Behind the Scenes
Are Swedish Laws efficient in stopping insider trading?

Master’s thesis within Economics
Author: Sandra Keitsch 2011-01-22
Tutor: Dr. Johan Eklund
Ph.D. Candidate Andreas Högberg
Jönköping January 2011
Abstract

In the aftermath of the verdict of acquittal in “Sweden’s largest insider trading case” once again a debate concerning illegal insider trading has arisen and a lot of criticism is directed towards the laws (Melzer, 2010). The purpose of this master’s thesis is to investigate the occurrence of insider trading and whether or not Swedish legislation has decreased the presence of insider trading on the Stockholm Stock Exchange. For this purpose the legal aspects and relevant arguments are presented and discussed. An event study is performed in order to see if profit warnings show evidence of insider trading on the Swedish stock exchange.

The event study show statistically significant evidence of illegal insider trading in 21 out of 44 cases on the Stockholm stock exchange. There is no significant difference in insider trading between profit warnings and reversed profit warnings. The regression show evidence of that the law has had a small negative impact on insider trading in the sample which is surprising and that insider trading is industry correlated. The high frequency of insider trading shows evidence of that the laws are inefficient in stopping insider trading.

Since it is clear that the law is seriously flawed in stopping insider trading and that insider trading actually may positively affect the market and its participants, it is argued that it is very questionable if the legislation is necessary and if insider trading should be prohibited at all.
# Table of Contents

1 Introduction ........................................................................................................... 1
   1.1 Background & previous studies ...................................................................... 2
   1.2 Outline ............................................................................................................. 3

2 Insider trading .......................................................................................................... 4
   2.1 The Swedish Insider trading legislation ................................................. 4
   2.2 The problems with the legislation and its enforcement ................. 5
   2.3 Regulations vs. free insider trading ....................................................... 7
   2.4 The legality of insider trading regulations ....................................... 9

3 Insider Trading & the Efficient Market Hypothesis .......... 11

4 The Event Study ....................................................................................................... 13
   4.1 Profit warnings and other events ......................................................... 13
   4.2 Event study methodology ................................................................. 14
      4.2.1 Abnormal returns ........................................................................ 15
      4.2.2 Test estimation ........................................................................... 16
   4.3 Implications of Abnormal Returns .................................................... 16

5 Data and methodology ............................................................................................. 18
   5.1 Methodology ............................................................................................... 18
   5.2 Regression estimation .............................................................................. 19

6 Event study & regression results ................................................................. 20
   6.1 Profit warnings 2008-2010 ................................................................. 20
   6.2 Reversed Profit warnings 2008-2010 ............................................... 21
   6.3 Profit warnings 1997-1999 ................................................................. 22
   6.4 Regression results .................................................................................. 22
   6.5 Average results ...................................................................................... 23

7 Conclusions ............................................................................................................. 26

List of references ....................................................................................................... 27
1 Introduction

In the aftermath of “Sweden’s largest insider trading case” involving employees at Cevian and Nordea who walked free of all insider trading charges once again a debate concerning illegal insider trading has arisen and a lot of criticism is directed towards the insider trading laws. The prosecution concerned approximately 111 million of claimed illegal profits and the prosecution took three years of investigations before the sentence of acquittal was ruled in June of 2010 (Östlund & Agerman, 2010). The Swedish courts and law enforcers are having problems in prosecuting and sentencing insider trading cases. When looking at statistics it shows that in 2009 only 8 out of 93 cases were tried in court, and from them only 6 led to convictions (Melzer, 2010). In 2010 the situation looks even worse since 118 cases of suspicious insider trading have been handed over to the EBM (Ekobrottmyndigheten) of which zero cases have lead to further actions (TT, 2010b).

Economists and legal scholars have an ongoing debate on the legality and efficiency of insider trading laws. The legal scholars argue that the law exist in order to keep the market place fair for all and to make insiders keep their fiduciary duties towards their shareholders. Further arguments are about liquidity problems stemming from a decrease of trust in the market. Economists’ base their arguments on that insider trading make the market reflect new information more efficiently which gains investors. Manne (1985) writes that “insider trading is a victimless crime” which is supported by Eklund (2003) who writes that it has not been proven that insider trading would harm the market and that it is far from univocal that banning insider trading is in the best interest of the public.

Generally legislations should only be passed if a market failure is detected and if the market cannot deal with the problem on its own (Niemeyer 2001) and the governments intervention has to solve the problem better than the market does itself (Eklund 2003). If the costs exceed the benefits or if the legislator cannot stop the problem then insider trading should not be legislated against (Niemeyer, 2001). Taking into account the legal inefficiency of stopping insider trading, the costs of maintaining the law which may not be in the best interest of the public and that laws are proven to stop the market from working more efficiently are all arguments that argue that the laws may be unnecessary. The question that arises is if insider trading really should be prohibited and this thesis deals with that question.

More specifically the purpose of this master’s thesis is to investigate the occurrence of insider trading and whether or not Swedish legislation has decreased the presence of insider trading on the Stockholm Stock Exchange. This is done by presenting the legal aspects, the relevant arguments and by carrying out a discussion throughout the paper. An event study is performed in order to see if profit warnings and reversed profit warnings show evidence of insider trading on the Swedish stock exchange. If the event study show signs of inefficient the law changes after 2000 somewhat has decreased the occurrence of insider trading even though there still is a large occurrence of insider trading. The regression also shows a statistically significant negative relationship between insider trading and industries showing that the occurrence of insider trading may to some extent be industry clustered.

The results of the event studies show evidence of insider trading in 21 out of 44 event cases which indicates of inefficiency of the law. The results are statistically significant at the 1% level and show an average abnormal return starting to grow at about 10 days prior the event for profit warnings. The results indicate no significant difference between profit warnings and reverse profit warnings. A cross sectional regression is performed which shows that the law changes after 2000 somewhat has decreased the occurrence of insider trading even though there still is a large occurrence of insider trading. The regression also shows a statistically significant negative relationship between insider trading and industries showing that the occurrence of insider trading may to some extent be industry clustered.
1.1 Background & previous studies

The topic of legal insider trading has been a controversial roller coaster since the 1960s when Manne (1966) wrote the first study regarding insider trading and market efficiency. Before the 1970's insider trading was taken for granted but today most countries have some kind of insider trading regulation (Hetzler, 2001). Economists and legal scholars have an ongoing debate on the legality and efficiency of insider trading laws. Economists base their arguments on that insider trading makes the market reflect new information more efficiently. Further, Eklund (2003) writes that it has not been proven that the market would be harmed from the existence of insider trading and it is far from univocal that banning insider trading is in the best interest of the public. The legal scholars justify the regulation by that the laws exist in order to keep the marketplace fair for all and to make insiders keep their fiduciary duties towards their shareholders. Further there are arguments about liquidity problems stemming from a decrease of trust in the market. McGee (2009) finds important flaws in each of the arguments for keeping insider trading laws and states that the arguments are based on emotions rather than on economic analysis.

Insider trading is usually measured by event studies. They are performed by calculating abnormal returns in order to measure the impact an event has on the share price in order to test the market efficiency. The first event study was performed by James Dolley in 1933 who measured the nominal effects of share splits (Campbell, Lo & McKinlay, 1997). The methodology was very basic and thus refined in later years by separating events and eliminating general price movements of the share market. In the late 1960's a method was presented which practically is the same event study method used today. Fama, Fischer, Jensen & Roll (1969) studied the period around share splits and Ball & Brown (1968) looked at earnings announcements which showed that there were abnormal returns on started growing months prior to the announcement. Binder (1998) writes that the paper from Fama et.al in 1969 started a revolution with their methodology and that it since has been applicable in accounting, economics and finance when examining the events of earning announcements, cash flow announcements, changes in accounting rules and also the effects of new laws.

The event studied is profit warnings which are an announcement of that earnings performance will differ from current expectations. The warnings are announced randomly and are impossible to anticipate. Profit warnings have not received a lot of attention in the literature compared to events such as earnings announcements and Jackson and Madura (2003) suggest that this may depend on that profit warnings were not common until the 1990's. Though, Bulkley & Herrerias (2005) suggest that profit warnings are interesting events to study since they have large immediate impact on the market as they are a signal about an instant and specific economic performance actualization. This means that even though the initial reaction to the event may be biased the rectification should be comparatively fast and large. The reaction will give results that are more robust against the problems existing with long-term abnormal returns measurements such as defining a normal returns model. When they study profit warnings on US data they find that share prices on average drop by 22% within the announcement period. That percentage is a much higher initial effect on share prices than for any other event announcement.

The study most similar in the implementation as this thesis is the work of Jackson et al. (2003). They conduct an event study on US data by calculating abnormal returns and find a decline of 17.10% in the 6 days up until and including the event day. Further they find that there is a decrease of 3.53% in the days leading up to the event but excluding the event day, showing of information leakage and therefore insider trading. Even though the event study
is conducted in the US, it may be assumed that similar results are to be found on the Swedish data when looking at Alves, Pope & Young (2009) who also study profit warnings but on European data. They point out that event studies on profit warnings so far have been limited to the US & the UK market and therefore their study focuses on the European market as a whole. European profit warning announcing firms show on average -10.9% abnormal returns on the event date and -13.4% cumulative abnormal returns on the three days surrounding the event which may be applicable on Swedish data.

Further relevant studies are written by Bulkley, Harris & Herreras (2002) who study UK data and their study shows an average of a daily decrease of 0.18% returns prior to the announcement of profit warnings. Also, Chang & Watson (2007) study profit warnings and insider trading in Australia and their results show a total decline of 6.21% of returns in the pre-event period. As far as to knowledge of the thesis author no Swedish event studies on profit warnings have been conducted on a higher academic level. But for a relevant discussion on insider trading laws performed in Sweden, see Eklund (2003).

Korczak, Korczak, & Lasfer (2010) find that a larger fraction of good news, compared to bad news, is preceded by insider trading. Therefore this thesis will perform event studies on both profit warnings and reversed profit warnings in order to see if that is true for the Swedish market as well. A recent study conducted by Thomas & Zhang (2008) find correlations between an events announcement effect of share prices and other firms within the same industry. As they suggest that price changes due to events may be industry related it seems beneficial to perform a cross sectional regression in order to study whether insider trading is found to be correlated to any external variables such as industries or size. The time period chosen to perform the event study is 2008-2010 in order to give a sufficient large sample which in this thesis is set at 30 profit warnings.

Eklund (2003) writes that regulations against insider trading came in 1970, and in 1985 the laws made insider trading a criminal offence. In 1990 the laws were adapted to EU directives in order to harmonize Sweden’s laws before formally applying to the EU in 1991. In 2001 the law concerning insider trading was redone in order to make the laws easier to interpret and made punishments harsher, and in 2005 the law was once again redone for the same reasons in order to make the law more efficient in stopping insider trading. Since the law has been redone in the early 21st century in order to make the law more efficient in stopping insider trading, a sample from prior to 2001 in addition to the main sample of profit warnings in 2008-2010 will be tested. The additional time period will therefore be three years in 1997-1999 which equal to the time period of three years in 2008-2010.

1.2 Outline

Section 2 introduces the definition of illegal insider trading. The most important legislations that deal with insider trading are presented and the problems with the legislation and its enforcement are discussed. The different arguments for and against legal insider trading are presented and finally a discussion surrounding insider trading laws and its legality is carried out. The efficient market hypothesis and how it relates to insider trading is shown in section 3. The section also covers the share price movements which are caused by insider trading. Section 4 deals with event studies. Profit warnings are introduced together with various other events, the event study methodology is shown and the implications of abnormal returns are discussed. Data and methodology is found in section 5. The empirical findings of the event study are presented and discussed in section 6. The conclusions are found in section 7.
2 Insider trading

The meaning of an insider has changed during the years, first it meant the members of the share market where the non-share market members where outsiders. The word then came to depict all people with the obligation to report shareholdings (board members, employees & relatives etc.). Today, the word insider depicts all individuals who possess insider information, not only corporate employees but everyone that may come across insider information such as relatives, friends, accountants and even a taxi driver who overhears a conversation when driving a CEO. The focus of the regulation has therefore extended to include all people rather than the people related to the firm and so everyone is under scrutiny (Af Sandeberg, 2008).

Af Sandeberg (2008) writes that insider’s wide access to non public, share price altering information combined with the extent of the possibilities of high profits and marginally low risk of getting caught has made it intriguing to act on that information, even if there may be long jail sentences if caught. Even if all people now are possible insiders, the large majority of the people that are prosecuted are individuals in direct connection to the firm who’s share trading are being investigated. The investigations commonly concern a group of insiders who have been trading during the same time, with the same source of information and within an illegal time period (Af Sandeberg, 2008). The illegal trading most likely occurs when there are profit warnings, interim financial statements, firm acquisitions, firm mergers and other larger unforeseen firm announcements regarding the structure or economic situation of the firm (FI, 2010a).

2.1 The Swedish Insider trading legislation

The first step towards a Swedish insider trading law came in 1970’s forcing certain individuals to register their shareholdings in limited firms and in the 1980’s the essence of today’s legislation was formed prohibiting certain individuals within the firm to trade on insider information (Bengtsson, 2001). In the 1990’s the law was redone making it a crime for anyone who had insider information to trade on it and the regulation applied to any financial instruments which are traded in the share market. In 2000 the insider trading law were changed and the punishments of certain crimes was made harsher and changes were made in order to simplify the apprehension and adaptation of insider trading regulations. The law that is in force today was implemented in 2005 due to an EEC directive from 2003 which toughened and extended the law further.

The foremost important legislations will briefly be presented in order of the time the law was adopted.

The “Act concerning Reporting Obligations for Certain Holdings of Financial Instruments” (2000:1087)

The act forces individuals who have an insider position to report their own holdings and closely affiliated individuals’ holdings of financial instruments in the firm and when they change those holdings (Sjödin, 2006). The purpose of the paragraph is to make it harder to trade unnoticed on insider information. In paragraph 15, insiders are prohibited to trade 30 days before a financial report. The purpose of the regulation is to prohibit individuals that may have access to insider information to trade in the time period when they usually have that kind of information, for example before quarterly reports are announced (Lycke, 2010a).

The Market Abuse Penal Act (2005:377)
The Market Abuse law prohibits illegal insider trading which is defined as all trading for one’s own or others gain which takes advantage of insider information (Af Sandeberg, 2008). The Market abuse law defines insider information as non public or secret information which will affect the price of the financial instrument. There is a problem in making a distinction between public and secret information which makes it harder to punish according to the law. The law also prohibits unapproved disclosure of insider information which will affect the financial instruments price. The regulations apply to all individuals that are employed, have assignments or have other duties that usually can give them insight in occurrences about the firm or gives them secret information. The idea of this paragraph is to keep private information secret until it is meant to be released to the public. The law further prohibits market price manipulation by influencing the share price and states that it is a crime to keep from reporting suspicious market abuse crimes (Sjödin 2006).

The Law (2007:528) regarding disclosure requirements for listed firms

The law states that all listed firms continuously need to inform the stock exchange of its operations and to disclose all relevant information to the share market. In order to fulfill the legally obliged tasks a listing agreement is created between the share market and the listed firm which if counteracted will lead to disciplinary consequences. The listing agreement states that share price altering information immediately should be released by a press release; the idea is that all participants of the market should have the same information at the same time preceeding securities transactions.

The agreement clearly states that certain information always has to be announced to the public, for example financial reports, changes in board members or management and profit forecast adjustments. Further, there are some events that only in some cases are obliged to be announced if the changes are estimated to alter the share price. The latter may be up to the firm to assess whether or not the information has news worthiness enough to alter the share price, which may be tricky. An example of such an event is unexpected changes in earnings such as profit warnings. There is a general clause which states that the firm has to announce if any changes are made or new information is revealed which is not insignificant to the general view of the firm based on prior publicly know information. All individuals should be able to trade on the share market at the same terms and the law exists in order to obtain those conditions at the Swedish Stock exchange (Örtengren, 2008).

2.2 The problems with the legislation and its enforcement

Between 1991 when the first prohibiting rules came and 2008 more than 600 of suspected insider trading cases have been started and out of them 150 has been reported to prosecutors. Interestingly only around 30 cases where tried in court and only about 10 cases out of them have lead to convictions (Af Sandeberg, 2008). The low prosecution rate of the past does not seem to be an isolated incident. In 2009 only 8 cases were tried and 6 convicted out of a total of 93 suspicious insider trading cases (Melzer, 2010). Rather than decreasing insider trading and increasing the prosecution rates by changed laws and harsher legal actions it seems to go towards the opposite. In 2010 alone 118 suspicious illegal insider trading cases was handed over to the Ekobrottmyndigheten (EBM) but not even one of those cases has lead to a prosecution (TT, 2010b). Since 2006, the total amount of suspicious insider trading cases that have been reported to the EBM almost has doubled as seen in table 2.1, also market manipulation has increased drastically.

In Sweden Finansinspektionen (FI) is the institute that makes sure that firms follow the Market Abuse Act. The stock exchange, market places, security firms and banks are liable
according to the law to report transactions that may have relations to insider trading crimes or market manipulation at the latest 5 working days after the transaction. In addition of the public reports, FI may also on their own initiative or after tips start own investigations of the trade at the security market. The FI then gives the cases to the EBM who has the task of starting insider trading crime investigations since 2004, which priory was a task shared with the FI.

Table 2-1 All suspicious Market Abuse Matters handed over to the EBM

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insider Trading</td>
<td>60</td>
<td>129</td>
<td>110</td>
<td>98</td>
<td>118</td>
</tr>
<tr>
<td>Market manipulation</td>
<td>33</td>
<td>60</td>
<td>190</td>
<td>161</td>
<td>129</td>
</tr>
<tr>
<td>Unauthorized disclosure</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Default to report</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

(Source: FI, 2010b)

Convicting insiders of illegal insider trading is clearly problematic; Af Sandeberg (2008) writes that in order to be convicted all of the requirements or prerequisites that are specified in the penal offense description have to be fulfilled. In order to convict an insider of a crime the trading of financial instruments has to have taken place at the share market and it has to be proven that the information is of non public nature. Since it is hard to make a distinction between public and private information this creates a large problem for the prosecution. Further, the information must according to experience have altered the share price and the effect on the share price has to be essential in order for a conviction, which may not be easily defined. In addition it has to be clearly proven that the insider realized or should have realized that he was acting on forbidden information. The law does not regulate against a spread of information through rumors, speculations and thoughts as long as the information is based on public facts and does not come from a source that generally has access to insider information. The chain of thoughts may be hard to prove since there has to be obvious and relevant physical evidence of the insider’s was thinking, perhaps through recordings or emails which may not exist (Af Sandeberg, 2008).

Globally there are tendencies towards comprehensive prohibitions of insider trading which McGee (2009) finds disturbing since there also are laws being implemented against some forms of insider trading that may be rewarding to society. When a country wants to become an EU member today they have to pass legal restrictions on insider trading for their country, which may lead to ignorance of why these laws are implemented at all. In the process of becoming members they may pass a law without thinking about the effects the law will impose on that countries economy and property rights which is a frightening thought.

During the last couple of years there has been a large transformation of the regulations of financial instruments, the self-regulations have decreased and the public regulations have increased drastically. The EU-commission action-plan for financial services has lead to a number of directives which all have contributed to a new, changed and expanded legislation. The extensive changes and amount of new information given has not totally unexpectedly lead to a number of problems of adaptation and interpretation. These problems occur since the directives collide with old national legislation but in some cases also since the different EU-rules do not coincide (Lycke, 2010b). Further, Sweden implemented the EEC Market Abuse directive in a different way than other EU member countries. The legal text is formed in such a way that the exceptions are highlighted instead of clarifying the actual acts that are prohibited. Therefore it has to be interpreted restrictively. It is easy to interpret
the exceptions as exhaustive and interpret that all other situations are penalty imposed which is a problem (Schedin, 2010).

There has also been a rapid change from relatively concentrated national trade in financial instruments to an increase in size and numbers of the financial markets. The change has lead to new challenges both for the supervision authorities and for the market as a whole. Since the same financial instrument can be traded on a number of markets in different countries shareholders have a possibility to take advantage of the gap through manipulating the share price in one market which then affects the share price in another market. The market abuse is hard to detect due to the lack of coordinated surveillance between the market places (FI, 2010a). When insiders are able to go around the Swedish trading laws and disclosure agreements by trading internationally, the law proves itself quite useless since it only results in possible higher transaction costs for insiders and the increase in public confidence due to a creation of appearance of that the legislation is handling the problem which gives a false sense of security (Niemeyer, 2001). The problem still remains since the insiders still use the private information but only in other markets.

2.3 Regulations vs. free insider trading


Insider trading was almost taken for granted before the 1970’s and it was accepted in both Sweden and European countries since it was seen as a reasonable compensation to the people holding the information. The debate about the plausibility of an insider trading regulation has since been debated between two groups, the economists and legal scholars (Hetzler, 2001). Legislations of financial markets are generally founded only when there is a market failure and laws should only be passed if the market cannot deal with the problem on its own. The market has to be kept efficient, fair for all and transparent (Niemeyer, 2010). The arguments surrounding insider trading are here presented and discussed;

The Market efficiency argument

The government wants the market to be efficient since it is in the best interest of the public (Niemeyer, 2001) but still insider trading is regulated against. Manne (2005) writes that there is little dissent of that insider trading always directs the share prices towards their true values. In order to make the market more efficient insider trading should be allowed because it leads to a faster reflection of the new private information in the share prices. Share values are thus more accurate and make it possible to make better informed economical decisions and allocation of resources (Manne, 2005). The fact that insider trading leads to more efficient markets was first introduced back in 1966 by Manne (1966) and in recent years he can conclude that the argument has proven robust. The evidence is clear that insider trading should be allowed in order to let the market regulate itself and become more efficient. Today’s share market is seen to be semi-strongly efficient since the market both reflects the historical information and also to a wide extent all public available information. Insider trading allows private information to be faster reflected in the market and therefore lead to something more resembling a strongly efficient market. The assumption of that legal insider trading will lead to significantly faster price discovery is widely supported by academic journals. For further reading see; Aktas, De Bodt, & Van Oppens (2007), Rolstone & Piotroski (2004), Lin & Rozeff (1995) and Meulbroek (1992). The background of the argument will be more thoroughly covered in section 3.

The level playing field and the fairness arguments
Hetzler (2001) writes that the market should be based on fair rules for all and that all should have to follow the same principles, even if the market would be more efficient without the rules. The level playing field argument states that all people should have the same information at the same time in order to create the same trading environment for all. The principle of equal and fair rights in the market is the main argument which Swedish insider trading laws presently is based on.

McGee (2009) writes that the arguments are based on emotions rather than economic analysis and therefore falls short. The fairness argument is questioned; Strudler & Orts (1999) write that even though there is a widespread common support for regulating insider trading, it is hard to identify the reasons for such regulations. There is an uncertainty around the fairness argument since fairness is hard to define which leads to uncertainty in the range and application area of the regulation.

The level playing field argument is also questioned; McGee (2009) writes that the argument states that all investors should have the information and all should have it simultaneously. The argument states that everyone should have the same information even if they have done nothing or very little to gain that information. He writes that there is a problem with this argument since it is not desirable or even possible to have a level playing field when applied to economics. It is desirable to have competition in all areas. McGee gives the example of banana farmers in Alaska and in South America and that it is fair that they are competing on the same rules. It would not be fair to apply high taxes on bananas coming from South America and to give subsidies to the Alaskan farmers just because South America is gained by the weather. The same applies to economics where a regulation on information gained by individuals who are working at the stock exchange or are in the position to gain further information is not fair. He argues that the unfairness rather lies in the law which forces them to give away the information for free to individuals who have done nothing to deserve it.

The Fiduciary duty argument

The argument is based on the notion of that officers have a duty to do what is best for the shareholders, rather than what is best for them. The best of the shareholders is for the officer to fully give them all relevant and important information which would come to be significant to them. When firm insiders act on private information they rather gain themselves instead of looking after the shareholders interests. The fiduciary argument is according to O’Hara (2001) found to be the strongest of the arguments against insider trading but still it has flaws.

Strudler & Orts (1999) write that the argument is questioned since the fiduciary relationship only applies to the shareholders and officers, and not all individuals such as non employees and outsiders that have access to the inside information and therefore covered by the laws. They further argue that traditionally, officers have fiduciary duty towards the firm and not the shareholders, so if insiders trading by officers affect shareholders negatively they cannot claim compensation. According to O’Hara (2001) the argument also is somewhat flawed since the officers only have fiduciary duty to their shareholders and not all other individuals in the market, which would manifest itself by the officers notifying all insiders and all shareholders before announcing it to the market in order to protect their shareholders. Then all people would not have access to the same information at the same time and the fairness argument would argue against it. The argument falls short when the illegal insider trading is performed by anyone who is not an officer with fiduciary duties which often is the case (McGee, 2009).
The Liquidity argument

The liquidity argument states that if insider trading laws are abolished the private investors cannot trust the market. The laws are preventing insiders to firstly acting upon non public information and gaining from the trades which leads to a loss for other investors without the information. Secondly the law prohibits people from influencing the financial instruments inappropriately. If investors cannot trust the market this will lead to a loss in liquidity since they do not trust to invest their money in financial instruments and they become more risk advert. The secondary market will suffer since there are not as many participants in the market and investors may chose to invest in other markets, perhaps abroad. The cost of capital for the issuer increases and thereby the cost for society as a whole will increase (Af Sandeberg, 2002). The idea is supported by Swedish law in proposition 1990/1991:42. 

Dennert (1991) writes that if investors would react to insider trading with a decrease of confidence in the market there are still unclear results of how that would affect liquidity. He finds that a lack in confidence of the market may lead to underinvestment but also can lead to larger and better investments. Further, Kabir & Vermaelen (1996) write that the argument ignores the insiders own enhancement of liquidity and the law has also discouraged certain traders to invest in the share market. They find that in the Amsterdam stock exchange that having insider trading regulations actually has lead to a decrease in liquidity rather than an increase as argued by laws. Cao, Casares Field & Hanka (2004) study the event of IPOs lockup expirations and find that insiders may enter a market and affect both volume and price of the share without harming liquidity. Those findings are supported by for example Acharaya & Johnson (2007) and Cornell & Sirri (1992) who find no evidence of that legal insider trading will decrease the liquidity of the market.

The investor injury argument

Bainbridge (1999) writes that one of the traditional arguments of legislation against insider trading is that insider trading injures investors and will decreases the confidence in the market. The argument is found to lack credibility since if insiders were to trade freely the share prices would be more informative. If the prices contain more information the investors will make better economical decisions. With insider trading regulations, the market does not adjust the prices as quickly and the investors actually trade with shares which are not currently priced and thus do not make the best decisions for themselves. Further, it is not only the insiders who gain if when a share adjusts its price to its true value but actually all investors who own that share are gained. He also writes that all firms cannot reveal all information since the asymmetric information is part of the market and therefore everyone cannot know everything all of the time. Rather than insider trading, the natural market asymmetric information is the cause of why some trades are non profitable and some are. Henry Manne (1985) said it best when he wrote that “insider trading is a victimless crime” based on the fact of that there are no evidence of injury to long run investors.

2.4 The legality of insider trading regulations

Annika von Haartman (Nordic Market surveillance executor of Nasdaq OMX) says that it is unfortunate that Sweden has a legislation that clearly does not work and that it might be wise to revise it (TT, 2010a). In the aftermath of “Sweden’s largest insider trading case” involving Cevian and Nordea employees who walked free of all insider trading charges, once again there has been a lot of criticism directed towards the insider trading laws. The critique
amongst legal scholars is mainly that the evidence requirements are too high and the laws are too unclear which makes it impossible to exercise and punish according to the law (Neurath, 2010). A lot of time and resources has been wasted in the case which was sentenced in June 2010 after three years of investigations, the accused lawyer fees alone will cost taxpayers 10 million SEK (Bursell & Neurath, 2010). Annika von Haartman says that the sentence may lead to a decrease of prosecutions of suspected market abuse cases in the future since the EBM (Ekobrottmyndigheten) will believe that there is no point in raise the cases (Neurath, 2010). If the sentence will lead to fewer prosecutions in the future and there were zero prosecutions in 2010, one could question what that means for the legality and future of the law?

Legislations of financial markets are generally founded only when a market failure is detected and laws should only be passed if the market cannot deal with the problem on its own. The legislation must also solve the problem without creating any new worse effects (Niemeyer, 2001). Eklund (2003) writes that it is necessary that the governments’ intervention solves the problem better than the market does itself. If the market participants can deal with the problem themselves there is really no need for legislation. He writes that when looking at insider trading it is not entirely clear that those conditions are met. Firstly, it is still not clear whether insider trading should be regulated at all since insider trading may lead both to negative and positive market effects which undermines the condition of a market failure (Eklund, 2003). Secondly, looking at statistics in table 2.1 ins section 2.2 it is clear that the law has not stopped insider trading from occurring in Sweden which undermines that the legislation solves the problem better than the market and therefore falls short in that condition.

Even though a clear market failure may be detected, which seems questionable in the case of insider trading, it is still not necessary that legislations are the right way to solve the problem. Some negative effects are a standard for almost all legislations and a strong argument against legislation is when the costs of regulating the “problem” exceeds the benefits since the regulation then has created new worse effects. Further reasons not to legislate are that the legislator does not have the possibility and motive to adopt adequate enforcement. Further, the legislators may have a problem in strictly enforcing the legislation so that it becomes “toothless” which leads to undermining the Swedish legislations in general which is a threat to the Swedish legal security. Finally, a high consumer protection may lead to a false security and an efficient investor protection is becoming increasingly hard to maintain as the securities market is becoming more international (Niemeyer, 2001).

The latter reason is confirmed by FI who write that they presently are having increased problems with detecting market abuse due to the internationalization (FI, 2010a). The law will therefore only lead to a false sense of security for investors and actually have no opportunity to influence insider trading. Further, looking at the statistics it is clear that the law, which is supposed to stop all illegal insider trading and to prosecute and convict those who still break the law, does not function. Niemeyer’s arguments saying that legislations should not be implemented when legislators have no possibility to adopt the adequate enforcement and have problems in strictly enforcing it seems to be fulfilled. Further, the enormous costs of maintaining the legislation without creating any larger benefits by stopping insider trading from occurring makes it questionable if the costs of the law are lower than the benefits.

The arguments presented in sections 2.2, 2.3 & 2.4 show strong evidence of that the legality of the insider trading legislation may be questioned and it is questionable if insider trading should be regulated by law at all.
3 Insider Trading & the Efficient Market Hypothesis

“I’d be a bum on the street with a tin cup if the markets were always efficient.” - Warren Buffett

A share market is efficient when the price for any given share reflects the net present value of all expected future profits. The Efficient market hypothesis (EMH) indicates that all available public and private information is reflected in the share prices. A perfectly efficient market should receive new information in a random and independent manner, all risk and return information should be reflected in current share prices and if new unexpected information arise then the investors should immediately adjust the share prices in the market. This means that share prices only change when new information reaches the market and it is not possible to anticipate any new information. Thus there is no asymmetric information and it should be impossible for any investor to have superior knowledge and earn superior returns (Hirschey & Nofsinger, 2010).

In order for the market to reflect such a fully efficient state there are three necessary conditions to uphold. The market should not have any transaction costs tied to trading, all available information should be publicly known without any costs and all investors should have the same idea about which effect the presently available information has on today’s and future share prices. Naturally the described market does not exist other than in theory but Fama argues that a market may still act efficiently since these conditions are not necessary but only sufficient for a efficient market (Fama, 1970). In order to reflect all levels of an efficient market the EMH is divided into three definitions; the weak form, the semi strong form and the strong form of market efficiency (Hirschey et al., 2010).

- The weak form of an efficient market means that all of the information of past share prices should be reflected in the current share prices. The prices are unpredictable and follow a so called random walk so the best estimation of future returns should be a mean from the past returns.
- The semi-strong form of the efficient market implies that all publicly available information is reflected in the present share’s price. According to this form of efficiency no investor can earn higher returns based on public information. When unexpected earnings announcements are made the market immediately adjusts the share prices to the correct value and the investor can only earn risk-adjusted normal returns.
- The strong form of an efficient market assumes that all available information both public and private fully is reflected in the share’s market price. All new information is instantaneously and correctly reflected in the share price. No investor can have better possibilities to gain higher returns since there is no monopolistic information which only certain investors can gain access to.

The linkage between insider trading and an efficient market can be traced back to Manne (1966) who wrote the first detailed study about the subject. According to the EMH no new information can be anticipated and when the information is released it should immediately be fully incorporated into the share price. Manne shows that then the adjustment in the share price will look like Figure 3.1. When no insider trading is allowed due to a fully functioning and efficient regulation the shareholders are prohibited to act upon the information until it is made public at t*. No trading on the new information gained is allowed until the

information has spread to everyone and at that time the share price will have an immediate adjustment.

If insider trading is allowed the share price adjustment would look like in Figure 3.2. At first only a few insiders have the private information and buy shares when they know that money is to be made since the share price is underpriced. With time a cascade effect will be seen as more people are trusting that the first investors know what they are doing. The speed of which the price will adjust to its true price will depend on how fast the market will observe and translate the changes of information in the market and how quickly insiders spread the information. As seen in the Figure 3.2 free insider trading would help the market reflect the new information more quickly and therefore more efficiently according to the efficient market hypothesis.

![Figure 3.1 Price adjustment without insider trading](image1.png)  ![Figure 3.2 Price adjustment with free insider trading](image2.png)

Source: Manne (1966)

In reality the simplified Figures 3.1 and 3.2 would look somewhat different. Figure 3.1 relies on that all information is reflected into the share price directly at \( t^* \) which in reality is hard to arrange. There is always a time lag in the information spread. Also, there would have to be a total stop in all trading before the information is released and trading would not be resumed until all of the information has spread to everyone which in reality is not possible. Figure 3.2 would be less smooth as the price at first would increase with a steep line as a lot of people gain the same information. Then at a certain price the insiders would doubt that the price is reasonable and think that there are no more profits to be done, and then either stop buying or start to sell shares. At that point in time the price has reached its peak and will fall quite drastically, until the price has reached a bottom where profits are to be made again. Then the price will increase a bit again, adjusting to its true value when taking the information into consideration and then flatten out (Manne, 1966). Observe that if the new information is negative, the adjustments in Figures 3.1 and 3.2 will be the opposite.

A common way of testing the market efficiency is by isolating deviations from the forecasted returns of a fully efficient market. If there are deviations in return before the time \( t^* \) there are clear signs of information leakage due to information asymmetry and therefore the market is not fully efficient. If the market was fully efficient all information would already be incorporated in the price. The shift in the share price is explained by illegal insider trading and the market may still be semi-strongly efficient since the share price still reflects all public and historic information (Hirschey, et al., 2010). The test just described is called an event study which is described in the following section.
4 The Event Study

An event study is used to measure the impact an event has on the share prices and thus firm value. A null hypothesis is used to test if the market is efficient or not. In an efficient market the share’s price should have an immediate reaction to the event and the price movement after the event should be unrelated to preceding returns and market reaction of the event period (Kothari, 2001).

When conducting event studies it is important that the announcement of the event came as a surprise for the shareholders. For announcements such as earnings surprises it is obvious but for other events such as yearly earnings announcement it is required to make sure that the notice was a surprise. This is done by comparing the expected estimate of performance of professional analysts and the actual earnings performance of the announcement. The firms that have had a significantly different performance than expected can be used in the event study. Negative or positive surprises will have different price affects so when performing the event study the firms with positive surprises should be divided into one group and the negative into another.

There are two different types of event studies, the first are short term event studies which looks at a short period surrounding an event and the second are long term event studies which focuses on post-announcement periods to see whether the event causes long term effects. When testing for illegal insider trading a short run event study should be used. It should only focus at the time period preceding the event since that is the time period where it is possible to evaluate if insider trading has occurred or not. If the laws are functioning then the firm shares should have normal returns until the event day and then have a dramatic abnormal return on the specific day. Thus, if there are any signs of abnormal returns prior to the event day the market may not be strongly efficient since not all information is incorporated into the share prices (Elton, Gruber, Brown & Goetzmann, 2010).

4.1 Profit warnings and other events

Profit warnings are announcements about that a firm’s earnings may differ from analysts forecasts. The warning may be either a negative adjustment which is called a profit warning or a positive adjustment which is called a reversed profit warning. Presently firms are not obliged to report profit warnings according to the Law regarding disclosure requirements for listed firms (2007:528) unless the new information is clear to have a significant impact on the share price. Effectively there are limited numbers of profit warnings being announced each year since firms are allowed to access the importance of the information on their own.

The event study methodology works especially well for events that are hard to anticipate and in short time periods (Hirschey et al., 2010). Thus, profit warnings are good events to study since they are random events which make them unanticipated and not possible to forecast, which leads to a strong reaction on the stock exchange. Since profit warnings are not possible to anticipate, any abnormal returns prior to the event will show clear evidence of information leakage and thus insider trading. They also have the advantage of immediate actualization before events such as exchange listings and share splits.

Profit warnings have not received a lot of attention in the literature compared to events such as earnings announcements and Jackson et al. (2003) suggest that this may depend on that profit warnings were not common until the 1990’s. Though, profit warnings are interesting events to study since they have large immediate impacts on the market. On average
share prices drop by 22% within the event period which is a much higher initial effect on share prices than for any other event announcement (Bulkley et al., 2005).

Insider trading in the case of profit warnings is expected to be shown by a negative curve preceding the event which on the event day then drops more drastically. In the case of reversed profit warnings the curve is expected to have a positive upward sloping curve until the event and then drastically increase further.

There are many other corporate event covering earnings, firm structure and share structure and in order to give an overview some of them are presented;

Earning announcements are the most commonly event studied. The announcement is commonly performed by financial reports showing their performance. The event is seen as an anticipated announcement because investors know when they are released and therefore the abnormal returns may stem from anticipation rather than insider trading. Therefore the event may not be a good event to study for insider trading. For a recent study of earning announcements, see Betzer & Thiessen (2009).

Takeovers and mergers are events that change the firm structure. A merger is performed when two or more firms are combined commonly used by letting the shareholders of one firm give up their shares and instead gain shares in another firm. A takeover is when one firm makes an offer on outstanding shares. The events are commonly seen as having large pre anticipations since the events are industry clustered and commonly speculated, which may show of other effects rather than information leakage, and therefore these events are not good in studying insider trading. For a recent study on takeovers and mergers pre-announcement trading, see Gao & Oler (2008).

Share splits are when firms divide their existing shares into multiple shares. The total value of the shares stays the same even though they are greater in number. One example of why a firm chooses to perform a share split is that the price of one share has become too large and therefore is too expensive to many investors. The event is not as good an alternative as profit warnings when looking at insider trading since they do not have immediate realization. To read more about share splits and their effects, see Hirschey & Nofsinger (2010).

Share repurchases are an event when firms buy back their shares from the market which lowers the number of outstanding shares. Firms tend to buy back their shares when the firm believes that the current share price is wrongly valued (Firth, Leung & Rui, 2010). Since repurchase of shares decreases the share supply, the earnings per share increases and the market value tends to do the same. The market should see the event as a signal of share undervaluation and many studies show that there are negative returns before the event and positive share returns when the event is announced, see for example; Li & McNally (2007) & McNally, Smith & Barnes (2006).

Another event is dividends issuance. Dividends are money given to shareholders which are a part of the firm’s profits. Dividends are a large part of the earnings which a share generates during the year and not unexpectedly the size of the dividend depends on the size of the profits. It may be argued that dividend payments may be anticipated if investors study the market and historical information which makes them a bad event to study. For a recent study, see Del Brio & De Miguel (2010).

4.2 Event study methodology

Event studies are used in order to estimate the effect an event has had on share prices. In order to perform an event study firstly the time period surrounding the chosen event has to
be selected and also of which length the time period should be. The estimation and event window will look as in Figure 4.1. For example if the study wanted to study 30 days preceding the event, the event date would be 0 and -30,-29,-28,…-1 would be the thirty days before the event. It is also possible to study the 30 days after the event, but since this study focuses on examining the occurrence of insider trade leading up to the event it is not necessary to examine the post announcement effects.

![Figure 4.1 General estimation and event window](Source: Campbell, et al.(1997))

Where;

\( \tau = \) at time equal to zero which is the event day for which the profit warning is announced

\( \tau - T1 = \) The event window for which abnormal returns are calculated

\( T0 - T1 = \) the estimation window for which beta is calculated

The early studies used monthly data when performing event studies. Then it was hard to get correct results since there might have been additional surprise announcements embedded in the returns stemming from others than the event being studied. Most present studies use daily data which makes interpretations easier.

It is also important that the estimation window and the event window do not overlap. If the event window is included when calculating normal model parameters, this can lead to that both the normal and abnormal returns will reflect the events impact on the return. This causes a problem since the event method is based on the assumption that the impact of the event is captured by the abnormal returns (Campbell et al., 1997).

### 4.2.1 Abnormal returns

The impact an event has on the share price is measured by Abnormal Returns \( (AR_{it,t}) \) (Equation 1) which is a function of the Actual Return \( (R_{it}) \) less the Expected Return \( (E(R_{it})) \).

\[
\alpha_{it,t}(AR_{it,t}) = R_{it} - E(R_{it})
\]  

(1)

The Expected returns \( E(R_{it}) \) can be estimated using the Capital Asset Pricing Model (Equation 2) which is a function of the risk free rate, expected market return and the beta value;

\[
E(R_{it}) = r_f + \beta(r_m - r_f)
\]  

(2)

The risk free rate is usually represented by a short term government bond, the expected market return \( r_m \) is the average return rate calculated from daily historical values. The beta value \( \beta \) represents the systematic risk of the share compared to the market portfolio (Equation 3). The market has \( \beta =1 \), which means that if the beta value is below 1 the share is less risky, and a beta value over 1 means that the share is more risky than the market. The formula for the systematic risk is composed of the covariance between the daily share and market return \( \sigma_{it,m} \) and the variance of the market return \( \sigma_m^2 \);

\[
\beta = \frac{\sigma_{it,m}}{\sigma_m^2}
\]  

(3)
Abnormal return can be calculated by various equilibrium models, both economical and statistical models. Since this is an economic study the CAPM is chosen since it is the most frequently used economic model. The CAPM has received criticism of that many of the assumptions does not hold, for example no transaction costs. But one should not discard the CAPM based on the assumptions but rather look at how accurate the predictions are (Eklund, 2010).

Elton, et al. (2010) write that when the event studied is profit warnings they will have varying results across firms and it is then better to look at the individual firms instead of looking at the average of all the firms. Even though the point is reasonable, the average results will be an indicator of the events all together point towards a larger share of abnormal returns rather than normal returns. Indifferent what the results show they give an oversight of to which extent insider trading is occurring. Those findings may complement the individual firm results.

Thus, not only the effect the event has on the individual share will be tested but also the effect of the event has on average of the shares. The calculations for multiple shares in portfolios are the same as for one share but now several shares are used for each calculation. The Average abnormal return is calculated for each portfolio and then aggregated to see the effect over time.

4.2.2 Test estimation

In order to test the significance of the results of individual shares a t-test is performed. The t-test used is taken from McKinlay (1997) and Campbell, et al. (1997) but is slightly modified from a multiple to a single share t-test in order for relevance. The null hypothesis states that the cumulative abnormal returns equal to zero:

$$H_0 : \text{CAR}_i = 0, H_1 : \text{CAR}_i \neq 0$$

The formula for the t-test (Equation 4) is a function of the Cumulative AR (CAR) and the standard deviations of the AR of share i ($\sigma_i$);

$$t_i = \frac{\text{CAR}_i}{\sigma_i} \quad (4)$$

In order to test the Average Abnormal Returns, the Cumulative Average Abnormal Return will be tested in the same manner as for CARs.

4.3 Implications of Abnormal Returns

As previously mentioned an event study is performed in order to analyze the effect the event has had on the share price and therefore the firm value. The value is supposed to shift due to the surprise level embedded in the announcement and a share price adjustment is expected. If there is no significant shift in value on the event day, there may be something wrong.

Elton, et al. (2010) write that it might then be worth studying the return at the day following the event since the anomaly may be explained by the time it takes for the share prices to reflect the surprise. The event could either have been announced late in the work day or when the market was closed, so then the abnormal returns may not be seen until the day after. If that is not the case Bhattacharya, Daouk, Jorgenson & Kehr (2000) suggest that firstly there may be a totally informally inefficient market (firm value is not connected to share prices), the second case may be that firms in the economy do not present any signifi-
cant announcement which has economical value or thirdly the announcement was a totally anticipated by the market and the event is no surprise.

If the market reacts to the new information of the event as it should and there is pre-announcement abnormal returns they can be explained by three points according to Elton, et al. (2010):

Firstly, there may be a release of information of that an important announcement soon will occur. This thesis will focus on the surprise event of profit warnings and therefore there should not have been any official information release prior to the profit warning announcement, abolishing this particular point.

Secondly, it can partially be caused by prior abnormal returns included in the event window which makes the event study returns reflect that prior information. This thesis will examine each of the profit warnings separately which will make it possible to see if there is a “double-dip” in the aggregate abnormal returns and if there is evidence of other reactions the event will not be significant. That rules out the second point.

Thirdly, after abolishing the other two factors the remaining cause is the abnormal returns that may be a reflection of insider information leakage from the firm. That information is used prior to the announcement day without authorization by the insiders that have access to it.

The conclusion which is drawn is that if there are any signs of significant abnormal returns in the event period this will depend on information leakage and therefore illegal insider trading.
5  Data and methodology

The event sample consists of 44 profit warnings from firms in the large-, mid- and small-cap at the Stockholm Stock Exchange. The sample has an even and random spread between large and small firms since the sample is time determined rather than size determined. The time period studied is 2008.01.01-2010.10.21 and 1997.01.01-1999.12.31 and all profit warnings which meet the requirements are selected.

Out of the sample 29 are profit warnings and 8 are reversed profit warnings for the time period 2008.01.01-2010.10.21 and 7 are (negative) profit warnings for the time period 1997.05.01-1999.02.05. The two types of profit warnings are used in order to analyzing if there are any differences between the types, and the sample from 1997-1999 is used in order to investigate whether changes in laws after 2000 have made any difference on insider trading.

Affärsdata (2010) is the database used in searching through all newspapers after relevant profit warnings and reversed profit warnings. The daily SSVX 3 month values are given by Sveriges Riksbank (2010), the daily share prices are given by E24 (2010) which is an online business newspaper and the daily values of OMXSPI are taken from Nasdaq Nordic (2010). Additional information about historical prices is taken from Affärsvärlden (2010) and Nasdaq Nordic (2010).

5.1  Methodology

A sample period of 300 days which effectively denotes one calendar year is chosen. 30 days is the event period and 270 days is the estimation period. 30+1 days of event period gives a sample size of n-1 =30 which under the central limit theorem should be a large enough sample size to assume that the sample parameters are normally distributed, even though the data is not strictly normally distributed itself (Azcel, 2006). When the time period is chosen the announcement date is set at zero and the time period studied will look as in Figure 5.1;

[Figure 5.1: Specific estimation and event window. Source: Campbell, et al., (1997)]

Daily returns of the estimation period are calculated for each share and for the OMXSPI index. Those values are then used in order to calculate the systematic risk beta by the Equation 3 found in section 4.2.1. The daily returns are calculated without dividends.

The Share i expected returns are calculated by using the CAPM (Equation 2 in section 4.2.1). Beta is already estimated, the Government 3 month bond SSVX is used as the risk free rate and the expected market return is calculated using historical data of the OMXSPI to get an average return. The daily returns of OMXSPI are calculated without dividends.

The daily Abnormal return (AR) is then calculated by using the actual returns for each day in the event period and subtracting the expected returns of the CAPM by Equation 1 in section 4.2.1. The daily abnormal returns are then aggregated in order to see each shares price development over the time period.
In order to test the significance of the abnormal returns, firstly the Cumulative abnormal return (CAR) is calculated for the entire event period for each firm and then the standard deviation of the abnormal returns are then calculated. The t-test based on Equation 4 in section 4.2.2. Is then used to test the null hypothesis of: \( H_0: \text{CAR}=0, \text{H}_1: \text{CAR}\neq 0 \). The hypothesis is rejected with n-1 degrees of freedom (31-1=30) on the 1% level if the t statistic \( \text{t}>2.462 \), and therefore not rejected if the t statistic \( \text{t}<2.462 \).

In order to calculate the average abnormal returns the three different types of profit warnings will be divided into portfolios. The first will consist of all profit warnings in 2008-2010, the second will contain all reversed profit warnings in 2008-2010 and the third will consist of all profit warnings in 1997-1999. The calculations are the same as for one share but now several shares are used for each calculation. The Average abnormal return is calculated for each portfolio and then aggregated to see the effect over time. The results are then tested with the same t-test Equation 4 as previously used, but then the Cumulative Average Abnormal return (CAAR) is divided by the standard deviation instead.

### 5.2 Regression estimation

A regression will be performed in order to see if there are any statistically significant correlations between the occurrence of insider trade and the external variables chosen. The variables share turnover and sales are numerical and the dummy variables are binary. SNI industry codes are divided into four almost like sized dummies in order to test for industry correlation. The correlation matrix of the variables is found in Appendix 5.

**Insider trade** = the firm events that are found to show evidence of insider trading, Dependant variable showing either 1 or 0.

**Share turnover** = The event period average share turnover divided by total number of shares.

**Log (Sales)** = Logged Total Net Sales of the firm the year preceding the event period which is a proxy for firm Size.

**D_1** (After Law Dummy) = Dummy which is 1 if the event occurs before law changes (time period 2008-2010), 0 if it did not.

**D_2** (Before Law Dummy) = Dummy which is 1 if the event occurs after law changes (time period 2008-2010), 0 if it did not. The dummy has a perfect negative correlation to D1 and is therefore discarded.

**D_3** (Industry Dummy 00-20) = Dummy which is 1 if the firm belongs to Industry with SNI code 00-20, 0 if it does not.

**D_4** (Industry Dummy 21-40) = Dummy which is 1 if the firm belongs to Industry with SNI code 21-40, 0 if it does not.

**D_5** (Industry Dummy 41-60) = Dummy which is 1 if the firm belongs to Industry with SNI code 41-60, 0 if it does not.

**D_6** (Industry Dummy 61-90) = Dummy which is 1 if the firm belongs to Industry with SNI code 61-90, 0 if it does not.

In order to avoid multicollinearity, \( D_3 \) (Industry dummy 00-20) is excluded in the models. The regressions performed use the following Logit model 1:

\[
L_i = \beta_1 + \beta_2 \log(Sales) + \beta_3 \text{Turnover} + \beta_4 \text{AfterLaw} D_1 + \beta_5 D_4 + \beta_6 D_5 + \beta_7 D_6
\]
6  Event study & regression results

The purpose of the event study is to look at the Swedish stock exchange and see to which extent insider trading occurs in the case of profit warnings and reversed profit warnings. This is done by performing 44 event studies which implies calculating abnormal returns for each event by using the CAPM. For a complete list of the results for each event study and the list of t-statistics see Appendix 1, 2, 3 & 4. The profit warnings for 2008-2010 are presented in section 6.1, the reversed profit warnings in 2008-2010 are shown in section 6.2 and finally the profit warnings of 1997-1999 are presented in section 6.3. The results of the cross sectional regression is presented in section 6.4 and in order to give an oversight the average results are discussed in section 6.5.

6.1  Profit warnings 2008-2010

Profit warnings are expected to have a downwards sloping curve of aggregate abnormal returns preceding the event in order to show evidence of information leakage and therefore insider trading. The results for profit warnings in 2008-2010 show that 12 out of the 29 event cases show evidence of insider trading activities and also statistically significant CAR: s. The cases with the highest t-statistic are also the ones which show the most obvious signs of aggregate abnormal return during the event period.

24 out of 29 of the events had significantly relevant abnormal results. The ones that did not have significant results do not show signs of insider trading and had fluctuating abnormal returns cancelling out the effects. In order to give an overview of how the graphs look like some examples will be presented, see Appendix 1 for the complete list of firm event cases.

To stereotypical examples of insider trading in a semi strongly efficient market and a strong efficient market with no insider trading are shown for Nokia in figure 6.1 and for Tradedoubler in figure 6.2.

![Figure 6-1 Aggregate AR for Nokia](image1)

![Figure 6-2 Aggregate AR for Tradedoubler](image2)

Figure 6.1 shows a typical case of insider trading which can be compared to figure 3.2 in section 3, where Manne (1966) shows what the share price would look like with freely occurring insider trading. There are large cumulative abnormal returns preceding the event. It is clear that the firm has had an information leakage prior to the event and that investors are actively trading in the share based on insider information. The t-test statistic is -10.47, showing that the CAR: s is significantly different from zero at the 1% level.

In table 6.2 a text book case of a strong efficient market is displayed where the abnormal returns lie around zero until the event and then reacts on the information. Here no information has been leaked before the event is released. The graph aggregate abnormal returns may be compared with graph 3.1 in section 3 which is a picture of how Manne (1966) de-
scribed how a share price would react to new information if no insider trading was occurring. The results are significant at the 1% level.

Not all event studies resulted in such clear cut curves as in Figures 6.1 and 6.2, which is seen in Figure 6.3. A few event studies show insignificant results as for Autoliv which may be explained of the “double dip” seen in Figure 6.3. The dip could be explained by that the event period has captured two event announcements by Autoliv. If that is not the case, the dip could depend on that another firm within the same industry may have announced news. If a firm which is closely related within the same industry has announced non-firm specific news which affect their share price this will most probably affect also the related firm’s share prices. For example it is very likely that if there is a decrease in demand and therefore in returns for one firm, all firms within that sector will experience the same demand decrease, unless the change in demand depends on firm specific attributes. Then the first firm’s announcement affects the rest of the firms.

![Figure 6.3 Aggregate AR for Autoliv](image)

![Figure 6.4 Aggregate AR for StoraEnso](image)

In Figure 6.4 another unexpected curve appears. There is no apparent event market reaction displayed in the share price on the event day. As mentioned in section 2.4.6 there is the possibility that the event only starts to get reflected in the share price on the day after the event date due to that for example the announcement was made late during the trading day or even in the evening. Otherwise, as previously described Bhattacharya et al. (2000) says that no effect on the event day may depend on either a totally informally inefficient market, the event itself may not contain any economical value or the event was no surprise and fully anticipated.

The fact that there was no shift in the price for Stora Enso is unless announced after closing time most probably explained by that the announcement was anticipated. The conclusion is drawn since the firms that operate at the Stockholm Stock exchange do have share prices that sufficiently reflect the firm value which means that the market cannot be total informally inefficient and further firms profit warning announcement is an event which does presents economical value.

### 6.2 Reversed Profit warnings 2008-2010

Reversed profit warnings are expected to have an upwards sloping curve of aggregate abnormal returns preceding the event in order to show evidence of information leakage and therefore insider trading. The results show that 4 out of 8 firms show signs of insider trading with significantly relevant results. 7 out of 8 firms had significantly relevant results at the 1% level. The full results are found in Appendix 2. The 4 firms show very interesting results which is for example portrayed in Figure 6.5 for Scania where the abnormal return start to climb already 30 days preceding the event. The result is that the event was highly anticipated when it was announced and only climbed about 5% on the event day, which
may have been about 17% if the information leakage would not have occurred. Therefore the information was released much earlier due to insider trading and therefore the market incorporates the information more efficiently. The results are significant on the 1% level.

The event study for Axis which results are displayed in Figure 6.6 shows there is no evidence of information leakage. The event announcement seems to have come as a surprise to the market and accelerated the share price upwards.

6.3 Profit warnings 1997-1999

As earlier mentioned Profit warnings are expected to have a downwards sloping curve of aggregate abnormal returns preceding the event in order to show evidence of information leakage and therefore insider trading. The results show that in the sample 5 out of 7 firms show signs of insider trade, out of which 1 can be questioned. All 7 tested events had significantly relevant results on the 1% level. For all event studies see Appendix 3. In Figure 6.7 the decline in share price and abnormal returns start early about 23 days before the event, clearly showing information leakage. Figure 6.8 shows evidence of that the event announcement was totally unanticipated.

6.4 Regression results

The logit regression model is used with the variables found in section 5.2, the correlation matrix is found in Appendix 5. The dependant variable is based on an evenly divided sample with 21 insider trading cases and 23 non insider trading cases. In order to avoid multicollinearity the Dummy variable 3 (Industry dummy 00-20) was excluded. The results of the regression using Logit model 1 are presented in table 6.1.

In Table 6.1 the “After law” dummy (D1) and the “Industry 61-90” dummy (D6) are found to be significant at the 8% and 6.1% level.
Table 6-1 Logit regression results (After law regression)

<table>
<thead>
<tr>
<th></th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>Z</th>
<th>P &gt;</th>
<th>(Z)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share turnover</td>
<td>.3470998</td>
<td>.4763867</td>
<td>0.73</td>
<td>0.466</td>
<td></td>
</tr>
<tr>
<td>Log (Sales)</td>
<td>.0575964</td>
<td>.2756495</td>
<td>0.21</td>
<td>0.834</td>
<td></td>
</tr>
<tr>
<td>D$_1$ (After law)</td>
<td>-2.301447</td>
<td>1.313019</td>
<td>-1.75</td>
<td>0.080</td>
<td></td>
</tr>
<tr>
<td>D$_4$ (Industry 21-40)</td>
<td>-6.709271</td>
<td>1.008863</td>
<td>-.67</td>
<td>0.506</td>
<td></td>
</tr>
<tr>
<td>D$_5$ (Industry 41-60)</td>
<td>-2.841414</td>
<td>1.430158</td>
<td>-.20</td>
<td>0.843</td>
<td></td>
</tr>
<tr>
<td>D$_6$ (Industry 61-90)</td>
<td>-2.569252</td>
<td>1.372413</td>
<td>-1.87</td>
<td>0.061</td>
<td></td>
</tr>
<tr>
<td>_cons</td>
<td>-2.327594</td>
<td>1.881177</td>
<td>1.24</td>
<td>0.216</td>
<td></td>
</tr>
</tbody>
</table>

The regressions show that; the law changes after 2000 have had a negative impact on insider trading in this sample. The impact may not have been a large one but still statistically significant on the 8% level. The industry dummy has a higher statistically significance of 6.1%, showing that to a certain extent insider trading is correlated with industries. The results therefore support Thomas et al. (2008) of that the price effect of an event is linked with other firms within the same industry. The result show of negative correlation between insider trading and industries 61-90, which are for example public service companies, banks, telecom and service companies in general. None of the other variables are found significant meaning that in this sample insider trading is not dependant on share turnover & of the size of the firm.

The Pseudo $R^2$ =0.1486, meaning that only 15% of the variation in the dependant variable can be explained by the explanatory variables. $R^2$ is though not particularly meaningful when the regression is of a binary nature. But still, the results show that there are other variables not used in the regression that may be of higher importance.

6.5 Average results

In total 38 out of 44 firm events were found to have statistical significant Cumulative Abnormal Returns (CAR: s), which denotes that the event has had an abnormal effect on the share price and that the share price deviates from normal return. It is not possible to draw the conclusion that insider trading is the determinant of the significant CAR: s in all of those cases. That is why it is important to study the individual graphs.

The individual results show that a total of 21 out of our 44 firm events show signs of insider trading, and all of those cases have statistically significant t-test values. As assumed it is found that the graphs which have more distinctive slopes also have higher statistically certainty.

![Figure 6-9 Profit warnings 2008-2010](image1)

![Figure 6-10 Reversed profit warning 2008-2010](image2)
The event studies average abnormal returns of the three portfolios are shown in Figure 6.9, Figure 6.10 and Figure 6.11. They show that there are statistically significant abnormal returns even when averaging out the differences between the individual share event study results. It is found that the average abnormal return starts growing 10-13 days before the event in the case of profit warnings shown in Figure 6.9 & Figure 6.11 which support the findings of Gao & Oler (2008). The results contradicts the suggestions from Elton, et al. (2010) stating that it is only beneficial to look at the effect of each individual share in the case of earning surprises.

Though, in the case of reversed profit warning in Figure 6.10 no clear distinctions can be made when looking at the aggregate average returns since the results vary between firms and averages out as predicted by Elton, et al. (2010).

There is no possibility to draw any clear distinctions between the event of profit warnings and reversed profit warnings. Profit warnings in 2008-2010 have 12 out of 29 signs of insider trading and reversed profit warnings in 2008-2010 has 4 out of 8. The percentage is insignificantly different (41.3% and 50%) when thinking of the difference in sample size. That result contradicts the findings of Korczak et al. (2010) who find that a larger share of positive news compared to bad news is preceded by insider trading. Since the reversed profit warnings are so few there might have been other results if the samples were of the same size. Due to the time restriction and the implications it would have to expand the time period for only one of the events there was a very limited number of reversed profit warnings to be used.

The regression shows that insider trading has been negatively affected by the harsher insider trading laws which is surprising to find since the number of reported insider trading cases have increased in recent years. That finding may show evidence of that even though there is a higher rate of insider trading being reported today the estimated number of unknown cases which is not reported was higher prior to 2000. Though, the results may also be skewed since there are a limited number of profit warnings which can be found online prior to 2000. Even though the Affärslära Database was used where all available business journals are covered in total only 7 firm events were found in those years which still are active in the Stockholm Stock exchange today. The sample is then very dependent on which outcome each event sample has unlike the sample from 2008-2010 which had 29 event cases.

Looking at the total sample of profit warnings in 1997-1999 the abnormal returns for the event studies are not as random as the ones for 2008-2010. Either, the share price starts declining early on and keeps declining up until the event as in Figure 6.7, or the price starts climbing out of anticipation of good news and then at turns downward as the event day
comes near as in Figure 6.8. Accordingly, no double dips or other anomalies are found which shows that the market in the 1990’s was less volatile.

It is previously argued that if the legislators cannot strictly enforce the laws and therefore the legislations does not stop insider trading from occurring the laws should not be passed or kept (Niemeyer, 2001). The evidence is showing that almost fifty percent of all profit warnings in the sample from the Stockholm stock exchange is showing evidence of information leakage and it may be argued that legislations are inefficient in its enforcement and therefore keeping it will lead to negative consequences. Such a consequence is that inefficient enforcement will undermine the Swedish legislations in general and may threaten Swedish legal security (Niemeyer, 2001).

In 2010 there were 118 of suspicious cases of insider trading reported to the EBM. If the sample showing evidence of insider trading in 50% of the events is assumed to be representative for the share market as a whole that means that in total 236 events, including ALL events such as financial reports, profit warnings, share repurchases, mergers etc., would be announced. Since the market each year announces many more events a somewhat far-fetched assumption can be made of that the hidden statistics of insider trading are enormous. But, since hidden statistics are in fact hidden further research has to be done in order to validate the assumption. This may be done by performing a large scale event study including all events. The work of this thesis shows clear evidence of widespread insider trading on the Stockholm stock exchange and hopefully will contribute to the knowledge of insider trading that exists today.
7 Conclusions

The purpose of this master’s thesis is to investigate the occurrence of insider trading and whether or not Swedish legislation has decreased the presence of insider trading on the Stockholm Stock Exchange. This is done by presenting the legal aspects, the relevant arguments and by carrying out a discussion throughout the paper. An event study is performed in order to see if profit warnings and reversed profit warnings show evidence of insider trading on the Swedish stock exchange.

The event study show statistically significant evidence of illegal insider trading in 21 out of 44 cases and on average abnormal returns start showing about 10-13 days prior to the event day when studying profit warnings. There is no significant difference in insider trading between profit warnings and reversed profit warnings. The regression show evidence of that the law has had a negative impact on insider trading in this sample. Although a small impact, the results are significant which this is surprising to find since the number of reported insider trading cases have increased in recent years. The regression also shows that insider trading is correlated with industries. The size of the firm and share turnover is found insignificant.

Legislations of financial markets are generally founded only when a market failure is detected and laws should only be passed if the market cannot deal with the problem on its own. Further, the legislators have to be able to solve the problem without creating new negative effects; the costs may exceed the benefits. It is argued that if the market participants can deal with the problem themselves there is really no need for legislation. When looking at insider trading it is not entirely clear that legislation is warranted. The legislations have not managed to solve the “problem” since 2006 the numbers of reported suspicious insider trading cases have doubled and in 2010 not even one of the 118 suspicious insider trading cases handed over to the EBM has even lead to a prosecution. In the thesis it is argued that insider trading legislations keep the market from acting more efficiently, that there is no clear evidence of that insider trading hurt investors and insider trading regulations are unfair. The foundations of the legislations are criticized, it is hard to make a distinction between public and private information and the laws are inefficient in stopping insider trading which is said to threaten the Sweden’s legal security.

Since it is clear that the law is seriously flawed in stopping insider trading and that insider trading actually may positively affect the market and its participants, it is argued that it is very questionable if the legislation is necessary and if insider trading should be prohibited at all.

As insider trading is a very controversial subject where not all questions yet have been answered further research is very beneficial. There are very little empirical studies performed focusing on the Nordic and Swedish market and for further studies that may be an interesting area to study. All work leading to detecting how large the hidden statistics are will probably be much appreciated which may be done by performing a large scale event study including all events, maybe across countries. Further it would be interesting to perform a cost benefit analysis of the law.
List of references


Appendix 1 Profit warnings 2008-2010

The diagrams are showing the aggregated abnormal return calculated for each of the firms announcing a total of twenty-nine profit warnings during 2008-2010.
Appendix

Stora Enso 2009-03-13  T-test: -9.61*
-30 -28 -26 -24 -22 -20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0

Ericsson 2009-03-20  T-test: 2.21**
-30 -28 -26 -24 -22 -20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0

Tieto oyj 2009-03-23  T-Test: -1.01
-5 0 5 10 15 20 25 30 35 40

Nokia 2009-04-01  T-test: -4.86*
-5 0 5 10 15 20 25 30

SSAB 2009-06-17  T-test: 4.34*
-30 -28 -26 -24 -22 -20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0

Sandvik 2009-06-17  T-test: -0.67
-5 0 5 10 15 20 25 30

Lammhult 2009-06-30  T-test: -6.37*
-30 -28 -26 -24 -22 -20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0

Stora Enso 2009-08-19  T-test: 7.29*
-30 -28 -26 -24 -22 -20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0

Concordia Maritime 2009-08-28  T-test: -2.82*
-6 -4 -2 0 2 4 6

Q-Med 2009-09-18  T-test: -4.28*
-30 -28 -26 -24 -22 -20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0
Appendix

Tradedoubler  T-test: -5.91*  
2009-10-26

Fingerprint cards  T-test: -17.44  
2009-12-01

Stora Enso 2010-01-22  T-test: -12.43*  

Aerocrine 2010-04-07  T-test: -6.86*  

Fingerprint cards  T-test: -0.97  
2010-05-31

Nokia 2010-06-16  T-test: -10.47*  

Beijer Alma  T-test: 1.26  
2009-08-19

Geveko 2010-09-22  T-test: -4.36*  

Biophausia 2010-09-23  T-test: -4.52*  

Saab 2010-10-20  T-test: 2.31**
Appendix

* statistically significant at the 1% level

** statistically significant at the 5% level
Appendix

Appendix 2 Reversed Profit warnings 2008-2010

The diagrams are showing the aggregated abnormal return calculated for each of the firms announcing a total of eight profit warnings during 2008-2010.

*statistically significant at the 1% level
** statistically significant at the 5% level
Appendix 3 Profit warnings 1997-1999

The diagrams are showing the aggregated abnormal return calculated for each of the firms announcing a total of seven profit warnings during 1997-1999.

* statistically significant at the 1% level

** statistically significant at the 5% level
## Appendix 4 T-statistics for the CAR: s

<table>
<thead>
<tr>
<th>2008-2010 Profit warning</th>
<th>t-stat</th>
<th>2008-2010 Reversed P.W.</th>
<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boliden 2008-01-24</td>
<td>-10.53*</td>
<td>Ericsson 2008-10-20</td>
<td>-0.56</td>
</tr>
<tr>
<td>SAAB 2008-09-04</td>
<td>-4.18*</td>
<td>ABB 2009-10-19</td>
<td>5.8*</td>
</tr>
<tr>
<td>Husqvarna 2008-12-19</td>
<td>0.95</td>
<td>Autoliv 2009-12-11</td>
<td>11.42*</td>
</tr>
<tr>
<td>Hexagon 2009-01-13</td>
<td>3.75*</td>
<td>Netonnet 2010-01-07</td>
<td>-4.43*</td>
</tr>
<tr>
<td>Stora Enso 2009-01-19</td>
<td>-6.13*</td>
<td>Getinge 2010-01-14</td>
<td>2.29**</td>
</tr>
<tr>
<td>Semcon 2009-01-21</td>
<td>-4.83*</td>
<td>Axis 2010-01-20</td>
<td>7.41*</td>
</tr>
<tr>
<td>Duroc 2009-01-27</td>
<td>-5.55*</td>
<td>SKF 2010-03-12</td>
<td>3.42*</td>
</tr>
<tr>
<td>Autoliv 2009-02-24</td>
<td>-4.77*</td>
<td>Scania 2010-04-13</td>
<td>11.4*</td>
</tr>
<tr>
<td>Stora Enso 2009-03-13</td>
<td>-9.61*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ericsson 2009-03-20</td>
<td>2.21**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tieto Oyj 2009-03-23</td>
<td>-1.01</td>
<td>Elekta 1997-05-06</td>
<td>-13.06*</td>
</tr>
<tr>
<td>Nobia 2009-04-01</td>
<td>-4.86*</td>
<td>Seb 1997-12-19</td>
<td>3.82*</td>
</tr>
<tr>
<td>SSAB 2009-06-17</td>
<td>4.34*</td>
<td>Elekta 1998-04-01</td>
<td>-4.47*</td>
</tr>
<tr>
<td>Sandvik 2009-06-17</td>
<td>-0.67</td>
<td>SKF 1998-07-29</td>
<td>-13.8*</td>
</tr>
<tr>
<td>Lammhult 2009-06-30</td>
<td>-6.37*</td>
<td>SSAB 1998-10-05</td>
<td>-8.65*</td>
</tr>
<tr>
<td>Beijer Alma 2009-08-19</td>
<td>1.264</td>
<td>Ericsson 1998-12-10</td>
<td>6.26*</td>
</tr>
<tr>
<td>Stora Enso 2009-08-19</td>
<td>7.29*</td>
<td>Rörvik Timber 1999-02-05</td>
<td>-4.47*</td>
</tr>
<tr>
<td>Concordia M. 2009-08-28</td>
<td>-2.82*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q-Med 2009-09-18</td>
<td>-4.28*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tradedoubler 2009-10-26</td>
<td>-5.91*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fingerprint C. 2009-12-01</td>
<td>-17.44*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stora enso 2010-01-22</td>
<td>-38.3*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aerocrine 2010-04-07</td>
<td>-6.86*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fingerprint C. 2010-05-31</td>
<td>-0.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nokia 2010-06-16</td>
<td>-10.47*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Geveko 2010-09-22</td>
<td>-4.36*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biophausia 2010-09-23</td>
<td>-4.52*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAAB 2010-10-20</td>
<td>2.31**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kungsleden 2010-10-21</td>
<td>4.61*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* significant on the 1% basis, critical values≈ ± 2.4
** significant on the 5% basis, critical values≈ ± 1.68
### Appendix 5 Correlation matrix

<table>
<thead>
<tr>
<th></th>
<th>insider trading (Sales)</th>
<th>Log Turnover (Before)</th>
<th>D1 (00-20)</th>
<th>D2 (21-40)</th>
<th>D3 (41-60)</th>
<th>D4 (61-90)</th>
<th>D5 (volume)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insider trading</td>
<td>1.00</td>
<td>0.0342</td>
<td>0.08256</td>
<td>0.2011</td>
<td>0.1905</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>Log (Sales)</td>
<td>0.0342</td>
<td>1.00</td>
<td>0.08256</td>
<td>0.2128</td>
<td>0.1656</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>Turnover</td>
<td>0.2011</td>
<td>0.2128</td>
<td>1.00</td>
<td>0.8256</td>
<td>0.44</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>D1 (Before)</td>
<td>0.2064</td>
<td>-0.0234</td>
<td>0.2437</td>
<td>1.00</td>
<td>0.44</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>D2 (After)</td>
<td>-0.2064</td>
<td>-0.0234</td>
<td>-0.2437</td>
<td>-1.00</td>
<td>1.00</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>D3 (00-20)</td>
<td>0.0455</td>
<td>0.0095</td>
<td>0.0942</td>
<td>-0.1864</td>
<td>0.1864</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>D4 (21-40)</td>
<td>0.7693</td>
<td>0.9514</td>
<td>0.5429</td>
<td>0.2257</td>
<td>0.2257</td>
<td>0.44</td>
<td>0.44</td>
</tr>
<tr>
<td>D5 (41-60)</td>
<td>0.1223</td>
<td>0.5864</td>
<td>0.5185</td>
<td>0.3229</td>
<td>-0.3229</td>
<td>-0.2511</td>
<td>0.44</td>
</tr>
<tr>
<td>D6 (61-90)</td>
<td>-0.2364</td>
<td>0.0843</td>
<td>0.1000</td>
<td>-0.3229</td>
<td>-0.3229</td>
<td>-0.2511</td>
<td>0.44</td>
</tr>
<tr>
<td>D7 (volume)</td>
<td>-0.2265</td>
<td>-0.1415</td>
<td>-0.3128</td>
<td>-0.2365</td>
<td>-0.2365</td>
<td>-0.1031</td>
<td>0.44</td>
</tr>
</tbody>
</table>