Stockholm School of Economics
Master's Thesis in Finance

Insider trading on the Stockholm Stock Exchange
- efficient markets or abnormal returns

Abstract

In this thesis we study approximately twenty thousand transactions done by insiders on the Stockholm Stock Exchange during a period of fourteen years ending in 2004. We further expand previous research by studying transactions made in different types of market conditions, as well as the effects of the cases where two or more insiders do the same type of trades within a short period of time, termed cluster trades. Our main findings are that both buy and sell transactions have provided abnormal returns for both short and long time horizons; the effect has varied with the market conditions and that the abnormal returns have been larger for cluster transactions.

Authors: Mats Sjöholm (19234)
Peter Skoog (19409)

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Room 194

Tutor: Iñaki Rodríguez Longarela

Discussants: Erik Ekstrand
Casper Wrede

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1. Introduction

The mere fact that insiders are more heavily regulated than other investors indicates that there exists some kind of unfairness in the market. Being employed or having another position inside a company gives you an advantage compared to people outside the firm when it comes to information. Without certain rules and regulations it would be possible to use this advantage for personal benefits. What creates this information asymmetry is that people within a company get access to information before other market participants and also that insiders get access to more information than outside investors. To manage this asymmetry and prevent insiders from making unfair profits legislators have tried to find a balance between restrictions and freedom for employees and others to trade shares in their own firm. However, since a perfect balance in this case is practically impossible to achieve, the market imperfections and the signals that insider trading create may be possible to take advantage of. That is why this field is of interest for investment decisions.

1.1 Definition

Insiders are defined as follows in the *Act concerning Reporting Obligations for Certain Holdings of Financial Instruments (2000:1087)*:

> 1. directors or deputy directors of the company or its parent enterprise,
>
> 2. the managing director or the deputy managing director of the company or its parent enterprise,
>
> 3. an auditor or deputy auditor of the company or its parent enterprise,
>
> 4. a partner in a partnership which is the company's parent enterprise, but not a partner with limited liability,
>
> 5. a holder of another senior position or another qualified assignment of a continuous nature in, or on behalf of, the company or its parent enterprise, if such a position or assignment may normally be assumed to involve access to information which may influence the price of shares in the company and which has not been made public,
>
> 6. a holder of a position or an assignment in accordance with points 1-3, or another holder of a senior position in a subsidiary, if it may be normally assumed that such a

person has access to information concerning circumstances which may influence the price of shares in the company and which has not been made public,

7. a person who holds shares in the company corresponding to at least ten per cent of the share capital or of the votes for all shares in the company, or who holds shares to this extent together with a person or legal entity closely related to the shareholder in the manner indicated in Section 5, paragraph one.

This is the definition that will be used throughout the thesis without any further modifications. We will not do any additional division of the insiders based on their position within the company, their area of knowledge, their grade of influence or any other characteristic, even though we are well aware of the fact that this could be of interest. Due to scope limitations we have to leave it to another study to take this perspective and in this thesis insiders will be treated as one, homogeneous group.

1.2 Purpose

This study will cover trades done by insiders in the companies traded on the Stockholm Stock Exchange (SSE) between 1991-01-01 and 2004-12-31. The purpose is to investigate whether changes in insiders' holdings could provide abnormal returns in the market. In addition to looking on an aggregate level we intend to break down the data further and analyse whether the effect differs depending on various factors. The trades will also be divided into buy and sell transactions. More specifically, the questions we hope to answer are:

1. Do insider trades generate abnormal returns on an aggregate level?
2. Does the effect differ between bull and bear markets?
3. Does the effect differ between different periods?
4. Are the results altered if two or more insiders make the same trade at the same time?

Our intention is only to reveal whether or not there exist abnormal returns in relation to insider trading and in the case that we do find evidence of this we do not intend to develop any trading strategies concerning how to take advantage of this phenomenon. In order not to

forego this area completely, one could however as a very general comment say that as long as the brokerage fees, the limitations regarding the possibilities for a private person to take advantage of downward movements, and other transaction costs, that sometimes can be of considerable size for a small investor, does not exceed the gains from the abnormal returns, it should be possible to make money out of this information. This is nevertheless a possible subject for another thesis and it will not be treated here.

1.3 Contribution

As far as we know there has not been any research on insider trading in the Swedish market conducted on a data set as comprehensive as the one in this thesis. By using the entire data set, as maintained by Swedish regulatory authorities, we hope to get results that are more generally valid than results from studies performed on narrower time spans. This because the shorter the time period, the higher are the possibilities that a particular time period is subject to extraordinary and non-representative circumstances and events.

Neither have we found any paper treating whether or not the results differ in different types of markets. We look into the possibilities that insiders are better at using personal, non-public information in upward moving markets than in downward trends, or vice versa, which is of obvious interest for shareholders and participants in the financial markets in order to even out possible information unevenness.

Our last, and potentially most important contribution is our examination of the case where two or more insiders do the same type of trade within a short period of time. This is in our opinion very interesting to examine, since this type of confirming trades increases the possibilities that insiders are indeed trying to take advantage of inside information in order to make money. If this is the case, it is definitely something that should be of interest for investors, regulators and other market participants, since it is a clear indication of market inefficiencies.

1.4 Outline

After this introductory part we will give an overview of the prevailing regulations in Section 2. Section 3 covers the theoretical background and the previous research done in the area and in Section 4 we stipulate the hypotheses to be tested. Section 5 presents the gathering and processing of data, Section 6 describes the method used to conduct our study, and in Section 7 we analyse and discuss the results we have found. After that we will go through the conclusions we have reached in Section 8 before ending the thesis with giving some ideas about future research.

2. Regulations

The *Act concerning Reporting Obligations for Certain Holdings of Financial Instruments (2000:1087)* stipulates the framework within which insiders have to operate on the Swedish market. It says that a company that is registered on a stock market or authorized market place has to report a list of all people with an insider position within the firm and its subsidiaries to Finansinspektionen (Swedish Financial Supervisory Authority). The insiders are thereafter personally obligated to report all their holdings and changes in their holdings to Finansinspektionen. This has to be done within five working days from the transaction date or a penalty fee will be charged. The law also states that insiders are not allowed to trade with shares or other instruments in their own company during 30 days before the announcement of interim reports, the announcement day included. This prevents insiders from taking advantage of their position through short term trading.

These are the regulations as of the changes made July 1, 2005. Before this date the regulations were different in some aspects, where the section governing trading in the own company has gone through the most significant modification. Before the rule of a 30 day trading ban as described above was stipulated, the law stated that an insider could not sell a security within three months from the date of purchase (Henning Dahl, Finansinspektionen). Since the chosen time period in this thesis ends December 31, 2004, the new regulations had not been implemented when the trades in the study were executed, which is something for the reader to keep in mind.

3. Theoretical background

In this section we present the theories that serve as a foundation on which the thesis is built. We also present previous studies that have been done within this particular area and therefore are relevant to our study.

3.1 Efficient market hypothesis

The efficient market hypothesis was primarily developed by Eugene Fama, who in a famous article outlined the structure for the theory (Fama (1970)). Shleifer (2000) states that the theory rests on three important arguments: (1) that investors are assumed to be rational and value securities in a rational way; (2) that even if some investors are not rational, their trades are random and because of this their trades cancel each other out without affecting prices; and finally (3) that in the case that there exist investors that are irrational in a similar way, they will be met by rational arbitrageurs who will eliminate these investors' influence on prices.

According to Fama (1970) the primary role of the capital market is the allocation of ownership of the capital stock within the economy and a perfect market is one where prices fully reflect all available information, which would mean that it provides accurate signals for the allocation of resources. Such a market is called an efficient market and Fama (1970) defined three different subsets of market efficiency based on the amount of information in each category:

- Weak form
- Semi-strong form
- Strong form

3.1.1 Weak form

In the weak form of efficiency the prices are assumed to reflect all the information included in the record of historical prices. This means that prices follow a random walk and that it is impossible to earn superior profits just by observing past prices, a theory originally presented by Samuelson (1965) and Mandelbrot (1966). The reasoning is that if it was possible to use historical prices by finding certain patterns this opportunity would immediately be seized and prices would then adjust accordingly.

3.1.2 Semi-strong form

The intermediate level, the semi-strong form of efficiency, requires prices to mirror not just past prices, but also all "obviously publicly available" information (Fama (1970)). This includes announcements of new security issues, annual reports, proposals of mergers between companies, stock splits, and similar news that you can find in the financial press. To investigate if the semi-strong form holds, one would have to study the development of a share's price before and after the announcement of price affecting events and the speed with which the price adjusts to new information. The faster the adjustment after the release of new information, the more efficient is the market. However, if it is discovered that the price had adjusted, or even begun to adjust, before the announcement this could be a sign of information leakage and that investors with better access to information have used their advantage to earn abnormal returns. This level of efficiency is the one that this thesis is related to. Since all insider trades have to be reported to Finansinspektionen they become obviously publicly available information and can at least in expectation be considered as a price affecting event.

3.1.3 Strong form

The strong form of efficiency means that prices does not just reflect all publicly available information and the information contained in the historical development, but that it fully reflects all available information that exist in the market, both public and private. The implications of this are that no individual can generate abnormal returns above the expected because of monopolistic access to information and that there would be no point for insiders to trade in order to take advantage of their position. Additionally, this means that we could not expect to find any investors that consistently beat the market. Evidence that insiders can earn abnormal returns and that there are investment managers, traders, and others that in fact do beat the market on a regular basis would hence be incompatible with the strong form of market efficiency.

3.2 Signalling effect

It seems fair to assume that insiders have better information of the true value of a company than outside investors because of their position. A positive relationship between insider transactions and firm value is therefore assumed through the signalling effect that such transactions generate, meaning that insider buying would be a sign of a higher value of the

firm and insider selling a lower value. Changing the amount of ownership in your own company can be interpreted as an indication that the insider is taking advantage of unique information, that he or she is in a better position to accurately interpret and understand the implications of public information or a combination of the two. Either way this suggests that insider trading serves as a signal that pushes the stock price towards the level were it would be if all investors had the same access to information and knowledge about the company.

One could anticipate different results depending on the direction in which the insider trades. An increase in the holdings should in theory always be a signal that the company is undervalued. Since the person doing the investment have the possibility to invest in more or less any asset on the financial market, but still chooses shares in his or her own company, outsiders should interpret the purchase as a sign that the company in question is undervalued.

Regarding a decrease in the ownership there could be several reasons for an insider to do this. The most simple case is when the insider needs money for personal reasons. Another straightforward reason is for tax purposes, when the person wants to match gains and losses in different instruments against each other in order to minimize his or her tax payments. Insider selling could of course also be an indication that the company is overvalued and that the stock price should be lower than it currently is, but due to the above reasoning the link is not as clear-cut as in the case with buy transactions.

3.3 Previous research

The features of insider trading have been subject to numerous studies made from many different aspects. A full coverage of the material is therefore impossible, but we have chosen to present the findings of the research papers that we believe relate the most and are the most relevant to our thesis.

3.3.1 Foreign studies

One of the most famous articles on insider trading and market efficiency was done by Jaffe (1974). By examining data from the United States between 1962 and 1968 with what at the time was considered new and more efficient techniques, he showed that insiders indeed

possess and exploit exclusive information. This research has been considered ground-breaking within this area and when Finnerty (1976), who performed a similar study on US data between 1969 and 1972, came to the same conclusions the research in this field really took off.

Many studies have been performed since then. Pope et al (1990), Lin et al (1990), Seyhun (1992), and Richardson Pettit et al (1995) all presented research on this topic in the first half of the 90's. Pope et al (1990) found that, ignoring bid-ask spreads and transaction costs, abnormal returns could be earned from trading strategies based on news of directors' actions in the UK. Lin et al (1990) examined the same area in the United States, but took bid-ask spreads and transaction costs into account which gave the result that outside investors who mimic the trading of insiders cannot earn abnormal profits because of these market imperfections. Seyhun (1992) documented a strong relation between insider trading and future excess stock returns in his study of the US market and the results of Richardson Pettit et al (1995) showed that insider net purchases tended to be significantly above and below normal one to two years in advance of long-horizon returns that were above and below normal respectively.

A few years later Eckbo et al (1998) came with an interesting study performed on the Oslo Stock Exchange between 1985 and 1992, which showed zero or negative abnormal performance by insiders accompanied by some evidence that the average mutual fund outperformed the insider portfolio created in the study. These results were not found in the US where Jeng et al (1999), Lakonishok et al (1998), and Jeng et al (2003) all presented evidence that insider purchases earn abnormal returns, but that insider sales do not.

3.3.2 Swedish studies

There have also been some studies done on the Swedish market, even though they are not that many. Hjertstedt et al (2000) studied data on the Stockholm Stock Exchange between January 1996 and August 1999 and found that insiders earn significant abnormal returns both when they are buying and selling stocks. They also showed that transactions done in smaller firms were more profitable than those in large firms and that outsiders could make significant

abnormal returns by imitating transactions done by insiders on some occasions. Hjemgård et al (2002) could not draw any unanimous conclusions on whether insiders could earn abnormal profits in their study of the Stockholm Stock Exchange January 1998 to February 2002. Hjemgård et al (2002) used an approach similar to the one used by Eckbo et al (1998) and it turned out that the results were dependent on the way they created their insider portfolios.

In their study of the Stockholm Stock Exchange 1996-1999, Heinonen et al (2002) did not find any evidence of insider trading generating abnormal returns. Johansson et al (2005) studied data between January 2002-October 2004 from the same exchange. They found that insiders generate abnormal returns from purchasing, but not from selling. This result was more significant for smaller companies, which is analogous to the findings of Hjertstedt et al (2000).

4. Hypotheses

Based on the purpose established in Section 1.2 and the theoretical background presented, we will here identify four different hypotheses to be tested, where each of the hypotheses treats buy and sell transactions individually. The null hypothesis will in each case be the same; there are no abnormal returns:

H_0: No abnormal returns from insider transactions.

H_1: Abnormal returns from insider transactions.

From this follows logically that our first hypothesis, where we want to examine trades on an aggregate level, will be that insider trades do not generate abnormal returns. More formally:

Hypothesis 1: No abnormal returns on an aggregate level.

When we break down the data our first issue concerns the prevailing trend in the market. It is obvious that the likelihood of an increase in the stock price is bigger in an upward moving market, a bull market, and that the likelihood of a decline is bigger in a downward trend, a bear market, meaning that it is generally probably better to buy in the first case and to sell in the second case. However, since the market model that will be used here relates the stock price movements to the general market conditions this affects the expected return. Therefore trends should not have any effect on the abnormal returns, which leads us to the following hypothesis:

Hypothesis 2: The effect does not differ between bull and bear markets.

The time period we are studying in this thesis is rather long to be a study of this kind. The technological development relating to the spreading and the acquirement of information has been very rapid during this period and this development has provided essential prerequisites

for the markets to become more efficient. This would in turn imply smaller possibilities of earning abnormal returns and this is what our third hypothesis is about. Stated formally:

Hypothesis 3: The effect does not differ between different periods.

If two or more insiders make the same type of trade (buying or selling) within a short time span this strengthens the signalling effect and increases the probabilities that an information asymmetry is present. We call this phenomenon *cluster transactions* and this is the focus of our fourth hypothesis.

Hypothesis 4: The effect does not differ if an insider trade is accompanied by others within the same firm.

5. Data

In order to test the stated hypotheses, we have collected data describing the insider transactions, historical share prices, and historical index values for the benchmark index used in the event studies. This section will present the sources used, give an overview of the data gathering process and discuss imperfections associated with the data.

5.1 Transaction data

The source of the transaction data is the register of insider transactions maintained by Finansinspektionen. As previously described, insiders are obliged by law to report their transactions to Finansinspektionen, which in turn discloses the transactions to the market. The data was filtered for transactions that by previous research have proven to have the largest signalling effect. We thus only focused on trades done in publicly traded stocks, excluding any derivatives and subscription rights. We further limited the study to consider only transactions larger than SEK 50,000. These refinements leave us with the transactions with the largest signalling power and we feel confident that the reduction of the original data set have not caused any systematic errors in the final results. The full data set ranges from 1991-01-01 to 2004-12-31 and an overview of the transactions is given in *Table 1*. We will also use various portions of the full set to test the different hypotheses.

Table 1. Number of insider transactions by year and type.

YEAR	BUY	SELL	TOTAL
1991	409	169	578
1992	413	180	593
1993	313	247	560
1994	832	535	1367
1995	616	285	901
1996	663	355	1018
1997	633	349	982
1998	1026	345	1371
1999	1014	388	1402
2000	2009	558	2567
2001	1692	389	2081
2002	2984	709	3693
2003	1458	423	1881
2004	1639	435	2074
Total	15701	5367	21068

One problem associated with the data from Finansinspektionen is that there is a time gap of zero to five days between the transaction taking place and the publishing of the data to the public. In the data released, the date stated is the transaction date and not the publishing date. It is therefore impossible to exactly determine when the market was informed that a certain transaction had taken place. This problem has in this essay been solved by not testing any hypotheses with an event window shorter than five days. Even the shortest event window is thus guaranteed to include at least one trading day with the information of the transaction being publicly available and this way we are catching the immediate short term effect of all trades.

5.2 Historical prices

Historical security prices where gathered from the financial databases JCF Quant and Thomson DataStream. Since we needed data to estimate the market model and calculate abnormal returns lying on the far ends of the transaction data set, we gathered prices for the period between 1989-06-30 and 2005-06-30. Two time series per security have been used in

the study. In order to calculate the value of the transaction at the insider transaction point in time (used for the filtering of the transactions with a value exceeding SEK 50,000) we used the unadjusted price of the security. This price is not retroactively adjusted for any capital actions such as splits and dividends, and can thus be multiplied with the number of shares traded in order to find out the value of the trade. The second time series was the adjusted prices, which were adjusted for capital actions. This series was used to both estimate the market model and to calculate the abnormal returns.

Since we could not obtain any historical prices for some traded securities, transactions connected to these securities had to be excluded from the study. Additional transactions were left out because the transactions occurred soon after the stock was first listed, making it impossible to estimate the market model.

The left out data poses a potential source of systematic error in our data. We do however find it difficult to find valid arguments why there should exist anything more than sporadic correlation between insider activity and the fact that any given price could not be obtained from our databases. Even if such a pattern would exist, the number of excluded stocks (20) is low in relation to the total number (559) included in the study. The most reasonable expectation is thus that the transactions affected were a random sample from the population as a whole, and we therefore do not make any statistical corrections for the missing observations.

5.3 Index values

In order to estimate the market model, our main index used is the Affärsvärldens generalindex, AFGX. In order to verify the robustness our model specified, we chose to also perform the two main series of regressions with the OMXS30 index. Data was collected for the period between 1989-06-30 and 2005-06-30.

AFGX is a broad index that is designed to measure the average price development at the Stockholm Stock Exchange. Each stock is assigned a weight that is proportional to its market cap in relation to the total market cap of all traded stocks.

The OMXS30 has a much smaller reach, including the 30 most traded stocks on the Stockholm Stock Exchange. Similar to AFGX, each stock is assigned a weight that is proportional to its market cap in relation to the total market cap of all traded stocks.

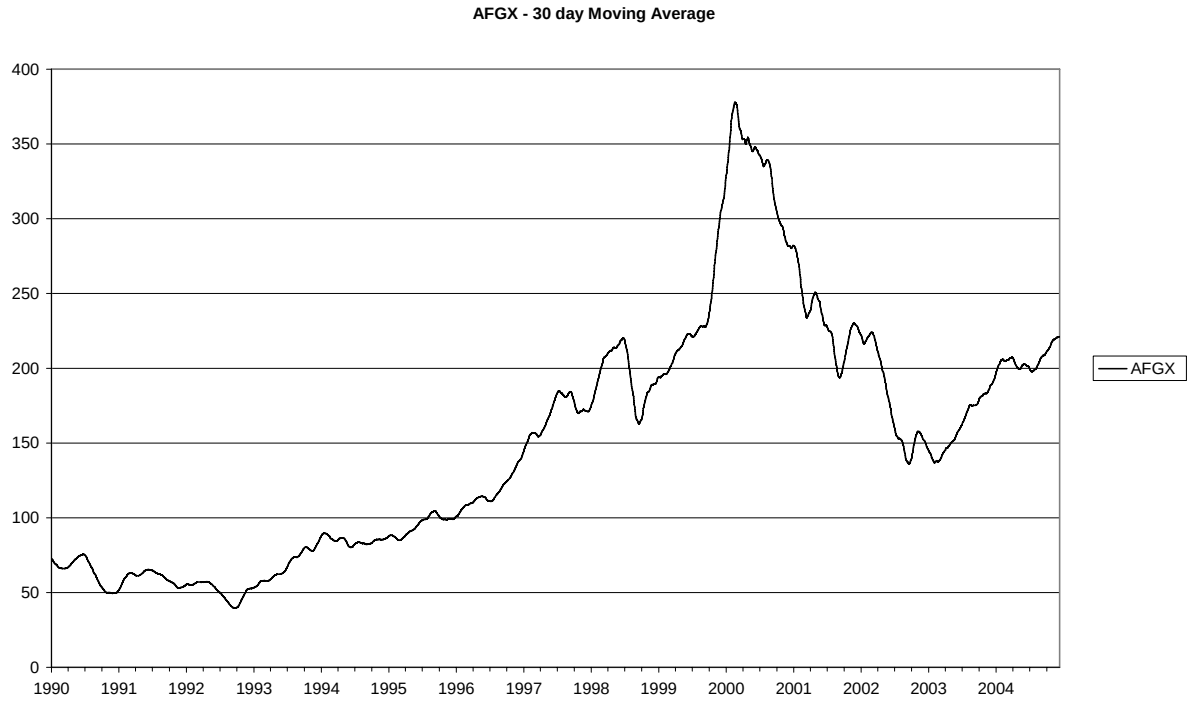

Figure 1. AFGX time series, 30 day moving average.

The division into upward and downward market trends, as needed to test the second hypothesis above has been based by the annual return of the AFGX index. Calendar years with positive returns are sorted under the "upward" category, the "downward" category thus consists of the annual periods with negative returns. The number of observations in each category is presented in *Table 2*.

Table 2. Number of insider transactions by trend and type.

PERIOD	DOWNWARD	UPWARD	TOTAL
Buy	6685	9016	15701
Sell	1656	3711	5367
Total	8341	12727	21068

6. Method

In this thesis each case studied is a specific event and this event is clearly identified by a specific date. These are crucial prerequisites for the use of the event study method as presented by MacKinlay (1997) and when they are satisfied this method provides a good tool for the kind of analysis we are doing.

Other possible models include multi-factor models such as the model described by Fama and French (1993). We did however not see it as an option to implement one of these models due to the very large number of firms and the relatively long time period in our study.

We have therefore chosen the single factor approach as described by MacKinlay, and it should be noted that this has also been the most frequently used methodology in previous studies.

6.1 Event study

An event study is conducted in several steps. The initial stage is to define the event of interest and the event window, which is the period that will be examined. The event in our study is the point in time when the transaction takes place. The reason for not choosing the date when the market gets the information about the trade was covered in Section 5.1 and hence do not need to be discussed again here. Regarding the event window we will examine several time periods around the time of the event. We will examine the effect over five days, one month, and three months, where the last two periods will be defined as 21 and 63 trading days respectively. This is because there have between 248 and 253 trading days per year at the Stockholm Stock Exchange during the period covered here and since using 21 trading days as a monthly basis instead of 20 hence gives a more realistic approximation we will use this as our monthly value.[1]

The five day horizon is here viewed as the short term effect from an insider increasing or decreasing his or her ownership in the firm. As mentioned before, five days is the time limit

[1] Daniel Grahn, Stockholm Stock Exchange.

that insiders have to report their trades, meaning that this time span will cover the instant impact of the transaction no matter when it is reported and this is why we have chosen this particular length as our short term window. Our second event window is somewhat longer, one month, and in case the market fails to react quickly to the insider's trade an eventual effect should definitely be captured within this period. Finally, as our third event window we have chosen a period of three months which will represent a more long term view in this context.

An estimation window from the period before the event date will be used to estimate the parameters for calculating the normal, expected return. According to Wells (2004) this typically includes 180 trading days and therefore we will use that length of our estimation window as well. There are many ways to model the expected return and these are normally divided into two categories; models that rely on statistical assumptions of asset returns and models that are based on economical assumptions about investors' behaviour. A model that is frequently used and the one that we will also use in our thesis is the market model, which is a statistical model where the return of the security is related to the return of the market portfolio. The parameters used to calculate this normal return, α and β, will be estimated in a statistical way with the following model:

$$R_{i\tau} = \alpha_i + \beta_i R_{m\tau} + \varepsilon_{it},$$

where $R_{i\tau}$ is the return of security i at time τ, $R_{m\tau}$ is the return of the market portfolio and ε_{it} is the zero-mean error term. One does not want to include the event date in the estimation window since this can affect the estimated parameters in the normal return model and therefore our estimation window will reach from the day before the event date and 180 trading days back in time. As discussed in Section 5 we will use index returns as an indicator of market portfolio returns.

The reason behind the introduction of two different indices with different scope, is to verify that the results obtained are not dependant on the unique characteristics of a single index. The first hypothesis is the most comprehensive in terms of number of observations and will therefore be tested using both the AFGX and the OMXS30. In case the model based on AFGX

and the model based on OMXS30 generate the same results for the first hypothesis, this rules out the risk of the results being severely biased due to the choice of index. In this case the three other hypotheses will be tested only with the model based on AFGX.

Before we move on we want to clarify that we will use logarithmic returns when doing the calculations in this thesis. This is because they are additive and because they appear to be more compatible with the normality assumption required for the hypothesis testing (Strong (1997)). The logarithmic returns are calculated as follows:

$$R_{i\tau} = \ln\left[\frac{P_{i\tau}}{P_{i,\tau-1}}\right],$$

where $P_{i\tau}$ is the price of security i at time τ. The next thing to do is to measure the abnormal return, which is the actual return minus the normal return in the case that the observed event had not taken place. Or more formally:

$$AR_{i\tau} = R_{i\tau} - E\left(R_{i\tau}\middle|X_{\tau}\right)$$

where $AR_{i\tau}$ is the abnormal return of security i at time τ, $R_{i\tau}$ is the actual return and $E\left(R_{i\tau}\middle|X_{\tau}\right)$ is the expected return under the conditioning information X_{τ} for the chosen model of normal return (MacKinlay (1997)). As mentioned before, the conditioning variable X_{τ} in our case is AFGX.

The variance of the abnormal returns ($Var(AR_{i\tau})$) is then calculated by dividing the sum of the squared abnormal returns with (*n-1*), which is the number of days in the event window adjusted for the loss of degrees of freedom:

$$Var(AR_{i\tau}) = \frac{\sum_{\tau}(AR_{i\tau})^2}{(n-1)}$$

After this we move on to the next step, which is calculating the sample aggregated abnormal returns (SAAR) in the event window. This is computed as the average abnormal returns for all companies at a specific date:

$$SAAR_{\tau} = \frac{\sum_{i} AR_{i\tau}}{n}$$

The variance of *SAAR* is also needed and is defined as the sum of the variances for the abnormal returns divided by the square of the number of companies after adjustment for the loss of degrees of freedom:

$$Var(SAAR_{\tau}) = \frac{\sum_{i} Var(AR_{i\tau})}{(n-1)^2}$$

The final step is then to sum up $SAAR_{\tau}$ over the event window, which gives us the sample aggregate cumulative abnormal return (SACAR):

$$SACAR(\tau_1, \tau_2) = \sum_{\tau} SAAR_{\tau} ,$$

where τ_1 and τ_2 represent the start and the end of the event window, respectively. The variance of *SACAR* is obtained by summing the $Var(SAAR_{\tau})$ over the event window:

$$Var(SACAR(\tau_1, \tau_2)) = \sum_{\tau} Var(SAAR_{\tau})$$

These two last figures will then be used to test the hypotheses stated in Section 4. We will use the nowadays very familiar hypothesis testing procedure, as described in Newbold et al (2003). Since we do not know the variance of the population, just the variance of our sample, we must base our tests on the student's *t*-distribution. This distribution depends on the degrees of freedom used to calculate the sample variance, where the degrees of freedom are *n-1* for a sample of *n* observations. However, the central limit theorem implies that the normal distribution can be used as an approximation when one has a large enough sample size. In this sense, our sample as presented in Section 5 can be considered large and a normal distribution will therefore be used.

The test statistic obtained from the process described above is:

$$J = \frac{SACAR(\tau_1, \tau_2)}{\sqrt{Var(SACAR(\tau_1, \tau_2))}}$$

This test statistic will be compared with the critical values for a two-sided test with a 5% significance level, which are -1.96 and 1.96 respectively (Newbold et al (2003)). If the absolute value of the test statistic is larger than the positive critical value, the null hypothesis will be rejected. We will also report the corresponding p-value obtained from the test procedure. The p-value is the lowest significance level for which the null hypothesis can be rejected.

Using a two-sided test means that we test for both positive and negative abnormal returns both when insiders are buying and when they are selling shares in their own firm. One could argue that by our way of reasoning one should only have to test for positive abnormal returns from insider buying and negative abnormal returns in the case of selling. However, since we do not know beforehand what results we will get, we do not want to exclude any possibilities and therefore we also test for the case of negative abnormal returns from insider buying and positive abnormal returns when insiders are selling.

6.2 Cluster transactions

In order for a set of transactions to be categorized as a cluster transaction, it has to meet the following criteria: (1) several individuals with an insider position must have traded the stock, (2) the trades have to be done within a given time frame, and (3) all transactions have to be of the same type, i.e. all transactions are buy transactions or all transactions are sell transactions. We will study transactions with a minimum of two insiders and with a maximum of one week (five trading days) between the transactions.

A problem associated with these transactions is when to define the event date of the cluster transaction. We decided to set the event date as the date of the last transaction in the series that met the above stated criteria. This might reduce the size of the abnormal returns since the market might very well have started to adjust the price of the security before the date of disclosure of the final transaction that we have set as the event date. Assigning the event date to the last date should by this reasoning not generate a larger abnormal return than what is actually true, implying that it does not in any way exaggerate the returns and therefore this alternative gives as pure results as possible when it comes to measuring the combined effect

of the transactions. Information about the cluster transactions in this study are provided in *Table 3*.

Table 3. Number of cluster transactions by type.

TYPE	CLUSTER
Buy	1143
Sell	576
Total	1719

7. Analysis & discussion of results

In this section we will present, analyse, and discuss our findings. The hypotheses will be handled in the order they were stated in Section 4. In this section all returns have been re-calculated so that all tables, diagrams, and numbers are stated in the more intuitive non-logarithmic way.

7.1 Hypothesis 1

When handling the signalling effect in Section 3.2 we discussed the possible implications of the differences in the signals that are being sent to the market depending on whether insiders are buying or selling shares in their own company. We pointed out several different reasons for why an insider would sell while suggesting that the only reason for increasing the ownership is the belief that the company is undervalued. By this logic, the implications of insiders' buy transactions should be more straightforward and hence the results more pronounced than the results for decreases in ownership. As can be seen in *Table 4 and Table 5* below this rationale turned out to be far from obvious in the results of our examination of the whole period.

Table 4. Statistics for hypothesis 1 (AFGX model).

	EVENT WINDOW	SACAR	T-STATISTIC	P-VALUE	H_0 REJECTED
Buy	5 days	0.67%	7.8963	0.0000	Yes
	1 month	1.29%	7.8536	0.0000	Yes
	3 months	3.43%	11.4476	0.0000	Yes
Sell	5 days	-0.47%	-2.8703	0.0041	Yes
	1 month	-1.76%	-5.3145	0.0000	Yes
	3 months	-8.92%	-15.8799	0.0000	Yes

Table 5. Statistics for hypothesis 1 (OMXS30 model).

	EVENT WINDOW	SACAR	T-STATISTIC	P-VALUE	H_0 REJECTED
Buy	5 days	1.06%	7.9592	0.0000	Yes
	1 month	1.91%	7.9557	0.0000	Yes
	3 months	4.13%	11.1431	0.0000	Yes
Sell	5 days	-1.16%	-3.0880	0.0000	Yes
	1 month	-3.06%	-5.6554	0.0000	Yes
	3 months	-12.12%	-16.3986	0.0000	Yes

The statistics show that the null hypothesis of no abnormal returns is rejected at a 5% significance level for all the event windows for both buy and sell transactions. In fact, the p-values show that all the null hypotheses are rejected at very low levels of significance, indicating that the relationship between insider trading and abnormal returns is strong. Contrary to the reasoning above we can see that the single most significant result can be found for the sell transactions. Looking at a three month horizon insider selling provides an abnormal return of -8.92%. This number is statistically significant on very low significance levels and it can definitely also be considered to be economically significant.

Figure 2 shows the development of the abnormal return over time, where buy and sell transactions are shown separately. It can clearly be seen that the latter display a steep downward sloping curve while insider buying demonstrate a more moderate slope upwards for the three month period. Looking at a horizon up to one month (21 trading days) the results are fairly similar with 1.29% and -1.76% for buy and sell transactions respectively, but after this point the abnormal returns from selling decrease sharply.

As already mentioned this is somewhat surprising and perhaps this finding can be interpreted as a sign that insiders' single most important reason for selling stocks in their own company is the same as their rationale for buying, namely to make the most money possible. Maybe the other motives brought up in Section 3.2, such as selling for personal reasons, do not need to be taken into account at all because insiders' desire to maximize returns dominates all other motives. If this is the case there would be no reason to expect a difference between insider buying and selling, meaning that the result observed here would not be that surprising.

By comparing the results in *Table 4* and *Table 5*, it becomes clear that the model based on AFGX and the model based on OMXS30 generates highly similar results. All six null hypotheses are rejected at very high significance levels for both indices. We also conclude that the findings are even more significant for the OMXS30 than for the AFGX. Since we use the same data and setup to test the other hypotheses, any significant findings with the model based on AFGX would most likely generate even stronger results with the OMXS30. We therefore proceed to test the other hypotheses only with the model based on the AFGX.

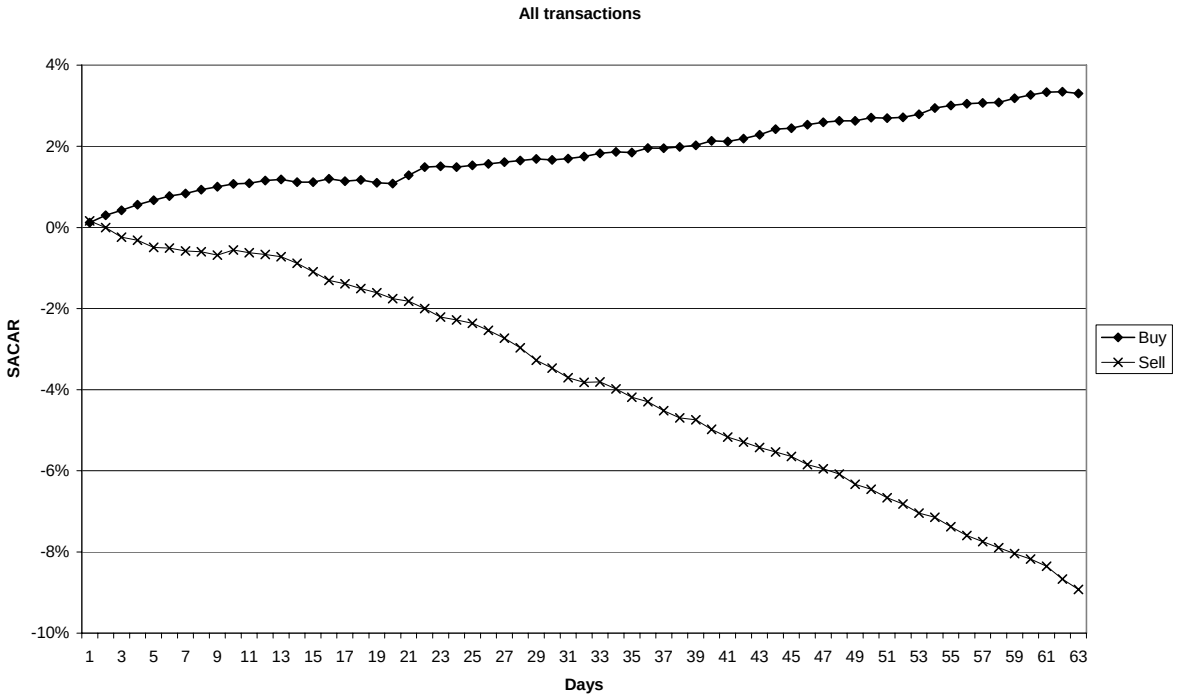

Figure 2. SACAR on an aggregate level for buy and sell transactions respectively (AFGX model).

7.2 Hypothesis 2

Since we are only interested in abnormal returns there is no reason to expect any differences between the results due to the prevailing market conditions. Even if there are bigger chances that the stock price goes up and that one makes money from buying when the market is in an upward trend, and the other way around for a downward trending market, the abnormal return should in expectation still be zero since the market conditions are taken into account in the event study method. Results from the study can be found in *Table 6* below.

Table 6. Statistics for hypothesis 2.

	EVENT WINDOW	SACAR	T-STATISTIC	P-VALUE	H_0 REJECTED
Buy - upwards	5 days	0.67%	6.3780	0.0000	Yes
	1 month	1.29%	7.2359	0.0000	Yes
	3 months	3.30%	11.3145	0.0000	Yes
Buy - downwards	5 days	0.62%	4.6684	0.0000	Yes
	1 month	0.89%	3.5624	0.0004	Yes
	3 months	1.46%	3.4408	0.0006	Yes
Sell - upwards	5 days	-0.36%	-2.0006	0.0455	Yes
	1 month	-0.50%	-1.3604	0.1738	No
	3 months	-2.37%	-3.6945	0.0004	Yes
Sell - downwards	5 days	-0.71%	-2.2306	0.0258	Yes
	1 month	-4.82%	-8.0424	0.0000	Yes
	3 months	-21.92%	-22.4770	0.0000	Yes

Starting with the buy transactions we can see that the results for all event windows for both types of markets are significant at very low levels of significance and that the null hypotheses of no abnormal returns consequently are rejected. The difference between the size of the abnormal returns in the two cases are not very big either. In the very short term purchases in bull markets seem to demonstrate somewhat larger abnormal returns, and the longer the time horizon the larger does this effect become. This is even more clear in *Figure 3* where the two lines above the horizontal axis represent buy transactions and where the line ending with the highest value is the upward trending market. We can see that the returns for a downward trending market match that of the bullish market up to just a little less than a month, when the upward market starts showing more sharply increased abnormal returns.

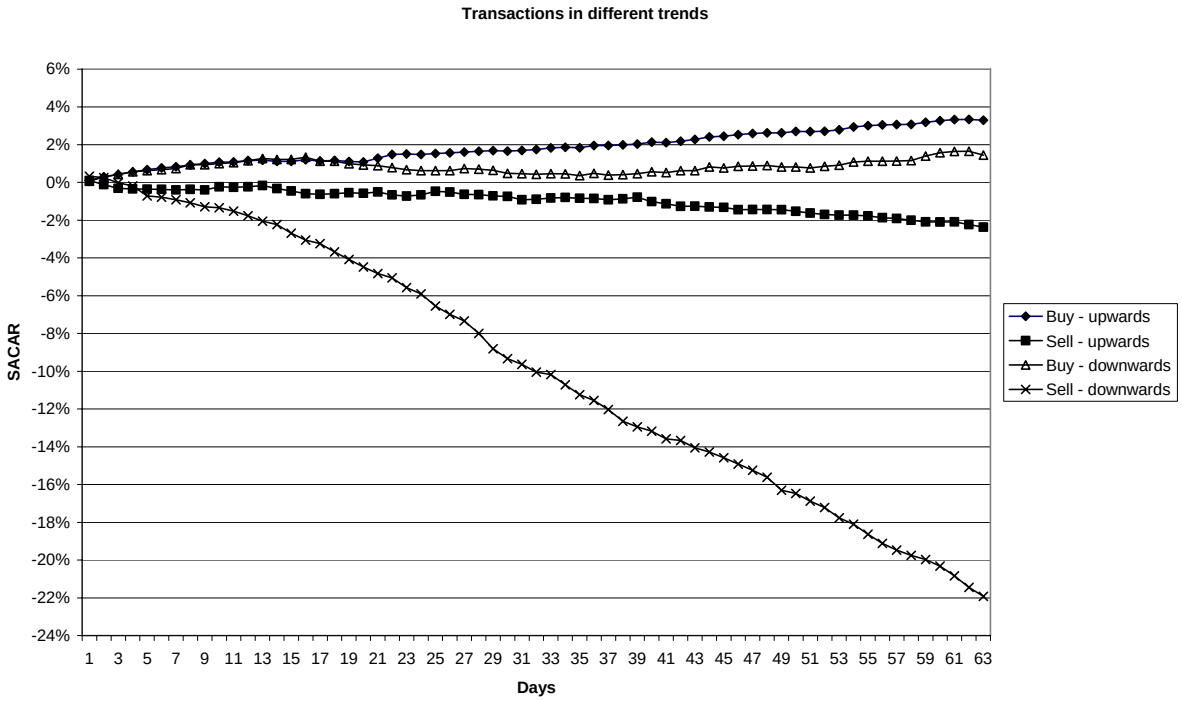

Figure 3. SACAR in different market trends for buy and sell transactions respectively.

The results for the sell transactions are more diverging. The abnormal returns for the downward trending market are larger for all three event windows and for the upward trending market we even find one insignificant result. For the one month horizon the analysis gives an abnormal return of -0.50 %, but a p-value of 0.1738. This means that the null hypothesis of no abnormal returns for sell transactions in an upward trending market cannot be rejected at any reasonable significance level. The other five null hypotheses are nonetheless rejected. It is clear in *Table 6*, and perhaps even more obvious in *Figure 3*, that the difference between the two types of trends is fairly large and that it also gets bigger the longer the time horizon. This can be compared to the buy transactions which do not at all display the same clear pattern.

The reason why the abnormal returns for sell transactions are so much bigger in a bearish market than in an upward trend is probably due to the insiders' information advantage. Insiders are higher up in the chain of information and can realize what is going on more quickly than outside investors. Therefore they either see on an early stage that things are looking tougher and that their company will not do so well in the near future, which can be a reason that the downward trend starts in the first place, or they become conscious that the already prevailing tough market conditions will affect them as well and that they will begin to

perform worse and hence contribute further to the downward spiral. In both cases the insiders are ahead of the outside investors and can take advantage of the situation by selling their stocks. This reasoning should however work just as well for the buy transactions in an upward market since insiders have the same informational advantage in this case. As has been just described the results in our study do not show this though, meaning that we end up with the same dilemma as in Section 7.1 regarding the larger abnormal returns for sell transactions.

7.3 Hypothesis 3

The technological improvement and other changes that have taken place during the time period studied here suggest that there could be differences between the results observed in different sub-periods. The most likely finding, if any, is probably an increase in market efficiency due to the more widespread and more easily accessible information in later periods compared to in the beginning of the sample. This would imply lower abnormal returns and less significant results with fewer null hypotheses rejected, which however is not what we observe when we divide our sample into seven two year-periods.

Table 7. Statistics for buy transactions hypothesis 3.

	EVENT WINDOW	SACAR	T-STATISTIC	P-VALUE	H_0 REJECTED
91-92	5 days	1.19%	3.2385	0.0013	Yes
	1 month	3.69%	4.8011	0.0000	Yes
	3 months	8.35%	6.7083	0.0000	Yes
93-94	5 days	0.01%	0.0167	0.9867	No
	1 month	1.00%	1.3702	0.1709	No
	3 months	3.61%	3.3987	0.0007	Yes
95-96	5 days	0.55%	3.3197	0.0009	Yes
	1 month	1.32%	3.3951	0.0007	Yes
	3 months	5.11%	7.2504	0.0000	Yes
97-98	5 days	0.60%	2.5319	0.0114	Yes
	1 month	-1.41%	-2.8526	0.0044	Yes
	3 months	-2.84%	-3.4342	0.0006	Yes
99-00	5 days	0.85%	4.6784	0.0000	Yes
	1 month	1.95%	5.7338	0.0000	Yes
	3 months	4.16%	6.7070	0.0000	Yes
01-02	5 days	0.58%	3.4474	0.0006	Yes
	1 month	0.90%	2.8756	0.0041	Yes
	3 months	1.94%	3.7186	0.0002	Yes
03-04	5 days	0.86%	4.4926	0.0000	Yes
	1 month	2.17%	5.6746	0.0000	Yes
	3 months	6.46%	7.3144	0.0000	Yes

Starting with the buy transactions, we only observe two cases where the null hypotheses are not rejected. Both of these occur in the period 1993-1994, where the third event window however shows a p-value as low as 0.0007. For all the other periods we get very low p-values for all three event windows and the null hypotheses are clearly rejected at the 5% significance level. Looking at both *Table 7* and *Figure 4* we can see that the shortest window is fairly stable with abnormal returns between 0.01% and 1.19%. The one and three month horizons are a bit more volatile, where the period 1997-1998 stands out. During this period, insiders' purchases generated an abnormal return of -1.41% and -2.84% for the two event windows respectively. These two negative abnormal returns are both significant even at a 1% significance level. From *Figure 4* we can also see that during this particular period the returns

are at their lowest for these two horizons. The very low returns are however both preceded and followed by periods of positive returns. Looking at the p-values in *Table 7* we can see that the pattern looks the same, indicating that there does not seem to be any systematic differences in neither the size of the abnormal returns nor the level of significance for the buy transactions between the different sub-periods.

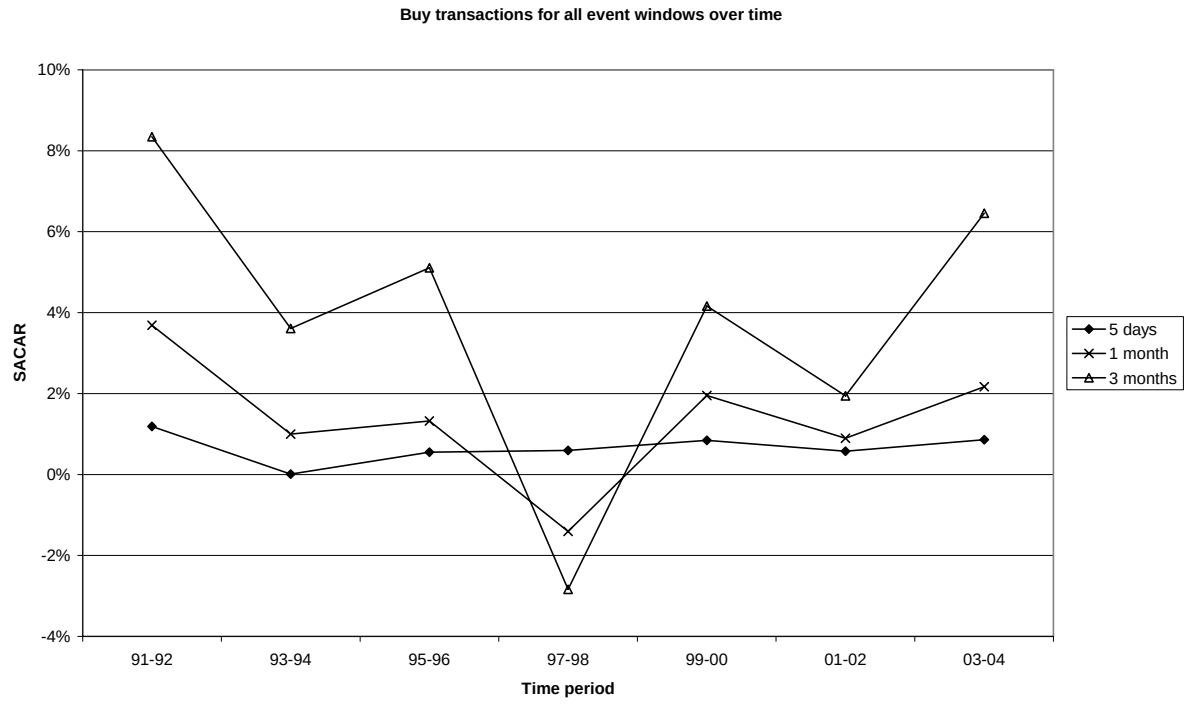

Figure 4. SACAR for buy transactions and all three event windows over time.

A closer look at the sell transactions show a different scenario than that of the buy transactions. In fact, more than a third of the null hypotheses are not rejected, where 1993-1994 is the most noteworthy period with all three event windows showing non-significant returns. In addition to this we can see that in five of the seven periods the null hypothesis for the shortest time horizon of five days cannot be rejected. The only two cases where we can indeed reject the null hypothesis for the five day event window is the first and the last period, which show abnormal returns of 1.33% and -1.17% respectively. This is interesting since one of them shows a positive abnormal return and the other one a negative abnormal return. Actually all the event windows for the period 1991-1992 have a positive and significant abnormal return, which is contrary to what would be expected on beforehand. Selling shares should mean that insiders are using negative information about the company not available for

outside investors, indicating that the share price will drop and not rise. However, as discussed in Section 3.2, there could be several reasons for an insider to sell and the results observed here could therefore be due to the fact that insiders are not trying to use private information but are selling for other incentives, such as to minimize tax payments or that they simple need the money.

Table 8. Statistics for sell transactions hypothesis 3.

	EVENT WINDOW	SACAR	T-STATISTIC	P-VALUE	H_0 REJECTED
91-92	5 days	1.33%	2.5063	0.0127	Yes
	1 month	2.72%	2.3704	0.0184	Yes
	3 months	6.66%	3.3979	0.0008	Yes
93-94	5 days	-0.03%	-0.0757	0.9397	No
	1 month	1.26%	1.5998	0.1101	No
	3 months	-0.92%	-0.7203	0.4715	No
95-96	5 days	-0.39%	-1.3212	0.1870	No
	1 month	-1.07%	-1.4859	0.1378	No
	3 months	-3.96%	-3.4837	0.0005	Yes
97-98	5 days	-0.61%	-1.0947	0.2740	No
	1 month	-3.92%	-3.8837	0.0001	Yes
	3 months	-13.99%	-9.2845	0.0000	Yes
99-00	5 days	-0.95%	-1.8957	0.0583	No
	1 month	-3.81%	-3.4464	0.0006	Yes
	3 months	-24.60%	-13.9895	0.0000	Yes
01-02	5 days	-0.33%	-0.9902	0.3223	No
	1 month	-1.92%	-2.9601	0.0031	Yes
	3 months	-7.71%	-7.3580	0.0000	Yes
03-04	5 days	-1.17%	-3.7882	0.0002	Yes
	1 month	-2.53%	-4.0156	0.0001	Yes
	3 months	-3.57%	-2.4388	0.0149	Yes

Figure 5 shows the development over time for each event window within the sell transactions and the picture looks somewhat different compared to the one for the buy transactions. The five days and one month horizons do not demonstrate particularly spectacular developments, perhaps with the exception that they show positive abnormal returns in the beginning which

as already mentioned is quite unexpected. For the longest event window we can however see that the three two year-periods between 1997 and 2002 experienced large negative abnormal returns. These were all highly significant and indicate that it would have been possible for outside investors to gain abnormal returns during this period if they would have imitated the actions of insiders and followed their trades. Considering this and the fact that the majority of the non-significant results were observed in the earlier periods, the results of the sell transactions do seem to have changed over the time period studied in this thesis. In contradiction to the reasoning in the beginning of the section it does however seem like the abnormal returns if anything have become larger in absolute terms over time and also that the results are more significant in the way that the null hypotheses of no abnormal returns can be rejected more easily.

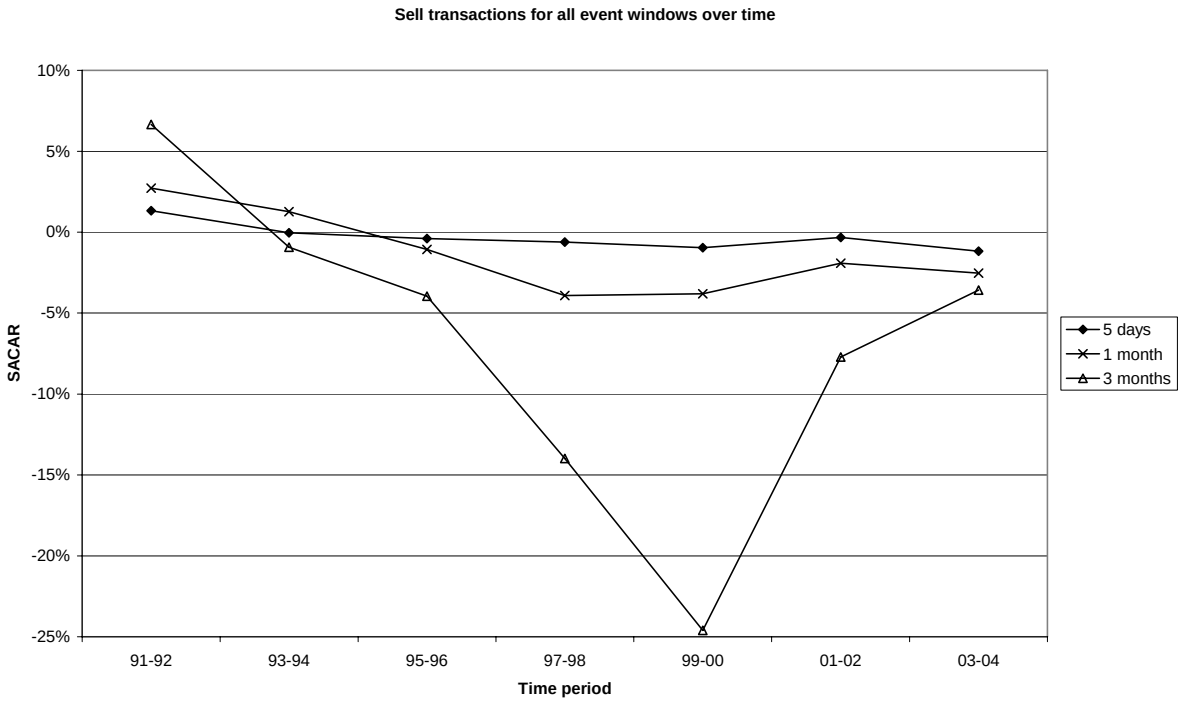

Figure 5. SACAR for sell transactions and all three event windows over time.

Even if the buy transactions do not show the same relationship as the sell transactions the results of the latter are worth noticing, since they indicate that the market has become more inefficient instead of the other way around. That in turn imply that insiders have bigger possibilities of earning abnormal returns now than they did 10-15 years ago.

7.4 Hypothesis 4

When stating our fourth and last hypothesis in Section 4 we claimed that the signalling effect should be stronger if two or more insiders do the same type of trade within a short interval from each other. By this way of thinking we could expect an even stronger result here than in Hypothesis 1 where all transactions were included.

In terms of percentage abnormal returns this turns out to be exactly what we find in our study. As can be seen in *Table 9* both the buy and the sell transactions show larger abnormal returns for all examined event windows compared to the results in Section 7.1. Just as in Hypothesis 1 all the null hypotheses here are also clearly rejected at a 5% significance level, even though the p-values are not as low as the ones achieved when examining all transactions. The rejections of the null hypotheses however signal that cluster transactions done by insiders generate abnormal returns. This is in accordance with expectations and not particularly surprising due to the reasons discussed above.

Table 9. Statistics for hypothesis 4.

	EVENT WINDOW	SACAR	T-STATISTIC	P-VALUE	H_0 REJECTED
Buy	5 days	1.06%	2.3966	0.0167	Yes
	1 month	1.91%	2.5777	0.0101	Yes
	3 months	4.13%	3.2035	0.0014	Yes
Sell	5 days	-1.16%	-2.6396	0.0085	Yes
	1 month	-3.06%	-3.2834	0.0011	Yes
	3 months	-12.12%	-7.5240	0.0000	Yes

The statistics also show that the abnormal returns are larger in absolute terms for sell transactions than for buy transactions for all three event windows. The abnormal return of -12.12% for multiple insider selling for a three month time horizon is the most significant result. The sell transactions also show lower p-values for all windows and together these two features indicate a larger effect if two or more insiders are selling shares in their own firm than if they are increasing their ownership. This relationship is perhaps even more clear in *Figure 6* where the negative slope of the sell curve is much steeper than the positive slope of the buy curve. All this means that cluster selling provide greater potential of making money for investors following the trades done by insiders than cluster buying.

The probability that insiders would sell or buy stocks in their firms for other reasons than maximizing their returns are in the case of cluster transactions minor. Even if the probability that one insider sells his or her shares to free money for other purposes can be expected to be non-negligible on beforehand, the probability that two or more insiders would simultaneously sell stocks on the very same grounds are indeed negligible.

This argument does however not explain the observed differences between buying and selling since it implies the same motives for the two types of transactions, meaning that the two results should be the same. Taking this into account the findings strengthen the ones made in Section 7.1, but still leave the rationale for why the sell transactions show larger abnormal returns than the buy transactions unclear.

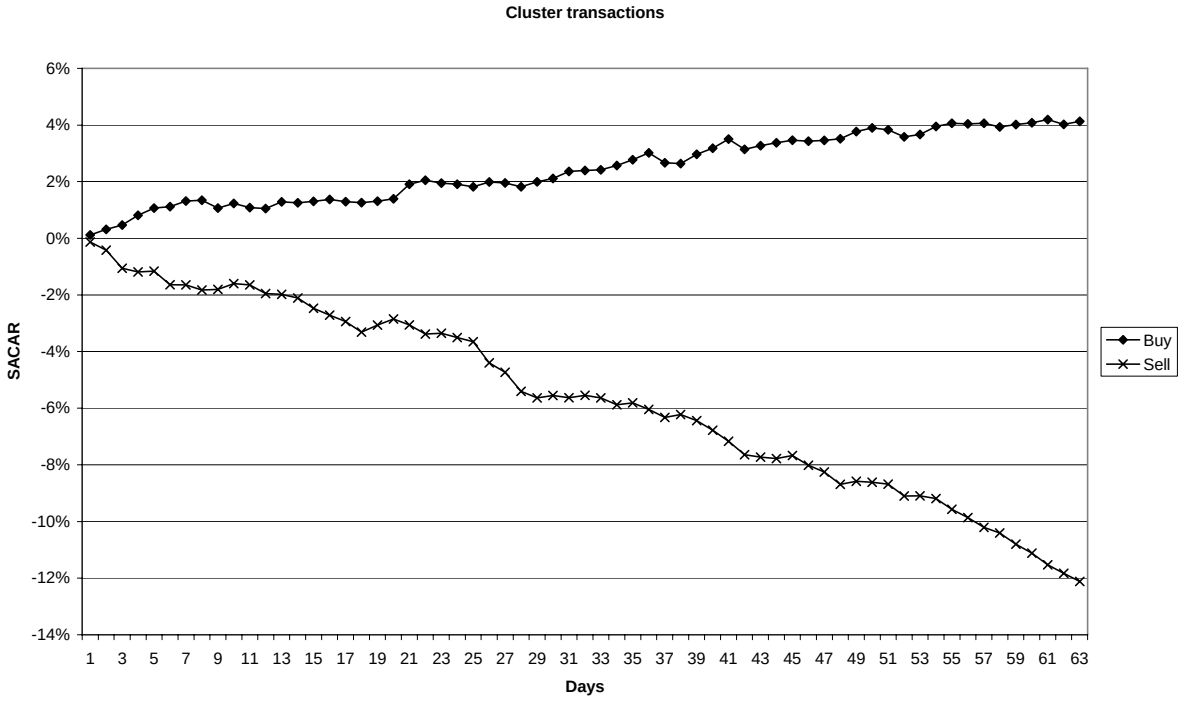

Figure 6. SACAR of cluster transactions for buy and sell transactions respectively

8. Conclusion

The first conclusion that we can immediately draw is that the results found in this thesis strongly suggest that insiders earn abnormal returns by trading stocks in their own company. In the introduction we addressed the problem with the information asymmetry, the possible advantages to insiders and the market imperfections this could cause. We also defined the purpose of the study which was to, in addition to look at an aggregate level over the whole period, break down the data into smaller segments in order to get a clearer view and a deeper understanding of the prevailing situation on the Stockholm Stock Exchange.

The first thing we could see was that both buy and sell transactions done by insiders during the 14 year period between 1991 and 2004 provide abnormal returns looking on both a short and a longer term horizon, where sell transactions appear to provide much larger abnormal returns in absolute value on a horizon of one month and onwards than increases in insider ownership. The first breakdown of the data into different types of markets show that there seem to be no big differences between upward and downward trending markets for the buy transactions, while the sell transactions show larger and more significant abnormal returns in bearish markets compared to when the market as a whole is doing well.

Dividing the data into different sub-periods gives a rather stable pattern for the buy transactions. Most of the results are significant and neither the abnormal return nor the p-values seem to change over time. The sell transactions do however show a bit more diverging results with somewhat larger abnormal returns in more recent times.

Looking at the occasions where two or more insiders within the same company do the same type of trade within a short time span, here referred to as cluster transactions, we see that these events generate even larger abnormal returns. This is perfectly in accordance with expectations since if several insiders do the same type of trade this should indicate that the company really is over-/undervalued, meaning that the possibilities for insiders to take advantage of the situation and earn abnormal returns are larger. Just as in the other cases the sell transactions show larger abnormal returns than the purchases for cluster transactions as well.

Our findings are in line with most previous studies presented in this thesis in the sense that they indicate that insiders can in fact generate abnormal returns. They do however contradict the results of Jeng et al (1999), Lakonishok et al (1998), and Jeng et al (2003) which found evidence of abnormal returns from insiders' buy transactions in the US market, but not from their sell transactions. The same result was found in a study by Johansson et al (2005) on the Swedish market, while Hjertstedt et al (2000) found that insiders make abnormal returns both when they are buying and when they are selling. We find in line with the latter that both cases are significant, but also that sell transactions in contrast provide even larger abnormal returns than purchases.

9. Future research

Besides further investigation of the issue with somewhat larger abnormal returns for sell transactions than for purchases just mentioned in the section above, one natural next step that could be taken after this thesis is to further break down and analyse the cluster trading aspect examined here in order to see if the effect differs between different insiders. Do the abnormal returns differ between different combinations of insiders doing complementary trades and does the number of insiders trading within a certain time span alter the picture?

It would also be interesting to study the effects of the regulatory changes described in Section 2. Has the 30 day trading ban improved, worsened, or not at all affected the abnormal returns and the information asymmetry between insiders and other investors? This is a question that needs to be answered for the market to have a chance of becoming more efficient. We will probably have to wait at least a couple of years before this is possible to examine, but that the rules have indeed been changed indicates that this unquestionably needs to be looked at. One could argue that if the legislation had been satisfactory as it was there had been no reason to change it in the first place and the only possible way to find out if this new regulation is better than the previous one is to perform a study similar to the one conducted here.

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DATABASES

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