high market efficiency it is necessary for certain information to be revealed. If we assume investors that take part of the information, use it for investment purposes, it will cause signals on the rest of the market (Haim & Esther, 1995).

This signalling effect also proven to occur when speculation in the price decline. For example, when applying short selling based on information regarding the negative future outcome on an asset and the information about short positions are available to the public. Diamond and Verrecchia (1987) consider short sellers as well informed and significant contributing to the dissemination of information and market efficiency. It is therefore reasonable to assume that the investors monitor the well-known and large players that are applying short selling strategy and the size on the short selling orders, to contingently follow the investment behaviour.

Analogies can be drawn between the signalling value of increases in short interest and other types of signals. Cheng et al (2011) also argue that managers and other insiders possess

significant signalling possibilities. They prove that insiders' actions generate signals to the market, which can increase efficiency and helps to reduce information asymmetry. This is based on the general managers have more information than outsiders regarding the company's future prospects.

Another event which can be compared to increases in short interest is the publication of sell recommendations by financial analysts or journalists. Lidén (2005), in a study of the impact of buy and sell recommendations for Swedish shares, highlights the importance of insight into the reasons a buy or sell recommendation is issued. Such information is not present in the publication of short positions. Lidén also emphasizes the importance of an investment horizon for the recommendation.

High financial leverage is commonly studied as a factor in stock price event studies, and has for example been linked with significant negative abnormal returns on for example below-expectation earnings announcements (Dhaliwal et al, 1991) and announcements of new financing (Do, 2009).

5.3. Price manipulation

After the Great depression in 1929 the discussion about price manipulation gained speed. In the US, the Senate of Banking and Currency uncovered extensive evidence of different price manipulation during the crash. More specific operations of "Trading pools" was found. Trading pools are a group of investors who first buy a stock, then spreading negative rumours about a firm and finally sell out with profit. The security exchange act of 1934 was established to try to eliminate most of the price manipulation. The act mainly covered two different kinds of price manipulation, information-based and action-based manipulation, also called trade-based manipulation (Allen and Gale, 1992).

The first can be described as manipulation through spreading false information or rumours about a firm. Benabou and Laroque (1992) also studied information-based manipulation and came up with evidence if a person has privileged information about a stock and his statement are considered credible by the market, he can make a profit through manipulating the stock price by making misleading announcements and trading based on expectations of the market's reaction to the announcements (Yang, 2015).

Trade-based manipulation implies that the manipulator buys and sells a stock without taking position in any other market. Also without alter the value of the firm or without releasing false

rumours. For example, if the manipulator makes small recurring buys of a stock, it can create a price momentum where other investors buy the stock at the same time. When the stock price has increased, the manipulator can make profit on the first trades that were bought at a lower price (Allen and Gorton, 1991). Also Jarrow (1992) showed that speculation can be more profitable if there is a price momentum so that an increase in stock prices at one date, remains in future prices of a stock. In other words, the stock reaches a higher "price level".

Allen et al (2006) extended the study of price manipulation. They came to results indicating the existence of "corners" in the market and found that there are mainly large players who alone can manipulate the market. Corners are investors who have a position large enough to be able to affect a stock price's true value and are generally considered to reduce market efficiency. The presence of large investors is proven to increase the number of short sellers in the market since it creates opportunity to exploit mispriced in the market. However, too large players are seen to be extremely risky for short sellers since they can create a situation of stock overpricing. Allen also show that market corners tend to increase market volatility.

5.4. Behavioral finance

Fama (1998) has produced evidence on how stock prices respond to information and focused on market efficiency and rational investors. A fully efficient market cannot be fulfilled to be able to practicing short selling and to beat the market. Thereby its assumed that information asymmetry exists between investors in the market. This creates the possibility of signal theory and to exploit misleading information dissemination and can be useful for a short seller to put negative pressure on a share price. The last part of the theory section treats an investor's individual financial behaviour as consequence of intentional and unintentional actions made by other players in the market. Also called Behavioural Finance.

In behavioural finance the central point is the rationality of investors. According to the efficient market hypothesis investors are rational and well-informed. In behavioural finance investors are considered to be more or less irrational which results in different types of behavioural systematic flaws in the market (Shiller, 2003).

Shefrin Hersh (2000) found clear examples on irregularities in returns that could not only be explained by the assumption of rationality in the existing efficient market paradigm. Instead he meant that behavioural anomalies exist for all individual investors and exist in all market sectors.

"The biases of the mass of individual investors are the stuff of Wall Street lore, but many professionals may be surprised by the strong case for the existence of biases even among the most sophisticated."

He divides his research of behavioural finance into three themes: Heuristic-driven biases, frame dependence and inefficient markets. The heuristics consists of people making decisions and at the same lacking available information. These shortcuts often lead to cognitive biases or systematic errors in decision making. For example, investors' retrieval of information may be flawed because they place too much weight on the newness of information or the frequency of information, instead of researching all available information in the market.

Frame dependence focus on the presentation form of a problem to significantly affect decisions. When investors look at a market with loss aversion, they hang on to losers and sell winners. Regret is another framing problem that interferes with proper evaluation of investment choices.

Inefficient markets are a result from the first two. Heuristic-driven biases and frame dependence cause prices to stray from fundamental values and the deviations are large enough to justify rejecting an unswerving belief in perfect markets. The irrational "noise" from some investors can cause deviations from fair value which creates possibilities to excessive returns in a well-informed investor.

5.5. Earlier research

The subject of short selling has been the focus in several previous empirical studies and articles. The aim of the studies differs between authors, but overall there is a breakdown between markets with or without bans on short selling. Since our research focuses on the effects of publication of short positions we have chosen to analyse articles or parts of articles that mainly focus on short selling on "free" markets.

One of the first and most important study of short selling is written by Diamond and Verrecchia (1987) entitled "Constraints on short-selling and asset price adjustment to private information". The authors examine the effects of constraints on short selling as well as the signal value that short selling has on the stock market and the price adjustment to private information. Both signal value and price adjustment have a great influence market quality and accurate pricing of an asset. Diamond and Verrecchia (1987) argue that unexpected public increases in short positions, also known as short interest, are considered as bad news, and as a

consequence it results in negative returns. Their idea that increases in short interest hold a significant signal value which will results in returns below what would otherwise have been expected has become known as the Diamond Verrecchia hypothesis. Their findings indicate that the signal value is especially clear for stocks which do not have options publically traded. This is due to the fact that options give investors a possibility to easily hedge their investments leading to less dramatic reactions to negative signals in general. They also conclude that by reducing the cost of short selling e.g. reducing constraints or transaction costs it can establish a more efficient market with better information flow and more accurate pricing on stocks.

Bris et al (2007) stated that free markets are necessary to achieve effective pricing in a stock market. They claimed restrictions result in slower price adjustment and have a negative relationship with the distribution of negative information into stock prices. Another report from 2008 is "Which Shorts Are Informed?" By Boehmer, Jones, Zhang also claim that investors who trade with short positions signals the true value of an asset (Boehmer et al, 2008), and that the 20 days following a week's significant increase in short interest is associated with a decline in the underlying securities price which persists beyond that window

Angel et al (2003) examine the possibility to distinguish negative excess return when a larger short position has been executed and published in the Nasdaq market. They only pick days to study if a short position is greater than 1 or 2 standard deviations from sample daily average percentage of short sales. Thereafter share prices were gather for the subsequent three days after executing the position. The results were clearly negative and after 3 days CAR reached -0.77% at 1 standard deviation and -1.34% at 2 standard deviations at a significance level of 5%. It was demonstrated that a greater short position means an increased negative return. The decline is once again explained by the strong signal value of well-informed short sellers. Angel also managed to distinguish the stocks that are more exposed to short selling and found that generally larger companies with high turnover and higher price volatility are the most popular.

Conrad et al (1994) found that the larger the volume of short sales in a stock, the more the stock's price declines, and that the decline magnifies when the short sale surprises the market. Senchack and Starks (1993) studied the correlation between stock lending and stock prices. They discovered significant reactions at the release date of stock lending and a significant negative return in period of substantial increase in short interest. Greater increase of short

sales meant larger negative returns. Like Diamond and Verrecchia (1987) they found the absence of publically traded options based on a shorted stock to be correlated with increased negative abnormal returns.

Similar to Angel, Aitken et al (1998) studied market reactions to short selling on the Australian Securities Exchange. On the ASX short positions are published as public documents and the publication occurs immediately after the execution. This enabled to study price reactions down to every minute which was in contrast to previous authors that studied subsequent days after executing a short position. This allowed a more precise measurement of market reactions and the speed of adjustment with a low probability of confounding other events affecting the analysis. The chosen event window is 45 minutes before and after short position had been placed. Aitken showed that the share price drops dramatically within the first 15 minutes where CAR reaches -0.2% in difference to the adjusted market return. Thereafter the reactions are levelled out. At the same time the share price volatility increases. Aitken also proves that short selling executed at the end of a financial year and related to hedging / arbitrage implicated smaller share price reactions. Trades executed in connection with information events were associated with larger reactions.

Within the research area of short selling many studies treats share price volatility. Especially differences between markets with or without constraints on short selling. Among other issues, Yanxiang and Yang (2007) studied different corresponding stocks on two similar exchanges, the Hong Kong and the Shanghai stock exchange. Short selling was allowed in Hong Kong, however Shanghai had a temporarily. They compared the volatility of selected shares adjusted for each market index. Results showed that the volatility in the Hong Kong stock market was considerably higher than in Shanghai. The volatility differed mainly on a daily basis and it was proven relate to the time for information publication of short position. This showed that short selling affects the market volatility. Also Figlewski and Webb (1993) found a positive correlation between short sales and volatility.

The studies concerning price volatility are not unilateral. Boehmer et al (2013) found support for restrictions against short selling results in increased price volatility in 2008 during the financial crisis. On 18 September 2008, shortly after the bankruptcy of Lehman Brothers, the Securities and Exchange Commission introduced a temporarily ban on short selling for about 1000 financial shares. Meanwhile the volatility was compared to a control group of stocks that were not charged with a ban. The results showed that the volatility was significantly higher in

the stocks that were charged with a ban. Boehmer explained that the increased volatility was a consequence of a deteriorating market quality by the short selling ban and due to the turbulent situation.

Other authors, including Ciro (2012) have noted how in particular highly leveraged companies' stocks were often the targets of short sellers during the financial crisis and how high short interest was correlated with negative abnormal returns.

Mohamad et al (2003) conclude in a study of British stocks between 2004 and 2010 that stocks experience a significant negative CAR in the 15 days following a significant increase in short interest, around -1,5%.

6. Method

In this chapter we outline the method we have chosen to test our hypothesis. We also define the parameters in our event study and delimitations which have been made in order to study the effects of significant increases in short interest.

6.1. Event study

The hypothesis will be tested in the framework of an event study, a common method of studying the impact of a certain type of event on asset prices or other key figures. It is important to note that previous to the changes in Q4 2012 the Stockholm Stock Exchange published data on shorted shares on a weekly basis. This publication ceased once the Swedish Financial Supervisory Authority started to publish changes in net short positions exceeding 0,5% taken by a single investor, known as significant net short positions. Unlike the current system the numbers published by the stock exchange did not report individual positions, but instead published the total volume of shares loaned out for the purpose of shorting. Thus, changes in net short positions are now more easily studied in the scope of an event study, while previous studies on the Swedish market, such as Elfving & Liljekvist (2009) or Lantz (2010) studied the covariance of shorting and stock prices or volatility over a periods of time when total stock loans were above or below certain levels.

In order to assess the impact of a given event, a "base case" is calculated as what a normal development of the studied metric would be, in this case stock price, and then compared to the actual outcome, with the difference defined as an abnormal return. The assumption of no abnormal returns, our null hypothesis, is the norm for event studies (MacKinlay 1997). The calculation of normal returns has been done according to the market model, described by Fama, Fisher, Jensen and Roll (1969) as:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_i + AR$$

Where

R_{it} = the actual return of stock (i) during the smallest measures unit of time, in our case one day

R_{mt} = the return of the market portfolio during the same time

ε_i = variable denoting a residual

AR = The difference between an actual return and normal returns, i.e. an abnormal return, which can be both positive and negative

R_{it} is taken from Thomson Datastream and adjusted for dividends, splits and share repurchases. The market portfolio is calculated using the OMX Stockholm PI index since it, like our sample, includes stocks irrespective of market capitaliztion and is limited to Sweden.

The Beta and Alpha values, α_j and β_{jRmt}, have been estimated during an estimation period spanning 120 calendar days, from 135 to 16 days before the event/publication, following MacKinlay's recommendation using the period which comes directly before the event window as an estimation period. To study the pre and post event window abnormal returns are compounded into a cumulative abnormal return for each security for the period between τ_1 and τ_2

$$\widehat{CAR_i}(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} \widehat{AR_{i\tau}}$$

Finally, the populations cumulative abnormal return is calculated:

$$\overline{CAR}(\tau_1, \tau_2) = \frac{1}{N} \sum_{i=1}^{N} \widehat{CAR_i}(\tau_1, \tau_2)$$

An alternative to the market model is the constant mean return model where normal returns are assumed to be constant, however we have chosen to use the market return model following MacKinlay's recommendation and previous studies undertaken on the Swedish market such as Aspholm and Johansson (2015).

For the purpose of performing t-tests a variance of $\overline{CAR}$ is calculated:

$$var(\overline{CAR}(\tau_1, \tau_2)) = \sum_{\tau=\tau_1}^{\tau_2} var(\overline{AR_\tau})$$

$$var(\overline{AR_\tau}) = \frac{1}{N^2} \sum_{i=1}^{N} \sigma_{\varepsilon_i}^2$$

$\sigma_{\varepsilon_i}^2$ denotes the variance of the abnormal returns as estimated during the estimation window:

$$\sigma_{\varepsilon_i}^2 = \frac{1}{L_1 - 2} = \sum_{\tau=\tau_0+1}^{\tau_1} (R_{i\tau} - \alpha_i - \beta_i R_{mt})^2$$

With these calculations we can calculate the critical value given by MacKinlay:

$$\theta = \frac{\overline{CAR}(\tau_1, \tau_2)}{var(\overline{CAR}(\tau_1, \tau_2))^{1/2}} \sim N(0,1)$$

The θ statistic is a t-value and can be tested as in a t-test where the null hypothesis is rejected if

$$\theta > t_{crit}$$

or

$$\theta < -t_{crit}$$

Where t_{crit} for the 95% confidence leverl for samples between 100 and 1000 is given as

$$t_{crit} = 1{,}984$$

6.2. Event window

The publication of changes in net short positions occurs typically within one bank day of the position being taken. The publication is released around 3.30 pm by the Swedish Financial Supervisory Authority, thus giving the market two hours of trading time to react to the information. We have chosen a relatively short event window of a single day, covering only the day of publication. MacKinlay recommends extending the event window by one day in cases where the event hypothesized to have an effect on returns may occur after markets closing but in the case of the publication of changes in net short position the publication always occurs around two hours before stock markets close in Stockholm so there is no need to extend the event window.

In order to identify whether the stock price behaves differently before the position is taken we have studied a pre event window of three weeks (15 days) and a post event window which is equally long, following Senchack and Starks (1993), in order to be able to determine a trend over an extended period of time but without broadening the scope of our study to a longer window than similar previous studies.

6.3. Event definition

In order to identify events to study each stock with reported significant net short positions during the period in which they have been published has been studied. Stocks are taken from

the Nasdaq Stockholm Stock Exchange as well as Nasdaq First North. Events which fit our definition have been selected, with the number of detected increases in short positions per company ranging between one to fourteen.

In order to test the hypotheses, we need to separate out the reports of changes in net short interest which constitute new information to which a semi efficient market would have a reason to react to. Although even minor increases in short positions may be interpreted as signalling an over-valuation of the underlying security in line with the Diamond Verrecchia hypothesis, reported increases are typically incremental and can take several months, and therefore we have chosen to limits the study to cover only reports of shifts in positions which meet the criteria listed below.

The criteria we have chosen to use to identify an event are:

1) The day a net short position passing the 0,5% threshold for mandatory reporting is reported
2) The day an increase in an existing position equal to or exceeding 0,5% is reported

For both types the following criteria need to be met:

1. In order to isolate the events, no new events are to have taken place during the 14 days prior to the relevant event.
2. Similarly, no existing positions are to have been reduced to a level below the 0,5% threshold in the preceding 14 days or on the day of the event as this could cancel out the effect of the position being taken. This and the previous criteria follow Senchack and Starks' method in which signals are chosen in a way which avoids the occurrence of any preceding signals occurring in the pre event window
3. Position announcements which are reported more than seven days after they are taken are not studied. Due to our short post event window we do not think that reports which due to failures in regulatory compliance are published significantly later (a week or more) than the position date will be meaningful to study.

Since no previous event studies have been undertaken on the data, no previous identification of what constitutes an event in this context have been made. These criteria are also similar to those used by Mohamad et al (2013).

6.4. Financial Supervisory Authority data

During the studied period (November 2012- February 2016) 4017 separate changes in net short positions were reported in the data. The vast majority of these could not, however, be studied as they did not meet our criteria. In our estimation around 85% consist of increases to existing positions which are too small be considered as events or decreases/closings of positions and 7,5% are new positions which for various reasons do not meet our criteria and cannot be used. The final 7,5% consist of new positions which we studied.

The distribution of the studied signals over the years we studied is shown below in figure 1.

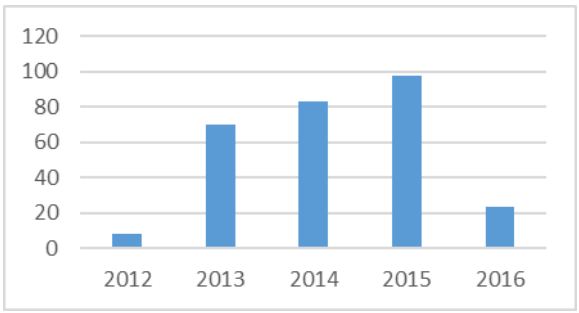


Figure 1 - Number of studied signals per year

6.5. Delimitation

EU mandates reporting changes in significant net short positions in Sweden since November of 2012. The period we have been able to study are therefore the 40 months from November 2012 until February 2016, with a post event window stretching into March of 2016.

The number of positions identified was 287. Of these, 5 were removed due to insufficient estimation periods (the firms had undergone IPOs within the estimation or pre-event period). We believe that the number of remaining observations is sufficient for analysis, compared for example with the sample size of 30 which is generally required in order to meet the minimum size requirement of the Central limit theorem.

6.6. Subsets

In order to study the effect of significant increases in short positions we will study the effect of the publication on the event day. Further, following Mohamad et al (2016) and Senchack and Starks (1993), we will also study a pre-and post-event window, which as mentioned are 15 days long, and test for abnormal returns. To give further depth to our study and to get an

understanding of which factors could potentially increase abnormal returns we will examine three subsets in addition to the entire selection. These subsets are outlined below.

6.6.1. Stricter event definition

Since no other studies have used the Financial Supervisory Authority's list as a basis for an event study we have chosen as a comparison to study significant increases in short interest defined in a stricter way in order to see if tendencies observed in the main event definition become more clear when the event is defined in a narrower way. Of the positions selected in the first step, only new positions were chosen where no new positions were taken or closed within the preceding 30 days as opposed to the 14 days studied in the entire studied population. One advantage of this is that no overlap between one signals post event window and other events pre-event window can occur. Additionally, a limit on activity within the preceding 30 days was set so that only a maximum of three adjustments made by at most two separate financial institutions were allowed to further isolate the effect of a new net short position without possible effects of adjustments to existing positions interfering. A similar categorization of different event definitions where one type is expected to display a smaller abnormal return than the other is made by Mohamad et al (2016) although in our care the alternative event definition is a subset of the entire population and not an entirely separate group of events.

6.6.2. High leverage companies

We have chosen to study a subset of highly leveraged firms, as defined by the Debt-to-Asset ratio at the time of the announcement of the net short position. As mentioned earlier, high leverage has been proven to be correlated with stronger reactions to negative announcements regarding a stock (Lidén, 2015), especially during the financial crisis when shorting of highly leveraged firms was highly prevalent and shown to be correlated with weak stock price performance (Ciro, 2012). We have chosen to define high leverage as firms with a Debt-to-Asset ratio above 50% as per the latest interim report at the time of the announcement.

6.6.3. Availability of options

We have also chosen to study the reactions of stocks with options traded publicly on the Stockholm options exchange. Both Diamond Verrecchia (1987) and Senchack and Starks

(1993) demonstrated that stocks with options without publically traded undergo a stronger negative reaction than other stocks. For that reason, we have chosen to study shares who at the time of the announcement there were options traded publicly on the Stockholm NASDAQ Options Exchange.

7. Empirical results

In the first part of this segment we will go through the results we reached and discuss the reliability and significance of the results for the entire sample of significantly increased net short positions, and in the second part for each of the subsets we studied.

7.1. Returns for entire population

	Pre event window			Event window	Post event window		
Period (days)	-15 to -11	-15 to -6	-15 to -1	0	1 to 5	1 to 10	1 to 15
Period CAR	-0,15%	-1,43%	-1,95%	-0,11%	-0,30%	-0,23%	-0,21%
T-value	-0,576	-3,799	-4,244	-0,917	-1,118	-0,604	-0,458
T-crit	1,98	***N:*** 282					

For the publication date the results for the entire population indicate a negative abnormal return of −0,11% but the null hypothesis of no abnormal returns cannot be rejected since the results lacks significance at a 95% confidence level. The same is true for the post event window, where the negative abnormal returns appear to be strongest in the first five days following publication and then decrease, however no statistically significant abnormal returns can be determined at a 95% confidence level for any period following the event day.

The largest abnormal return over the course of the studied period were found in the pre-event window. A statistically significant negative CAR can be determined with a 95% confidence level. This holds true both in the entire pre event window of −1,95% but also between 15 and 6 days before the publication when negative cumulative abnormal returns of −1,43% are found. Thus the null hypothesis for the pre-event window is rejected.

The development of CAR over the entire studied period is displayed below in Figure 2. The negative CAR in the pre-event window is visible in the period leading up to day 0, the announcement day.

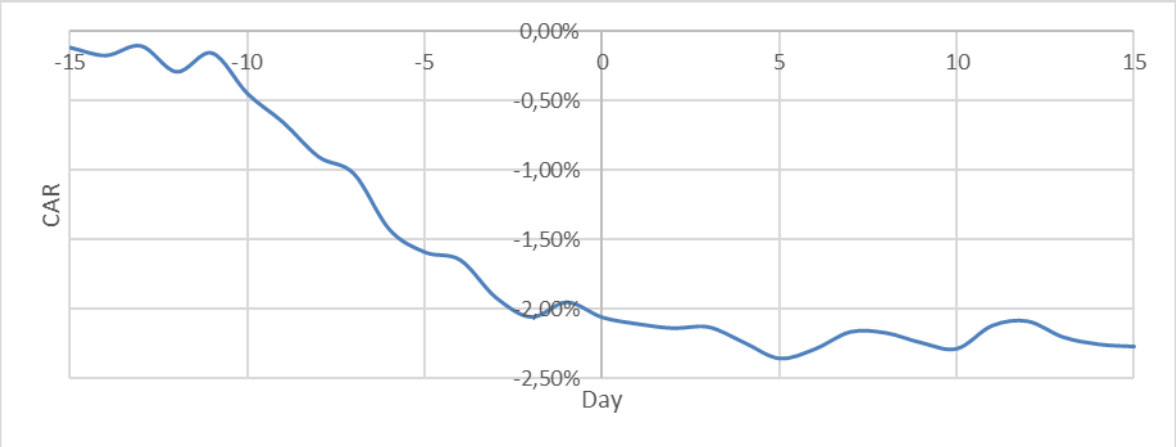


Figure 2 – CAR during the studied window for the entire sample of events

7.2. Returns for subsets

The results from our subsets are in some cases different from the main sample. Each subset is described below

7.2.1. Stricter event definition

	Pre event window			Event window	Post event window		
Period (days)	-15 to -11	-15 to -6	-15 to -1	0	1 to 5	1 to 10	1 to 15
Period CAR	-0,23%	-1,68%	-1,79%	-0,02%	-0,48%	-0,68%	-0,30%
T-value	-0,443	-2,268	-1,972	-0,092	-0,916	-0,922	-0,327
T-crit	1,98		***N:*** 171				

The results reached for the narrower event definition were largely identical with those of the entire studied sample. For the event date no significant abnormal return could be determined. Again, the post event window did not exhibit a significant CAR.

The pre-event window yielded a negative CAR of -1,8%, which closely fails a significance test at the 95% level but still is significant at a 90% level. Additionally, as can be seen in the appendix, the negative CAR for any other day during the last 6 days before the event window is significantly negative at a 95% level.

7.2.2. Highly leveraged companies

	Pre event window			Event window	Post event window		
Period (days)	-15 to -11	-15 to -6	-15 to -1	0	1 to 5	1 to 10	1 to 15
Period CAR	0,10%	-0,50%	-0,25%	-0,09%	0,29%	-0,04%	-0,60%
T-value	0,109	-0,396	-0,159	-0,225	0,329	-0,029	-0,386
T-crit	1,99	***N:*** 81					

For the subcategory of highly leveraged stocks, the null hypothesis could be rejected for all three studied periods. No significant abnormal returns could be identified in either the pre or post event window or during the event window itself. It thus differs from the entire sample in in pre-event window since no significant decline can be determined before the event.

7.2.3. Stocks without publically traded options

	Pre event window			Event window	Post event window		
Period (days)	-15 to -11	-15 to -6	-15 to -1	0	1 to 5	1 to 10	1 to 15
Period CAR	-0,38%	-3,01%	-3,86%	-0,46%	-0,67%	-1,20%	-1,38%
T-value	-0,405	-2,261	-2,373	-1,103	-0,716	-0,904	-0,849
T-crit	1,98	***N:*** 117					

For the category of stocks without publically traded options no significant abnormal returns could be determined on the announcement day, although a tendency indicating a more negative reaction than in the entire sample was observed. Thus the null hypothesis is rejected. The same is true for the post event window where the returns following the announcement day on average are negative, but the null hypothesis of no abnormal returns could not be rejected at a 95% confidence level. We could determine a significant negative abnormal return in the pre-event window of -3,6%, a more negative CAR than for any other studied set of events.

Figure 3 below shows the development of CAR for the entire studied period of time, days -15 to +15 for each of the subsets and the entire sample as a comparison.

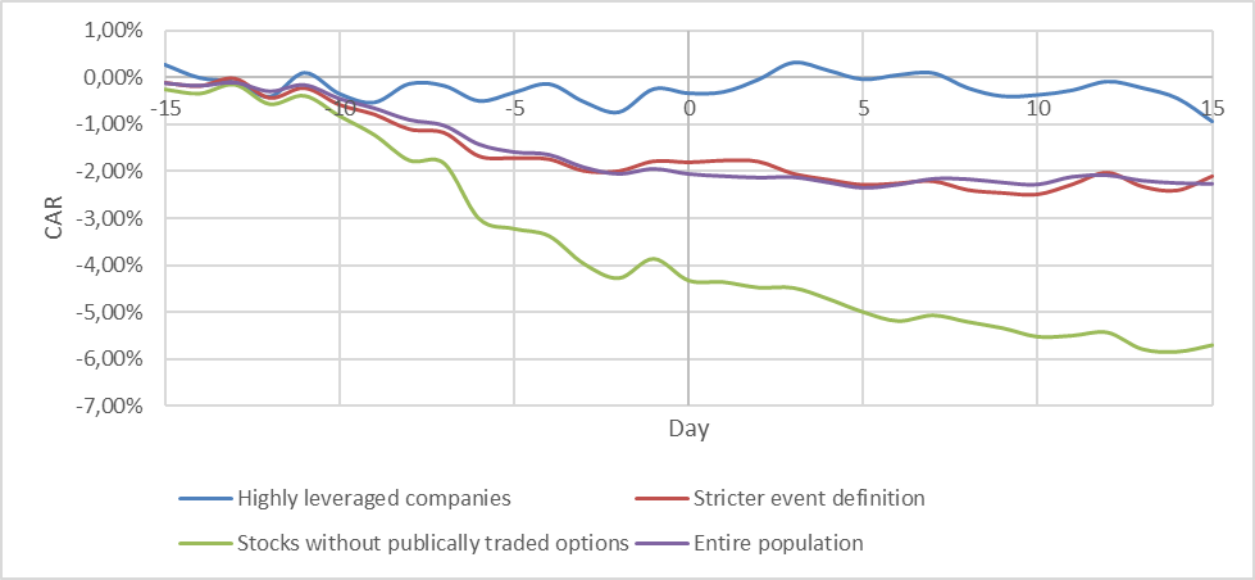


Figure 3 CAR for all studied sets of events

8. Discussion

In this chapter we will critically discuss the results presented above and possible explanations for the stock price behaviour.

8.1. Publication day and post event returns

The purpose of our study was to examine the impact of announcement of new or significantly increased net short positions taken in Swedish listed companies. For that purpose, daily data of announcements of changes in significant net short positions was used.

Our study failed to conclude with the desired confidence the existence of any significant publication date or post event abnormal returns in any of the categories studied. Thus we cannot with certainty say that the announcement of major net short positions has any impact of share prices in Sweden. Although this does not support the findings of Diamond and Verrecchia (1987) and Senchack and Starks (1993), a certain trend in confirmation of their findings could be seen, we especially found the tendency of a negative reaction in shares without options publically traded to be interesting. If this trend could be determined with greater significance, it seems to support the findings of those authors that firms without publically traded options react negatively to announcements of net short positions. With the current results however, no indication can be demonstrated that Diamond Verrecchia theory of increases in short interest are considered "bad news" holds true in the Swedish market during the period we studied.

The fact that our narrower event definition did not yield significantly different results from our main sample leads us to believe that the main, broader definition is sufficient.

With regards to market efficiency (Fama), the findings of this study seem to indicate market efficiency in its strong form, as the information of net short positions is not regarded as new information, but it is also possible that the publication by the Swedish Financial Supervisory Authority of net short positions is not sufficiently taken into account by investors for their reaction to the published positions to have an impact on share prices. Thus, one could hypothesize that the reaction, or lack of reaction, to the publication of net short positions is an example of markets acting with a weak form of efficiency.

Another event which can be compared to increases in short interest is the publication of sell recommendations by financial analysts or journalists. When comparing with the criteria Lidén

(2005) sets up for buy or sell recommendations to influence investors one can note that the daily data published by the Swedish Financial Supervisory Authority does not include a motivation for a net short position or an investment horizon giving any indication for how long the positions are intended to be held. The lack of this information may explain partially why markets do not seem to react to the data on net short positions.

The fact that announcement of significant increases in net short positions in highly leveraged stocks is not correlated with more negative reaction than for stocks in general seems to indicate that unalike other events leverage does not influence the reaction of markets to the studied announcements. However, since high leverage in other markets has been shown to be correlated with a more negative reaction to increases in short interest especially in times of market crashes it is possible that if our studied time period had included a period of a market crash we would have been able to determine a more negative CAR following the announcement.

With regards to price manipulation, our results appear to indicate that taking a net short position on its own is not an effective form of price manipulation and that net short positions on their own are insufficient to impact stock prices. Thus we find nothing which indicates either the existence of, or incentives to use short interest as a means of price manipulation in the Swedish market.

The low impact of increases in net short positions on stock prices can be interpreted in favour of deregulation. Since no impact of short positions can be determined, price behaviour cannot be used as an argument against short sale bans or regulations, as has been done in the past. However, since we study the period after the publication rather than the taking of the position it is theoretically possible that testing for abnormal returns for the period following the date of the position being increased rather than the period following the publication would yield different results. Since the difference between the two dates is typically no more than two days and there is little indication that the two days before the announcement give a significantly negative CAR we do not believe this to be the case.

The results we reached can be interpreted as supporting the idea of a “random walk”. Institutional shorting, or following announced shorts cannot be demonstrated to be a method of reaching a return above market returns.

8.2. Pre-event returns

In both our main sample and in the subsets of stocks without publically traded options, a significant negative abnormal return was observed in the pre-event window. Senchack and Starks (1993) describe the risk of the dissemination of information about a short position about to be taken, or of it having been taken in the period between the date of the position being taken and the publication date. We believe this risk to be inherent in the type of event we are studying which relies on secondary information (as the short positions are not announced directly and by the institutions making them). However, we believe that if this leakage of information could explain the negative abnormal returns before the publication date a stronger negative abnormal return would be visible in the post event window when also the uninitiated investors have to opportunity to react to the announcement. Instead, we believe that short positions taken during the studied period were typically taken after a period during which the stock has experienced a negative trend unrelated to the planned short position, possibly due to speculation that the decline would continue.

Since the Diamond Verrecchia hypothesis is centred on reactions to new information it cannot explain the negative CAR before the event occurs.

8.3. Critical reflexion

The window we chose to study was relatively short, stretching only from December 2012 to February 2016, in total 39 months. A study in a few years when a longer set of historical data is available will have greater opportunity to study the effects of the announcements.

When studying the data, it was clear that most shorted positions are held for at least two months. In our study we have chosen to study a relatively short post event window. If reactions to stock prices are an example of markets reacting with a low degree of market efficiency it is possible that when studying a longer post event window, the reasons for the position holder to believe that the stock was over-valued would become apparent and be reflected in the share price. Thus a future study may want to include a longer post event window.

A potential problem in our study is the weakness of the results we reached. Despite a seemingly large negative CAR in the post event window for stocks without publically traded options, -1,38%, we could not determine that the negative CAR was statistically significant. It is possible that using an alternative method for significance testing would have yielded more significant results and been more appropriate.

Unlike other studies, due to the nature of the publically available data in the Swedish market, we have not studies increases in total short interest but rather the effects of individual positions. This may be a weaker signal and explain our lack of significant results following the event.

9. Conclusion

In our study we researched the impact of the announcement of increases in significant net short positions on the Swedish Stock market. Unlike Senchack and Starks (1993) and Angel (2003) we did not find significant evidence in support of a negative impact on stock price performance in the aftermath of a short positions announcement.

A significantly negative CAR was however found in the days leading up to the publication of a significant increase in a net short position.

9.1. Suggestions for further research

The data from the Swedish Financial Supervisory Authority is an interesting material which we believe can form the basis for future research. Differences between stock performances of stocks subject to short positions taken by different financial institutions could form a basis of similar future research. The opportunity to study market agents individually with the data provided would be a completely new opportunity as previous studies have only had access to data on total short interest.

We also recommend that the data over total outstanding short volume per share which was published on a weekly basis until 2012 (when the Swedish Financial Supervisory Authority started publishing the current information) be resumed by the Stockholm Stock Exchange or the Swedish Financial Supervisory Authority. Although the data currently published is a useful addition, we believe the decision not to publish the previous data is detrimental to transparency in financial markets.

The value of a position in larger Swedish companies which exceeds the 0,5% threshold are only published when their value becomes very high relative to that of significant short position taken in for example Small Cap companies. We believe that for the sake of transparency rules which for example lower the limit of short positions for publication to 0,3% of the market capitalization for Large Cap companies would reduce information

asymmetry. Short positions of this size are already reported to the Swedish Financial Supervisory Authority and could thus easily be made public.

The period we covered did not include any periods which can be characterized as market crashes, unalike some previous studies. An examination of the data in a time of strong price declines could yield insights into the effect of shorting in crisis times and be a valuable to the discussion of how shorting affects prices during financial crisis.

We chose to study only daily closing prices and no intra-day data. A possible venue for future research is the behaviour of stock prices on the day of the publication of short positions, in order to compare with the findings of Aitken et al (1998).

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11. Appendix

Entire sample data

	Pre event window														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Daily AR	-0,11%	-0,06%	0,07%	-0,19%	0,14%	-0,29%	-0,21%	-0,25%	-0,12%	-0,40%	-0,16%	-0,06%	-0,27%	-0,14%	0,11%
Period CAR	-0,11%	-0,17%	-0,10%	-0,29%	-0,15%	-0,45%	-0,65%	-0,90%	-1,03%	-1,43%	-1,59%	-1,65%	-1,92%	-2,06%	-1,95%
CAR σ	2,18%	3,27%	4,10%	4,66%	5,15%	5,59%	6,21%	6,81%	7,22%	7,46%	8,00%	8,70%	8,86%	9,29%	9,92%
T-value	-0,951	-1,016	-0,494	-1,215	-0,576	-1,535	-2,075	-2,682	-2,875	-3,799	-4,039	-4,005	-4,478	-4,633	-4,244
T-crit	1,98	***N:*** 282													

	Event window	Post event window														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Daily AR	-0,11%	-0,05%	-0,03%	0,01%	-0,11%	-0,12%	0,07%	0,12%	-0,01%	-0,07%	-0,04%	0,17%	0,03%	-0,12%	-0,05%	-0,02%
Period CAR	-0,11%	-0,05%	-0,08%	-0,07%	-0,18%	-0,30%	-0,23%	-0,11%	-0,11%	-0,18%	-0,23%	-0,06%	-0,03%	-0,14%	-0,20%	-0,21%
CAR σ	2,31%	1,36%	1,77%	2,21%	2,66%	3,15%	3,67%	4,11%	4,45%	4,78%	5,19%	5,65%	6,09%	6,48%	6,77%	7,24%
T-value	-0,917	-0,403	-0,467	-0,342	-0,765	-1,118	-0,787	-0,334	-0,335	-0,515	-0,604	-0,151	-0,070	-0,335	-0,439	-0,458
T-crit	1,98	***N:*** 282														

Stricter event definition

	Pre event window														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Daily AR	-0,12%	-0,07%	0,16%	-0,41%	0,21%	-0,36%	-0,21%	-0,31%	-0,08%	-0,50%	-0,04%	-0,02%	-0,25%	-0,01%	0,21%
Period CAR	-0,12%	-0,19%	-0,03%	-0,44%	-0,23%	-0,59%	-0,79%	-1,11%	-1,18%	-1,68%	-1,73%	-1,75%	-2,00%	-2,00%	-1,79%
CAR σ	2,04%	3,44%	3,95%	4,75%	5,47%	5,93%	6,36%	6,96%	7,48%	7,43%	8,11%	9,00%	9,14%	9,61%	10,44%
T-value	-0,512	-0,564	-0,072	-0,942	-0,443	-1,023	-1,280	-1,670	-1,683	-2,268	-2,216	-2,150	-2,358	-2,280	-1,972
T-crit	1,98	***N:*** 171													

	Event window	Post event window														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Daily AR	-0,02%	0,04%	-0,02%	-0,26%	-0,13%	-0,11%	0,03%	0,05%	-0,19%	-0,06%	-0,03%	0,22%	0,25%	-0,30%	-0,08%	0,30%
Period CAR	-0,02%	0,04%	0,01%	-0,24%	-0,37%	-0,48%	-0,45%	-0,40%	-0,59%	-0,65%	-0,68%	-0,47%	-0,22%	-0,52%	-0,60%	-0,30%
CAR σ	2,41%	1,35%	1,72%	2,07%	2,56%	3,01%	3,50%	3,97%	4,24%	4,63%	5,08%	5,60%	6,20%	6,59%	7,03%	7,55%
T-value	-0,092	0,161	0,044	-0,597	-0,790	-0,916	-0,778	-0,646	-0,887	-0,927	-0,922	-0,602	-0,271	-0,610	-0,681	-0,327
T-crit	1,98	***N:*** 171														

High leverage companies

	Pre event window														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Daily AR	0,27%	-0,28%	-0,09%	-0,31%	0,51%	-0,45%	-0,18%	0,40%	-0,04%	-0,32%	0,18%	0,18%	-0,38%	-0,22%	0,49%
Period CAR	0,27%	-0,01%	-0,10%	-0,41%	0,10%	-0,35%	-0,53%	-0,14%	-0,18%	-0,50%	-0,32%	-0,14%	-0,52%	-0,74%	-0,25%
CAR σ	1,84%	2,94%	3,96%	4,13%	4,13%	4,45%	4,90%	5,41%	6,03%	6,73%	7,12%	7,36%	8,43%	8,74%	9,80%
T-value	0,674	-0,021	-0,145	-0,513	0,109	-0,355	-0,502	-0,121	-0,148	-0,396	-0,243	-0,102	-0,359	-0,494	-0,159
T-crit	1,99	***N:*** 81													

	Event window	Post event window														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Daily AR	-0,09%	0,03%	0,26%	0,36%	-0,17%	-0,19%	0,09%	0,04%	-0,32%	-0,17%	0,03%	0,10%	0,19%	-0,14%	-0,22%	-0,49%
Period CAR	-0,09%	0,03%	0,29%	0,65%	0,48%	0,29%	0,39%	0,43%	0,11%	-0,06%	-0,04%	0,06%	0,25%	0,11%	-0,11%	-0,60%
CAR σ	2,39%	1,31%	1,81%	2,20%	2,46%	2,86%	3,40%	3,89%	4,04%	4,25%	4,29%	4,53%	4,83%	4,98%	5,01%	5,27%
T-value	-0,225	0,068	0,513	0,937	0,604	0,329	0,395	0,404	0,098	-0,053	-0,029	0,048	0,179	0,078	-0,072	-0,386
T-crit	1,99	***N:*** 81														

No publically traded options

	Pre event window														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Daily AR	-0,24%	-0,09%	0,19%	-0,41%	0,18%	-0,43%	-0,41%	-0,54%	-0,07%	-1,18%	-0,22%	-0,15%	-0,59%	-0,31%	0,41%
Period CAR	-0,24%	-0,33%	-0,14%	-0,56%	-0,38%	-0,81%	-1,22%	-1,76%	-1,83%	-3,01%	-3,22%	-3,38%	-3,97%	-4,28%	-3,86%
CAR σ	2,87%	4,15%	5,54%	6,39%	7,02%	7,43%	8,24%	9,14%	9,69%	9,91%	10,64%	11,67%	11,73%	12,40%	13,44%
T-value	-0,581	-0,560	-0,197	-0,664	-0,405	-0,787	-1,093	-1,480	-1,448	-2,261	-2,311	-2,317	-2,618	-2,719	-2,373
T-crit	1,98	***N:*** 117													

	Event window	Post event window														
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Daily AR	-0,46%	-0,03%	-0,12%	-0,01%	-0,23%	-0,28%	-0,19%	0,12%	-0,14%	-0,13%	-0,18%	0,02%	0,07%	-0,36%	-0,06%	0,14%
Period CAR	-0,46%	-0,03%	-0,15%	-0,16%	-0,39%	-0,67%	-0,87%	-0,75%	-0,89%	-1,02%	-1,20%	-1,18%	-1,11%	-1,47%	-1,52%	-1,38%
CAR σ	3,01%	1,42%	1,98%	2,43%	2,96%	3,70%	4,19%	4,78%	5,38%	5,85%	6,45%	7,14%	7,71%	8,26%	8,81%	9,43%
T-value	-1,103	-0,082	-0,255	-0,216	-0,466	-0,716	-0,840	-0,670	-0,745	-0,807	-0,904	-0,845	-0,763	-0,967	-0,968	-0,849
T-crit	1,98	***N:*** 117														

Studied Stocks:

AAK AB	Com Hem AB	Modern Times Group	Swedish Match AB
Active Biotech AB	Concentric AB	Mycronic AB	Gränges AB
Africa Oil Corp	Dannemora mineral AB	NCC AB	H&M AB
Alfa Laval AB	Dustin Group AB	New Wave Group AB	Haldex AB
Alliance Oil Company L	Electrolux AB	Nobia AB	Holmen AB
Arcam AB	Elekta AB	Opus GROUP	Husqvarna AB
Avanza AB	Eniro AB	Orexo AB	I.A.R Systems Group AB
Axfood AB	Episurf Medical	Oriflame	ICA GRUPPEN AB
BE Group	Fingerprint Cards AB	PA Resources AB	Industrivärden AB
Betsson AB	Getinge AB	Precise Biometrics AB	Indutrade AB
BillerudKorsnäs AB	Intrum Justitia AB	Proffice AB	SSAB AB
Black Earth Farming	JM AB	Ratos AB	Swedish Orphan Biovitrum AB
Boliden AB	Kambi Group	SAAB AB	Tele2 AB
Bufab AB	Kungsleden AB	Sandvik AB	TeliaSonera AB
Bulten AB	Lindab AB	SAS AB	Tethys Oil AB
Byggmax Group AB	Lundin Petroleum AB	Seamless Distribution AB	Trelleborg AB
Castellum AB	Meda AB	Securitas AB	Tribona AB
CDON Group AB/Qliro	Medivir AB	Sensys Gatso Group AB	Unibet Group AB
Clas Ohlson AB	Mekonomen AB	Skanska AB	Volvo AB
Cloetta	Millicom International	SKF AB	Vostok Nafta Investment Ltd