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Insider trading and excess returns

Evidence from the Swedish stock market

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Abstract

This paper aims to examine whether there exist short-term excess returns following insider transactions on the Swedish stock market and, if that is the case, explore whether they differ depending on corporate position of the insider. Based on the results in the first part of the paper, an investigation will be conducted to determine whether outside investors can generate excess returns by pursuing a replicating trading strategy. As there exist no studies of these particular subjects for the Swedish stock market, the contribution of this paper is bridging the gap in existing literature. The first part of the study is able to reject the null hypothesis that excess returns following insider transactions equal zero. Furthermore, the study finds the largest impact on excess returns in the transactions made by non-executive directors. Lastly, this paper finds no statistically significant results regarding the existence of profitable replication strategies for outside investors.

Keywords: Insider Trading, Excess Returns, Information Hierarchy Hypothesis, Replicating Strategies, Event Study

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1. Introduction

The primary aim of this paper is to evaluate the characteristics of excess returns following insider transactions on the Swedish stock market. Once an understanding of the relationships has been established, the paper investigates whether outside investors profitably can trade on this information.

The paper will start with an analysis of previous literature as it has formed the ground on which this paper is built. Firstly, literature concerning the existence of insider excess returns and the factors affecting them will be presented. Here we delve into the information hierarchy hypothesis (IHH) in particular, stating that executive directors should have more information on firm prospects than non-executive directors and that their insider transactions therefore should give rise to larger excess returns. Secondly, literature concerning replication strategies for outside investors will be presented. As no studies of the aforementioned have been conducted for the Swedish stock market, this paper aims to fill that gap.

After having determined the fit of this paper into existing literature, the theoretical framework will be introduced. Firstly, the research questions and hypotheses of the paper will be presented in order to give the reader a clear overview of what is to follow. Thereafter, the short- and long-term event study methodologies are justified and explained, followed by an examination of the limitations connected to the chosen approach and how they affect the findings of this paper.

Once a clear understanding of the applied methodologies has been established, we continue by describing the type of data needed in this particular kind of event study. The collection of the data is then presented together with the main exclusion rules that have been used for limiting the raw data set. The resulting data set consists of 738 transactions. Noteworthy is that 71 % of these are buy transactions, the ratio of executive to non-executive transactions is 1.56, and the dataset is somewhat positively skewed towards larger firms.

Applying the refined data set to the chosen methodologies allows this paper to draw concrete results regarding the initial research questions. With regards to the first research question, we find that there are statistically significant excess returns connected to insider transactions, which is in line with previous research. As for the second research question, this paper finds support for that insider position does matter for excess returns, with non-executives giving rise to the highest abnormal returns surrounding an insider transaction. Concerning the last research question about the excess returns of replication strategies, this study fails to find that it is profitable for outside investors to replicate the trades of insiders.

The paper is concluded with a summary of the studies together with their key results and implications, followed by suggestions for areas of future research.

2. Literature Review

Insider trading activity has sparked in the past decades, leading to tougher and more explicit regulation of these types of trades. In the vast majority of countries corporate insiders are now obliged to disclose any long or short positions that they enter. The extensive data resulting from this legislation has led to a considerable amount of research touching upon the subject of insider trading. Due to higher disclosure and reporting standards, most previous studies have been focused on the US and UK markets, although there have been an increasing amount of other country-specific studies in more recent years. The following review delves into previous literature studying different markets around the world and it is divided into two main parts. The first part touches upon previous literature examining the existence of excess returns generated by insider transactions and the factors affecting those returns. Thereafter, the second part concerns previous literature connected to the generation of excess returns for outside investors by pursuing trading strategies replicating insider transactions.

2.1 Insider excess returns

The rich literature on the subject of insider trading dates back to Smith (1940) that compared insider trades to indices and concluded that on the whole insiders "did not make exceptional trading profits". However, he recognised that insiders might trade for other reasons than profit, such as diversification or liquidity reasons, and that this could explain his findings. Kallunki et al. (2009) later examined this theory on the Swedish market and concluded that such trading reasons were in fact more frequent than the use of private information to make profits. Other studies, such as Jaffe (1974) and Finnerty (1976), concluded that corporate insiders in fact can detect mispricing and trade on that information in order to generate excess returns. The methodology was refined by Seyhun (1986) that used the market model for normal return calculations and incorporated a size effect that distinguished firms based on their market capitalisation. His findings were that there is a negative relationship between firm size and abnormal return, i.e. that abnormal return from insider trades would be larger for smaller as opposed to larger firms. No correlation was found between transaction value and excess returns. However, he did find insider position as an important determinant of excess returns and thus brought support to what came to be known as the information hierarchy hypothesis (IHH). The hypothesis states that the informational value of an insider trade depends on the type of director making the trade, with directors closer to the daily operations having higher informational value, a more thorough definition is provided in appendix. The IHH was later supported by Lin and Howe (1990) but received criticism from Jeng, Metrick and Zeckhauser (1999), arguing that more informed insiders are subject to increased scrutinisation and thus are more reluctant to trade on their informational advantage, in turn reducing the informational value. While the time windows for the above-mentioned studies has varied from a few days to months and years, Lakonishok and Lee (2001) examined both short- and long-term implications of insider trading and came to the conclusion that although excess returns were connected to buy transactions on small firms, these returns were of little magnitude over the short term.

In recent years there has emerged an increasing amount of single-country studies that focus on other markets than the US or the UK. One example is Zingg et al. (2007), that studied the Swiss market and found that insider excess returns are existent, although mainly concentrated to small firms and highly dependent on trading volume. As earlier mentioned, the correlation between trading volume and excess returns had previously been studied by Seyhun (1988) that found no connection between the two. With the aforementioned studies in mind, it is clear that research regarding the influence of trading volume on excess returns points in different directions.

2.2 Excess returns for outside investors

Lorie and Niederhoffer (1968) were pioneers in arguing for insider trading as a source of excess returns for insiders as well as for outside investors. Their radical findings helped spark research and discussions in the field of replication strategies. Jaffe (1974) followed course and expressly concluded that replication strategies can generate excess returns but in order for them to be economically significant post transaction costs they have to be pursued in the long-term and using heavy trading. Later studies by Seyhun (1986) and Rozeff and Zaman (1988), controlling for firms size and earnings-to-price, went further and argued that excess returns for outside investors did not exist at all when taking transaction costs into account. This supported the efficient market hypothesis (EMH), which is defined in appendix.

Seyhun (1988) later presented another study targeting large-volume trades by top-management and found evidence that contradicted his earlier findings. The examined trades did in fact generate excess returns for outside investors net of transaction costs. Lin and Howe (1990) found contradicting results whereas a later study by Jeng, Metrick and Zeckhauser (1999) instead supported Seyhun's (1988) view regarding the existence of excess replication returns for outside investors.

2.3 Fit into existing literature

The aforementioned research shows that the subject of insider trading has been widely discussed and studied over the years. Yet there are niches that remain untouched by previous research. Insider excess returns have been researched ever since Smith (1940) and the subject has enjoyed a considerate amount of research for US and UK markets. However, only recently have other markets started to receive proper attention and it is our conclusion that there remains a gap in researching the Swedish market for short-term insider excess returns. This shortage of literature also invites to more profound research looking into different factors affecting these potentially existent excess returns surrounding insider transactions. Hence, by examining their existence and subsequently delving into differences in excess returns depending on the corporate position of the insider, we aim to bridge a gap in existing literature and contribute to a deeper understanding of the dynamics of insider trading on the Swedish market.

Once the existence of short-term excess returns has been examined around insider transactions and the group of insiders giving rise to the highest abnormal returns has been determined,

we follow up our initial research questions. We do this by conducting a replication strategy that examines whether it is possible to generate excess returns for outside investors by following the trading patterns of this identified group. Although the replication of insider trades has received a considerable amount of research over the years, again the majority of this research has been focused on the US and UK markets. The most influential papers on the area also tend to be from the 20th century and, as for examples transaction costs have diminished in the past years, it would be interesting to view the subject in the light of the market characteristics of today. Thus, the second section of this paper will examine the previously unanswered question of whether it is possible to generate excess returns for outside investors by replicating the trades of a specific group of Swedish corporate insiders.

3. Theoretical framework

After reading the literature section it is clear that the broader subject of insider trading as well as more specific sub-questions, such as different factors affecting excess returns and the existence of profitable replication strategies, all have been thoroughly researched and discussed in the past decades. In the light of the rich previous literature it becomes increasingly important to explain what distinguishes a certain paper from the already existing ones. Hence, in an attempt to be as clear and explicit as possible, we will in this section outline our research questions and hypotheses, followed by the methodology used to investigate the aforementioned.

3.1 Research questions and hypotheses

The research questions and hypotheses of this paper are divided into two main sections. The first section initially concerns an examination of the existence of short-term excess returns connected to insider transactions and continues with a study of whether those returns differ depending on the position of the insider. The second section is based on the results in the first section and investigates whether those results can be used to generate excess trading returns for outside investors.

3.1.1 Main research questions and hypotheses

The first hypothesis relates to the broader question concerning the existence of short-term excess returns surrounding an insider transaction. Although extensively researched on the US and UK markets, there is no previous literature examining this on the Swedish market and thus the first hypothesis is defined as follows:

- *Are there any short-term excess returns connected to insider trades on the Swedish stock market?*

The majority of previous research, such as Jaffe (1974) and Finnerty (1976), has focused on the long-term study of insider excess returns. Lakonishok and Lee (2001), however, also performed a short-term study concluding there are excess returns connected to insider transactions. Similarly to the findings of Lakonishok and Lee (2001) in the US market, this paper expects to find evidence of existent short-term excess returns following an insider transaction in the Swedish market.

The second hypothesis digs deeper into the dynamics of any excess returns around insider transactions on the Swedish market. Examining the relationship between insider position and excess return was initially done by Seyhun (1986), who resultantly defined the IHH. As no previous literature examines this relationship on the Swedish market, the second hypothesis is defined as follows:

- *Are excess returns on the Swedish stock market differing depending on whether an insider holds an executive or non-executive position?*

Following Seyhun's (1986) definition of the IHH, there has been research embracing his results (Lin and Howe, 1990) just as there has been research contradicting them (Jeng, Metrick and Zeckhauser, 1999). In the light of these previous findings, and with the logic of people working with the daily operations being more informed and thus having a larger impact on returns, this paper expects to find results in favour of the IHH. This means that executive directors are expected to have a larger impact on excess returns surrounding an insider transaction than non-executive directors.

3.1.2 Follow-up research question and hypothesis

With the EMH in mind, differing excess returns between executives and non-executives will imply different relative value of the information conceived in the trade. With this section, we want to evaluate whether outside investors can earn excess returns by trading on the most informative types of insider transactions. The subject of replicating transaction strategies has been previously studied on other markets by e.g. Lorie and Niederhoffer (1968), Jaffe (1974), Seyhun (1986, 1988) and Rozeff and Zaman (1988) but remains to be examined on the Swedish market. Therefore, the third hypothesis is defined as follows:

- *Based on the result of the initial research question, is it possible for outside investors to earn excess returns by replicating the insider trades of executives or non-executives on the Swedish stock market?*

Lorie and Niederhoffer (1968), Jaffe (1974) and Seyhun (1988) all found support for excess returns connected to the replication of insider trades. Rozeff and Zaman (1988), however, found reverse results after taking transaction costs into consideration. Reflecting upon these previous studies on foreign markets, it appears as the majority is supporting the profitability of replication strategies at least when considered pre-transaction costs. As transaction costs have diminished in the past years, excluding them from earlier studies would make those papers more comparable with the market characteristics of today. Thus, in accordance with the consensus of comparable previous research, we expect outside investors to be able to generate excess returns by replicating the trades of insiders, also on the Swedish stock market.

3.2 Methodology

The aforementioned research questions and hypotheses will be examined and tested throughout the course of this paper. However, for that to be successful it is of vital importance to present a clear methodology explaining the working process that will be followed. As this paper measures both short- and long-term effects, we will use two different event study concepts, each explained in more detail below.

3.2.1 Short-term event study

The first section of the paper involves a short-term event study investigating insider trades on the Swedish stock market and their short-term effects on share prices. We chose to follow the framework

of MacKinlay (1997), which is one of the most cited papers on the subject. The author presents a straightforward methodology to evaluate event impact on share prices, summarised below:

1. Define the event of interest and determine the period over which the security prices of the firms involved in this event will be examined.
2. Determine selection criteria for inclusion of a given firm in the study.
3. Select a normal performance model and estimate normal returns during the event windows using a defined estimation window. Then calculate abnormal returns.
4. Aggregate individual firms' abnormal returns and perform statistical tests.
5. Presentation of empirical results.

A more detailed description of the methodology, and how it is applied in this particular paper, is presented below.

The event of interest is an executive or non-executive's buy or sell transaction in his or her company's own stock. The event day (t_0) is set to the publication date of the transaction. The insider trades are analysed in four different event windows:

- Event window 1: the event day (t_0)
- Event window 2: the event day (t_0) ± 1 day
- Event window 3: the event day (t_0) ± 3 days
- Event window 4: the event day (t_0) ± 5 days

The purpose of using extended event windows is to account for pre- and post-event returns that may arise due to for example leakages between the transaction and publication date. We decided to keep the maximum event window at eleven days since longer event periods make it harder to draw statistical inferences from the results due to the fact that there might be other reasons for movements in share prices that are difficult to control for.

We calculated abnormal returns, defined as actual stock ex-post return subtracted by the expected return for that stock, as follows:

$$AR_{it} = R_{it} - E(R_{it}|X_t)$$

Where:

- AR_{it}: The abnormal return for firm *i* in time period *t*
- R_{it}: The realised return for firm *i* in time period *t*
- $E(R_{it}|X_t)$: The expected return for firm *i* in time period *t*
- X_t: Explanatory variable determining expected returns in time period *t*

MacKinlay introduces two models of normal returns, the constant mean return model and the market model. The constant mean model simply uses the mean return of a given period as the normal return, while the market model regresses historical return of the security to a market index to

control for variation in the market portfolio. The outcome of using the market model should be that the variations in the abnormal returns become lower; hence we decided to use this framework in the study. The market model is specified below:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

Where:

- R_{it}: Return of security *i* in time period *t*
- R_{mt}: Return of a market portfolio in time period *t*
- ε_{it}: A residual defined as the mean disturbance term for firm *i* in time period *t,* with variance $\sigma_{\varepsilon_i}^2$. The expected mean disturbance is zero.

The alpha (α_i) and beta (β_i) of the market model are estimated using an ordinary least squares (OLS) regression for a certain estimation window. MacKinlay suggests using 120 days as the estimation window, but we chose to use 40 days instead as this should provide enough time to estimate short-term normal returns in our sample.

From the market model of normal returns we are able to calculate our estimated abnormal returns:

$$\widehat{AR_{it}} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt})$$

The abnormal returns are then aggregated to cumulative abnormal returns (CARs) over each event window in order to be able to draw overall inferences for the desired events. The CAR is calculated the following way:

$$\widehat{CAR}(t_1, t_2) = \sum_{t=t_1}^{t_2} \widehat{AR}_{it}$$

3.2.2 Long-term event study

For the second research question, we want to investigate more long-term effects of replicating a certain group of insiders' trades. For this application we refer to the discussion of long-term CAR vs. buy-and-hold abnormal returns (BHAR) by Barber and Lyon (1997). The authors describe the main differences between the two as BHARs emphasising compounding returns, while CARs do not. Through a series of argumentations, they state that CARs are biased estimators of BHARs. Therefore, Barber and Lyon advocate for the use of BHARs and we will follow this recommendation in our study.

BHARs are calculated as compounded returns, according to the formula below:

$$BHAR_{it} = \Pi[1 + R_{it}] - \Pi[1 + E(R_{it})]$$

Where:

R_{it} is the return of security *i* in time period *t*

$E(R_{it})$ is the expected return of security *i* in time period *t*

Barber and Lyon (1997) mainly describe two alternatives to determine the expected returns, either through a simple reference portfolio or using matching firms. This paper posts BHARs calculated with both methods separately.

The main determinant of what reference portfolio to use will be the market capitalisation of our target group identified in the short-term event study. Furthermore, we will base our decision of control firms using the same rules as Barber and Lyon (1997); the initial consideration will be 70% - 130% of the sample firm's market capitalisation and the final decision will be the company with the most closely matched price-to-book ratio (inverted book-to-market ratio).

When the BHARs have been calculated we define our null hypothesis as the buy-and-hold replication strategy not generating any excess returns and the alternative hypothesis as the buy-and-hold replication strategy generating excess returns:

$$H_0: \overline{BHAR}(t_0, t_1) = 0$$
$$H_A: \overline{BHAR}(t_0, t_1) \neq 0$$

These hypotheses are tested with the following t-statistic:

$$t_{BHAR} = \frac{\overline{BHAR}}{(\frac{\sigma(BHA\square it)}{\sqrt{n}})}$$

Where:

$\overline{BHAR}$ is the sample average BHAR

σ(BHAR) is the cross-sectional sample standard deviation

Using a significance level of 5% we are able to determine whether or not our cross-sectional sample average BHAR is statistically significant.

3.3 Limitations of study

As a natural continuation of describing the chosen methodologies, we will now consider the main limitations of the study. Initially, limitations concerning the short-term event study are discussed, followed by those of the long-term study.

MacKinlay (1997) argues of three main issues with short-term event studies. These are the role of the sampling interval, inference with event-date uncertainty, and robustness of results – although he mentions that the latter seldom poses any real problems. Firstly, he argues that the power of the test decreases as the event window becomes longer. The longest event window of this study is eleven days, indicating that we might encounter problems with the power of the tests and therefore may not be able to draw any conclusions from the results related to those event windows. Secondly, in event studies it is assumed that the exact event date can be identified with certainty. At first, this does not seem to be a problem in this study since the corresponding event dates are required by law to be provided accurately. However, what we cannot be sure about is whether any information has been leaked beforehand. Although difficult to control for, it is commonly solved by including days prior to the event date in the event windows. As this increases the total number of days included in the windows, it will weaken the power of the tests in accordance with the above discussion. Looking at this paper, it is noteworthy that the effect of these methodological limitations should be small as the event windows are considered short and the event dates are precisely defined. In accordance with MacKinlay (1997) we should be able to reach well-defined test statistics in this section of the study.

According to Barber and Lyon (1997), long-term event studies are commonly associated with high variability in abnormal returns and this is generally considered a main drawback of the methodology. The high variability is derived to the use of estimator for expected returns in abnormal return calculations. Here, the reference portfolio approach is associated with three main biases, in essence causing test statistics to be negatively biased. In order to alleviate these biases the authors propose using a matching firm based on size and valuation metrics, which ultimately will diminish the abovementioned biases. However, some extreme outliers will likely arise using the latter method, as the matched firm might move in any direction relative to the sample firm and thus create a large spread in abnormal returns. This is a clear limitation in the long-term study of this paper as the sample size is narrowed to a particular group of insiders in accordance with the third research question in section 3.1.2. Due to the small sample, and the inability to increase the size of the sample as the time interval is fixed from January 1st 2011 to December 31st 2015, this paper might have difficulties high variability in abnormal returns.

4. Data

Following the methodologies applied in this study, mainly two types of data will have to be collected; share prices and data on insider transactions. Furthermore, the raw dataset created from these two data types needs to be cleaned from any noise that might affect the reasoning behind observed relationships. In this section we will explain how the sample dataset was collected and refined, followed by a concise description of the distributions in our key variables.

4.1 Share prices and market indices

The data on share prices has been collected from FactSet and includes the 321 firms on the OMX Stockholm All Share index that trade on large, mid and small cap. The time interval has been set to January 1st 2011 to December 31st 2015. Regarding limitations, the dataset has been limited to high-liquidity firms by excluding firms turning over less than an average of 10 000 shares per day, the intuition being that illiquid firms will have a harder time adjusting for any new information that might follow an insider transaction. As for indices, OMX Stockholm All Share is used as the reference index for abnormal return calculations in the short-term event study. In the long-term event study, the OMX Stockholm Small Cap is used as reference portfolio. Data for these indices has been downloaded from the website of Nasdaq Sweden for the time period corresponding to that of the share prices. Finally, matching firms have been identified using data from Bloomberg, and the chosen control firm's stock prices have been downloaded from the website of Nasdaq Sweden.

4.2 Insider transactions

In Sweden, insider transactions are scrutinised by the Swedish Financial Supervisory Authority (SFSA) that subsequently documents them in a directory named "Insynsregistret". This is the database that we used to download data of insider transactions in the Stockholm Stock Exchange between January 1st 2011 and December 31st 2015. The collected data has been limited to solely include stocks and transaction type has been limited to buy and sell transactions made on behalf of the insider's own account or legal entity. Any observations without information regarding the insider's position in the company have been excluded as well, resulting in transactions solely made by executive and non-executive directors. Lastly, any observations publicised more than seven days after the transaction date (set to the event date) have been excluded. The gap between transaction and reporting date was thoroughly researched by Bettis, Vickrey and Vickrey (1997) and the rationale for excluding these transactions is that the transaction can be leaked to external parties. Post the above-mentioned limitations, the remaining dataset consists of 6,259 transactions.

Furthermore, an informative transaction is certainly not the only event that could cause share prices to move in an abnormal manner. Thus, the potential noise of other share price-affecting events must be controlled for and we have applied two decision rules for that purpose:

1. We exclude any observation that takes place ten days prior to ten days after a quarterly or annual report. We expect many transactions to fall within this interval, as insiders are not allowed to trade in their own firm's stock within 30 days prior to the release of such a report (§15 2000:1087) and therefore likely will perform the transaction shortly after this date. Since we want to minimise noise around the insider transaction, these observations are excluded from the study. Data for the release dates have been gathered from Bloomberg.
2. Additionally, we also investigated a random subsample of 431 firms and evaluated whether they have released any informative news that might cause abnormal movements in share prices around the time of the event dates. Our exclusion rule entailed excluding observations with any obvious share price-moving events happening within ten days of the event date. Examples of such events include changes of CEO/CFO, any substantial new deals or contracts, and regulatory changes with clear operational implications. As with the first decision rule, the objective is to remove noise and increase causality in our results.

4.3 Distribution of key variables

The resulting dataset after controlling for the above is a total of 738 transactions – summary statistics of these are presented in table 2. As an introduction to our dataset, table 1 reports and explains the dummy variables included in the study. The observations are skewed towards buy transactions, which account for about 71% of the total transactions. This finding contradicts those of Seyhun (1986) and Lakonishok and Lee (2001) that found more sell than buy transactions. This has been explained with corporate remuneration packages as, in the US, senior employees receive a large part of their compensation in bonuses, options and equity plans, thus accumulating large amounts of equity in their own companies. The authors then argue that that equity is sporadically divested due to e.g. diversification or liquidity needs.

Furthermore, the ratio between executive and non-executive observations is 1.56 and hence executives are more frequent traders in our sample as compared to non-executives. Moreover, the sample is skewed towards larger firms as the distribution is 213, 262 and 263 transactions for firms in small, mid and large cap, respectively. This may be explained by limitations made conditional on trading liquidity, as this restriction will likely reject more small cap than large cap firms. Finally, table 1 show that the observations are centred in the transaction amount interval between 100 and 500kSEK, and that large transactions (over 500kSEK) are more common than small transactions (less than 100kSEK).

Table 1 - Dummy variables
This table introduces the variables included in the study. Dummies for the insider positions are split in two, each indicating buy or sell transaction.

Variable	Description	Total observations
Buy	Dummy indicating buy transaction	518
Sell	Dummy indicating sell transaction	220
Executive buy/sell	Dummy indicating executive's buy/sell	310/140
Non-executive buy/sell	Dummy indicating non-executive's buy/sell	208/80
Large cap	Dummy indicating large cap firm	263
Mid cap	Dummy indicating mid cap firm	262
Small cap	Dummy indicating small cap firm	213
Large amount	Dummy indicating large transaction amount (>500kSEK)	216
Mid amount	Dummy indicating mid transaction amount (100 - 500kSEK)	346
Small amount	Dummy indicating small transaction amount (<100kSEK)	176

Hereinafter follows a description and basal analysis of the distributions of the key variables in table 2. Studying Panel 1, one key takeaway is that transactions are evenly distributed over the years, except during 2013 for purchases and 2011 and 2015 for sell transactions. There is no clear explanation for the observed distributions. However, as decision rules for exclusions have been the same for each of the firms, consecutive over the five-year period, there should not exist any sampling error in this distribution.

Panel 2 summarizes transactions over the four different event windows. As is apparent there are fewer transactions the larger the event windows. This distribution is explained by the fact that we did not allow any overlapping event and estimation windows. Therefore, when the total window increases there will be more overlapping and hence fewer observations. The ratio between purchases and sales is 2.35 for the one-day event window, and the same ratio in the eleven days window is 2.74. Hence, there are more sell transactions excluded than buy transactions in the longer event windows.

Moving to Panel 3 it becomes apparent that the ratio of executives' to non-executives' transaction is positively correlated with firm size, for both buy and sell transactions. This is an interesting observation as it shows that executives trade more in larger firms and non-executives trade more in smaller firms in our sample. This will be crucial to keep in mind when evaluating any differing effect of firm size between executives and non-executives in section 5.

Panel 4 and 5 concerns transaction amount and reveals that buy transactions have a lower absolute mean than do sell transactions. An explanation for this can be found in Panel 5, showing that sell transactions mainly fall into the "large" category" whereas buy transactions mainly fall into the "mid" category. Thus, the lower mean among buy transactions can be explained by the

fact that they are more evenly distributed when it comes to size, as opposed to sell transactions that are positively skewed towards “large” transactions.

TABLE 2

Panel 1 - Yearly distributions

Number of observations separated over the years included in the dataset.

	Buy			Sell		
Year	Executive	Non-executive	Total	Executive	Non-executive	Total
2011	64	51	115	16	12	28
2012	63	42	105	34	16	50
2013	54	34	88	31	22	53
2014	67	42	109	32	23	55
2015	62	39	101	27	7	34
Total	**310**	**208**	**518**	**140**	**80**	**220**

Panel 2 – Distributions over event windows

Number of observations in each of the event windows.

	Buy			Sell		
Year	Executive	Non-executive	Total	Executive	Non-executive	Total
One day	310	208	518	140	80	220
Three days	280	176	456	116	72	188
Seven days	195	123	318	76	45	121
Eleven days	160	100	260	61	34	95

Panel 3 - Distributions over lists

Number of observations separated into which exchange list the insider transactions occurred in.

	Buy			Sell		
Exchange	Executive	Non-executive	Total	Executive	Non-executive	Total
Small cap	92	72	164	27	22	49
Mid cap	102	74	176	49	37	86
Large cap	116	62	178	64	21	85
Total	**310**	**208**	**518**	**140**	**80**	**220**

Panel 4- Transaction amount

Summary statistics of transaction amount in the total sample of 738 observations.

Amount (SEK)	Obs	Mean	Min	Max
Buy	518	2,896,706	668	232,030,500
Sell	220	-9,732,421	-722,850,000	0

Panel 5 - Transaction amount groups

Transactions divided into groups based on absolute transaction amounts in SEK. Small contains transactions that amount to less than 100kSEK, Mid contains transactions between 100kSEK and 500kSEK and Large contain transactions with over 500kSEK in value.

Group	Small	Mid	Large
Buy transactions	148	256	114
Sell transactions	28	90	102
Total transactions	**176**	**346**	**216**

Source: Insynsregistret, Nasdaq OMX Stockholm

5. Results and discussion

By applying the refined data to the aforementioned methodology of choice, we are able to draw results that will guide this paper in answering the initial research questions and hypotheses. These results will be divided into two main sections that are unequivocally linked together. The first section portrays descriptive statistics of the sample and contains key takeaways liked to those statistics. The second section concerns statistical tests and conveys the results connected to the initial short-term event study, followed by those of the long-term study.

5.1 Descriptive statistics

This section will start of by portraying descriptive statistics for CARs conditional on transaction type. Following this, the same statistics will be shown divided into the insider positions and finally be provided by firm size.

Table 3 reports descriptive statistics divided into transaction type. As shown in section 4, a majority of the transactions are buy transactions; hence the median CARs could be expected to be positive, which is shown in panel 1. With the aforementioned distribution in mind, it is not surprising to find that the average CARs also are positive. One takeaway from panel 1 is that the average CAR decreases between the seven and eleven days event window, which indicate that returns are closer to zero for days farther afield the event date. This is a common observation in short-term event studies according to MacKinlay (1997), as longer event windows generally are associated with less power. The aforementioned can be observed through both lower average CARs and higher relative standard deviation for the longest event window. In this study, panel 1 show that the seven day event window contains the largest median and average CARs for buy transactions, and the three days window correspondingly for sell transactions. Furthermore, panel 1 provides evidence that the CARs for the longer event windows are more positively skewed than for the shorter, as the average CARs are significantly higher than the median CARs in the former's windows.

Panel 2 and 3 separates panel 1 into descriptive statistics for buy and sell transactions individually. The observed positive skewness of abnormal returns now becomes apparent even in the smaller event windows looking at buy transactions, where the difference is as much as 0.4 p.p. and 0.5 p.p. for the three days event window and the seven days event window. The same observation is not that economically significant for sell transactions, which seem to be more evenly distributed. Furthermore, this distribution is also shown in the standard deviations, which are consistently higher over all event windows for the buy compared to the sell. Additionally, the spread between min and max CARs is considerably higher for buy compared to sell transactions. Hence, the descriptive statistics provide evidence of outliers among the buy transactions.

TABLE 3 - Descriptive statistics of cumulative abnormal return by transaction type

Panel 1 – All transactions

Descriptive statistics for all transactions, over our four event windows. The one-day event window contains our full dataset, while longer windows include sub-parts as explained in section 4.3.

Event windows	One day	Three days	Seven days	Eleven days
Obs	738	644	439	355
Min	-9.1%	-18.3%	-29.8%	-35.6%
Mean	0.1%	0.2%	0.6%	0.5%
Median	0.0%	0.0%	0.3%	0.1%
Max	22.0%	26.9%	27.3%	44.5%
Standard deviation	2.4%	3.8%	5.6%	7.8%

Panel 2 – Buy transactions

Descriptive statistics for the buy transactions, over our four event windows. The one-day event window contains our full dataset, while longer windows include sub-parts as explained in section 4.3.

Event windows	One day	Three days	Seven days	Eleven days
Obs	518	456	318	260
Min	-9.1%	-12.4%	-29.8%	-22.6%
Mean	0.3%	0.7%	1.0%	0.9%
Median	0.1%	0.3%	0.5%	0.4%
Max	22.0%	26.9%	27.3%	44.5%
Standard deviation	2.5%	3.9%	5.7%	7.9%

Panel 3 – Sell transactions

Descriptive statistics for the sell transactions, over our four event windows. The one-day event window contains our full dataset, while longer windows include sub-parts as explained in section 4.3.

Event windows	One day	Three days	Seven days	Eleven days
Obs	220	188	121	95
Min	-5.7%	-18.3%	-28.8%	-35.6%
Mean	-0.3%	-0.9%	-0.4%	-0.6%
Median	-0.4%	-0.9%	-0.1%	-0.7%
Max	9.1%	7.7%	15.2%	27.6%
Standard deviation	1.8%	3.2%	5.1%	7.4%

Further, table 4 reports descriptive statistics divided into the position of the insider. Starting at buy transactions the positive skewness of CARs mentioned above is apparent for each of the two insider groups. One takeaway looking at buy transactions is that non-executives have higher means and medians consistently over the event periods as compared to executives. Additionally, standard deviations seem to be larger for non-executives. Figure 1 in appendix graphically explains the differing mean returns shown in panel 1 and 3 for executives and non-executives and these statistics clearly indicate that the excess returns will be higher following a non-executive's purchase as compared to an executive. Continuing with sell transactions, essentially the same distribution of CARs can be seen in the sell transactions as well where the group of non-executives have more negative means and medians than executives. This is graphically shown in figure 2 in appendix. Similarly,

standard deviations are higher for non-executives as well, as reported in table 4. One interesting observation is that the mean CAR for executive sell transaction is positive for the longer event windows. Although standard deviations are relatively large, which will have implications in the statistical tests reported in the next section.

TABLE 4 - Descriptive statistics of cumulative abnormal returns by insider position

Panel 1 – Executives' buy transactions

Descriptive statistics for all transactions, over our four event windows.

Event windows	One day	Three days	Seven days	Eleven days
Obs	310	280	195	160
Min	-7.77%	-12.38%	-29.82%	-22.64%
Mean	0.16%	0.47%	0.52%	0.33%
Median	0.04%	0.06%	0.27%	-0.29%
Max	22.02%	18.48%	16.67%	44.49%
Standard deviation	2.42%	3.74%	5.52%	8.69%

Panel 2 – Executives' sell transaction

Descriptive statistics for the buy transactions, over our four event windows.

Event windows	One day	Three days	Seven days	Eleven days
Obs	140	116	76	61
Min	-5.70%	-10.07%	-8.02%	-12.60%
Mean	-0.38%	-0.79%	0.18%	0.55%
Median	-0.34%	-0.94%	-0.09%	0.95%
Max	3.59%	6.84%	15.17%	27.61%
Standard deviation	1.35%	2.74%	4.51%	6.90%

Panel 3 – Non-executives' buy transactions

Descriptive statistics for the sell transactions, over our four event windows.

Event windows	One day	Three days	Seven days	Eleven days
Obs	208	176	123	100
Min	-9.09%	-10.52%	-10.04%	-17.43%
Mean	0.58%	1.03%	1.84%	1.78%
Median	0.24%	0.58%	1.16%	1.46%
Max	19.49%	26.93%	27.29%	23.63%
Standard deviation	2.70%	4.22%	5.95%	6.47%

Panel 4 – Non-executives' sell transactions

Descriptive statistics for the sell transactions, over our four event windows.

Event windows	One day	Three days	Seven days	Eleven days
Obs	80	72	45	34
Min	-5.66%	-18.30%	-28.80%	-35.63%
Mean	-0.14%	-1.06%	-1.51%	-2.79%
Median	-0.53%	-0.99%	-1.45%	-1.29%
Max	9.09%	7.72%	6.30%	8.15%
Standard deviation	2.35%	3.78%	5.93%	7.91%

Table 5 reports descriptive statistics of CARs by firm size groups. The key takeaway from this table is that there seem to be a negative relationship between firm size and mean returns, something that would be in line with findings of previous literature such as Seyhun (1986). Additionally, the mean and median returns for large firms are negative for the shorter event windows. An explanation for this might be found in section 4.3, where table 2 indicate a sell transaction of over 700MSEK. However, the legitimacy of the negative mean and medians will be shown in the following section using statistical tests of significance.

TABLE 5 - Descriptive statistics of cumulative abnormal returns by firm sizes

Panel 1 – Large cap firms

Descriptive statistics for the large cap transactions transactions, over our four event windows.

Event windows	One day	Three days	Seven days	Eleven days
Obs	263	226	149	121
Min	-5.70%	-18.30%	-28.80%	-35.63%
Mean	-0.18%	-0.15%	-0.07%	-0.30%
Median	-0.24%	-0.11%	0.26%	0.12%
Max	8.17%	18.48%	13.96%	44.49%
Standard deviation	1.52%	3.04%	4.18%	7.12%

Panel 2 – Mid cap firms

Descriptive statistics for the mid cap transactions, over our four event windows.

Event windows	One day	Three days	Seven days	Eleven days
Obs	262	235	160	124
Min	-9.09%	-10.52%	-13.03%	-21.44%
Mean	0.05%	0.08%	0.80%	0.89%
Median	0.06%	-0.25%	0.55%	0.44%
Max	10.78%	16.11%	27.29%	23.63%
Standard deviation	2.08%	3.62%	5.37%	6.81%

Panel 3 – Small cap firms

Descriptive statistics for the small cap transactions, over our four event windows.

Event windows	One day	Three days	Seven days	Eleven days
Obs	213	183	130	110
Min	-7.77%	-12.38%	-29.82%	-22.64%
Mean	0.66%	0.86%	1.23%	0.86%
Median	0.31%	0.50%	0.61%	-0.09%
Max	22.02%	26.93%	18.95%	28.51%
Standard deviation	3.27%	4.70%	7.07%	9.43%

5.2 Statistical tests

In this section we provide the results of our OLS regressions, reported in table 6 and 7. Firstly, we will evaluate the first research question and investigate whether there are any excess returns surrounding insider transactions. Secondly, we will investigate the effect of insider position according to our

second research question. Thirdly, we will evaluate if firm size and transaction amount have any significant effect on CARs in order to proceed to the final section where we provide the result of two t-test of whether outside investors profitably can trade on any informational value in the insider transactions.

5.2.1 Excess returns around insider transactions

Regression 1, 5, 9 and 13 in table 6 and 7 report the estimated beta coefficients for buy and sell transactions respectively. As shown in panel 1 in table 6, insiders' purchases are associated with positive excess returns, with beta coefficients of between 28 - 68 basis points (b.p.) that is significant at the 1%-level for the one, three and seven days event window respectively. The interpretation of this is that if an insider transactions is a purchase, the CAR increases by 28 b.p., 56 b.p. or 68 b.p. on average in the one-day, three-day and seven-days event windows respectively. This interpretation will apply to all of our dummy beta coefficients that is reported in section 5. The eleven days event window show a beta coefficient for the buy dummy of 45 b.p., although only significant at the 10%-level.

Furthermore, insiders' sell transactions, reported in panel 2 are associated with negative excess returns, although only significant in the one and three-days event windows.

Resultantly, we can reject the null hypothesis that insider transactions are not followed by abnormal returns in the one and three day event window. In the longer event windows, we can only reject the null hypothesis on the 1%-level for insiders' purchases in the seven days period.

5.2.2 Excess returns and insider position

Starting with executives in table 6 we find evidence of a positive beta coefficient for executives purchases in the three and seven days event window (regression 6 and 10), significant on the 5% and 10%-level respectively, The coefficient for their purchases is 41 b.p. and 38 b.p. for the two event periods respectively. In the last two regressions in each event window we attempt to strengthen the estimation model by including control variables and industry fixed effects. For executives, we find no significant relationship of their purchases as surrounding abnormal returns when using these additional controls

Furthermore, we report results on executives' sell transactions in panel 2, which shows that the relationship is negative and significant at the 1%-level for the one and three days event windows. The beta coefficients are -38 and -66 b.p. respectively for the two windows. As opposed to the group's purchases the beta coefficients are statistically significant including the control variables and industry fixed effects.

In table 7 regression results are shown for non-executives. In panel 1, regressions 2, 6, 10 and 14 report that this group's purchases are associated with positive excess returns over all event windows, which is significant at the 1%-level. The beta coefficient for the non-executive buy dummy is between 53 and 112 b.p.. The beta coefficient for the dummy of non-executives' purchases seems to

be of larger economic magnitude (higher beta) than the whole group of insiders (buy variable), which opposites our findings for executives. Additionally, the relationship does not change in any greater extent including the control variables and industry fixed effects.

Moreover, as shown in panel 2 in table 7, non-executive's sell transactions are associated with negative abnormal returns, although only significant at the 5%-level for the three and eleven-days event windows as shown in regression 6 and 13. Although, as we include control variables and industry fixed effects to the estimation model the results become significant at the 1%-level for the three days window (regression 7 & 8) and at the 5-level for the seven and eleven days window (regressions 11, 12, 15 & 16). The coefficients are -1.21%, -1.45% and -1.75% for the event windows respectively.

Overall, we find evidence that insider positions do have effects on excess returns. Furthermore, a key takeaway from the results is the indication of that non-executives thoroughly post larger abnormal returns around the time of insider transactions. With the aforementioned in mind, we find no support for the IHH in the Swedish stock market. These results are in line with those of Jeng, Metrick & Zeckhauser (1999).

5.2.3 Excess returns, firm size and transaction amount

The key finding in the control variables is that transactions in small cap stocks seem to be associated with more positive returns than transactions in the other size groups. For purchases we only find significance in the one-day event period, where the small cap dummy has a beta coefficient of 48 b.p. and 36 b.p. for executives and non-executives respectively, as seen in regression 4 in table 6 and 7. The associated significance levels are 5% and 10%. Furthermore, the large cap dummy seem to have a negative relationship with CARs in the one-day event window as the coefficient is -25 b.p., significant at the 5%-level in regression 4 in table 7 for non-executives.

Evaluating the effect of firm size on CARs for sell transactions indicate a relationship of over 50 b.p. for both executives and non-executives on small cap firms, both significant at the 1%-level. A positive beta coefficient implies that the negative CAR is counter-affected if the transactions occur on small cap as opposed to mid cap. Overall, other studies that also found a negative relationship between firm size and abnormal return were Seyhun (1986), Lakonishok and Lee (2001) and Zingg et al. (2007).

Furthermore, we find weak results for that transaction amount should have any particular effect on CARs. For non-executives we find positive coefficients of 68 b.p. and 81 b.p. for large amounts in the seven- and eleven-days event windows respectively, significant at the 10%-level. These results are concurring with those of the consensus in previous research.

TABLE 6 - OLS Regression results on executives transactions

Panel 1 – Executives purchases

Each column represents regressions in our event windows. Values in percentage points. Variables buy & sell contains both executive's and non-executive's transaction. Accordingly, executive's transactions are preceded with the prefix "E.". Variables large cap and small cap are referring to changes relative to mid cap firms. Consequently, variables large amount and small amount are relative to mid amount. Robust standard errors are posted in parentheses below the beta coefficients. Asterisks refer to significance levels: * = 10% signigicane, ** = 5% significance & *** = 1% significance.

Regression	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Event window	One day	One day	One day	One day	Three days	Three days	Three days	Three days	Seven days	Seven days	Seven days	Seven days	Eleven days	Eleven days	Eleven days	Eleven days
Buy	0.28***				0.56***				0.68***				0.45*			
	(0.09)				(0.15)				(0.19)				(0.25)			
E. buy		0.11	0.65	0.65		0.41**	0.32	0.32		0.38*	0.15	0.15		0.17	0.21	0.21
		(0.11)	(0.15)	(0.15)		(0.19)	(0.24)	(0.24)		(0.22)	(0.30)	(0.30)		(0.35)	(0.42)	(0.42)
Large cap			-0.20	-0.20			-0.27	-0.27			-0.30	-0.30			-0.36	-0.36
			(0.13)	(0.13)			(0.24)	(0.24)			(0.59)	(0.59)			(0.41)	(0.41)
Small cap			0.48*	0.48**			0.42	0.42			0.59	0.59			0.30	0.30
			(0.19)	(0.19)			(0.29)	(0.29)			(0.38)	(0.38)			(0.46)	(0.46)
Large amount			0.22	0.22			-0.10	-0.10			0.35	0.35			0.42	0.42
			(0.15)	(0.15)			(0.25)	(0.25)			(0.33)	(0.33)			(0.42)	(0.42)
Small amount			-0.06	-0.06			0.21	0.21			0.32	0.32			-0.11	-0.11
			(0.18)	(0.18)			(0.28)	(0.28)			(0.37)	(0.37)			(0.49)	(0.49)
Industry F.E.				X				X				X				X
Constant	0.00**	0.00	0.00	0.00	0.00***	0.00	0.00	0.00	0.00	0.00**	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Panel 2 – Executives sales																
Sell	-0.29**				-0.77***				-0.25				-0.28			
	(0.12)				(0.20)				(0.26)				(0.33)			
E. sell		-0.38***	-0.47***	-0.47***		-0.66***	-0.82***	-0.82***		0.10	-0.12	-0.12		0.24	0.18	0.19
		(0.11)	(0.14)	(0.14)		(0.21)	(0.25)	(0.25)		(0.28)	(0.32)	(0.32)		(0.38)	(0.42)	(0.42)
Large cap			-0.09	-0.09			0.01	0.01			-0.22	-0.22			-0.32	-0.32
			(0.12)	(0.12)			(0.22)	(0.22)			(0.27)	(0.27)			(0.40)	(0.40)
Small cap			0.55***	0.55***			0.60**	0.60**			0.70*	0.75*			0.35	0.35
			(0.19)	(0.19)			(0.27)	(0.27)			(0.36)	(0.36)			(0.48)	(0.48)
Large amount			0.08	0.08			-0.01	-0.01			0.65*	0.36			0.38	0.38
			(0.15)	(0.15)			(0.24)	(0.24)			(0.33)	(0.33)			(0.41)	(0.41)
Small amount			-0.15	-0.15			0.37	0.37			0.39	0.39			-0.02	-0.02
			(0.16)	(0.16)			(0.28)	(0.28)			(0.36)	(0.36)			(0.46)	(0.46)
Industry F.E.				X				X				X				X
Constant	0.00***	0.00**	0.00	0.00	0.00***	0.00**	0.00	0.00	0.00***	0.00***	0.00	0.00	0.00*	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406

TABLE 7 - OLS regression results for non-executive directors

Panel 1 – Non-executives purchases

Each column represents our event windows. Values in percentage points. Variables buy & sell contains both executive's and non-executive's transactions and our posted as references. Accordingly, non-excutive's transactions are preceded with the prefix "N.E.". Variables large cap and small cap are referring to changes relative to mid cap firms. Consequently, variables large amount and small amount are relative to mid amount. Robust standard errors are posted in parentheses below the beta coefficients. Asterisks refer to significance levels: * = 10% signigicane, ** = 5% significance & *** = 1% significance.

Regression	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Event window	One day	One day	One day	One day	Three days	Three days	Three days	Three days	Seven days	Seven days	Seven days	Seven days	Eleven days	Eleven days	Eleven days	Eleven days
Buy	0.28***				0.56***				0.68***				0.45*			
	(0.09)				(0.15)				(0.19)				(0.25)			
N.E. buy		0.53***	0.53***	0.53***		0.79***	0.84***	0.84***		1.12***	1.02***	1.02***		0.87***	0.89***	0.89***
		(0.16)	(0.18)	(0.18)		(0.23)	(0.28)	(0.28)		(0.34)	(0.37)	(0.37)		(0.31)	(0.40)	(0.40)
Large cap			-0.25**	-0.25**			-0.26	-0.26			-0.38	-0.38			-0.41	-0.41
			(0.12)	(0.12)			(0.21)	(0.21)			(0.26)	(0.26)			(0.38)	(0.38)
Small cap			0.36*	0.36*			0.30	0.30			0.36	0.36			0.30	0.13
			(0.19)	(0.19)			(0.27)	(0.27)			(0.37)	(0.37)			(0.50)	(0.50)
Large amount			-0.11	-0.11			-0.33	-0.33			0.09	0.09			-0.19	-0.19
			(0.16)	(0.16)			(0.26)	(0.26)			(0.34)	(0.34)			(0.45)	(0.45)
Small amount			-0.06	-0.06			0.30	0.30			0.33	0.33			0.07	0.07
			(0.16)	(0.16)			(0.28)	(0.28)			(0.35)	(0.35)			(0.05)	(0.05)
Industry F.E.				X				X				X				X
Constant	0.00***	0.00	0.00	0.00	0.00***	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Panel 2 – Non-executives sales																
Sell	-0.29**				-0.77***				-0.25				-0.28			
	(0.12)				(0.20)				(0.26)				(0.33)			
N.E. sell		-0.14	-0.28	-0.28		-0.95**	-1.21***	-1.21***		-0.85*	-1.45**	-1.45**		-1.19**	-1.75**	-1.75**
		(0.26)	(0.29)	(0.29)		(0.40)	(0.45)	(0.45)		(0.50)	(0.58)	(0.58)		(0.59)	(0.70)	(0.70)
Large cap			-0.18	-0.18			-0.16	-0.16			-0.25	-0.25			-0.30	-0.30
			(0.12)	(0.12)			(0.21)	(0.21)			(0.25)	(0.25)			(0.38)	(0.38)
Small cap			0.52***	0.52***			0.58**	0.58**			0.70*	0.70*			0.44	0.44
			(0.18)	(0.18)			(0.27)	(0.27)			(0.36)	(0.36)			(0.47)	(0.47)
Large amount			0.08	0.08			0.15	0.15			0.68*	0.68*			0.81*	0.81*
			(0.17)	(0.17)			(0.28)	(0.28)			(0.38)	(0.38)			(0.48)	(0.48)
Small amount			-0.02	-0.02			0.39	0.39			0.43	0.43			0.04	0.04
			(0.16)	(0.16)			(0.28)	(0.28)			(0.36)	(0.36)			(0.46)	(0.46)
Industry F.E.				X				X				X				X
Constant	0.00***	0.00*	0.00	0.00	0.00***	0.00**	0.00	0.00	0.00***	0.00***	0.00*	0.00	0.00*	0.00*	0.00*	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406	274,406

5.3 Long-term event study results

According to our third research question this paper will also investigate whether there is any informational value for outside investors to exploit in the trading of the insider group with the most prominent short-term returns.

In the previous sections we found evidence that non-executive directors are accompanied with larger abnormal returns than executives, hence we want to evaluate the former group of insiders. Additionally, in the one-day event window we find significance for larger returns for smaller firms, which is also supported by the results of Seyhun (1986), Lakonishok and Lee (2001) and Zingg et al. (2007). Hence, the chosen group of transactions to replicate will be those that non-executives execute on small cap firms. Table 8 in appendix reports the 45 transactions that are included in the identified target group.

Following our methodology outlined in section 3.2.2, we calculate a test statistic based on average BHAR, the standard deviation of the same over the sample transactions and the number of observations included using both the reference portfolio and the matching firms approach. These statistics are reported in table 8 in appendix.

First of, we will provide the resulting test statistic using the reference portfolio approach and then the one using matching firms.

Using the reference portfolio approach our test statistic will be:

$$t_{BHAR} = \frac{\overline{BHAR}}{\left(\frac{\sigma(BHARit)}{\sqrt{n}}\right)} = \frac{6.23\%}{\left(\frac{0.71}{\sqrt{45}}\right)} = 0.56$$

For the matching firms methodology it will be:

$$t_{BHAR} = \frac{\overline{BHAR}}{\left(\frac{\sigma(BHARit)}{\sqrt{n}}\right)} = \frac{1.73\%}{\left(\frac{0.66}{\sqrt{45}}\right)} = 0.18$$

The resulting test statistics are associated with p-values of 0.56 and 0.86 respectively, and they are therefore statistically insignificant. Accordingly, we fail to reject the null hypothesis that the average BHAR equals zero.

6. Conclusion

In support of previous literature, this paper finds that there are short-run excess returns connected to both buy and sell insider transactions on the Swedish stock market. The interpretation of this outcome is that the market places an informational value on the trades of insiders, which is intuitive. However, this paper makes no attempt to evaluate whether insiders can profitably exploit these opportunities, as that would require the implementation of a more detailed portfolio approach. This part of the study simply investigates any excess returns following insider transactions on the Swedish stock market.

Following the validation of excess returns, the second part of the study fails to find support for the information hierarchy hypothesis (IHH) for the Swedish stock market in the short-run, as the returns of executives are not higher than those of non-executives. This implies that the market does not place a higher relative informational value on the trades of people closer to the daily operations of the business. These results contradict those of Seyhun (1988) and Lin and Howe (1990), while they are in line with those of Jeng, Metrick and Zeckhauser (1999) that raise the argument of more informed insiders being more heavily scrutinised. They argue that this makes more informed insiders reluctant to trade on their informational advantage, in turn effectively reducing the informational value of their trades. Another possible reason for the higher informational value of non-executives could be linked to signalling theory. As non-executives are less publicly scrutinised, they can make trades in accordance with their own preferences, as opposed to executives that instead may be obliged to make certain trades in order to satisfy stakeholders. However, we should be careful with speculations without statistical support, hence we should not put too much emphasis on this kind of reasoning.

As this study finds the highest excess returns connected to non-executives' transactions in Swedish small cap firms, the final section of the paper examines whether outside investors could generate excess returns by replicating the trades of this particular group of insiders. After creating a rolling portfolio of these transactions with a one-year holding period, we found no significant evidence connecting that strategy to the generation of excess returns. The insignificance remains for the reference portfolio as well as for the matching firms approach and can be attributed to the previously discussed problems connected to long-term abnormal returns studies. One way to improve the study would be to increase sample size, for example by investigating a longer time period and thus reaching a larger number of observations. However, this is left in the hands of future research and thus the gap in existing literature related to replication strategies in the Swedish stock market remains to be filled.

The main implications of this paper are connected to economic theory and the interpretation of previous research. Firstly, our initial results fortify the general consensus in previous research stating that insider transactions are connected to excess returns. Secondly, and perhaps more interestingly, are the results in the more heavily debated area of the IHH. As no support is found for

executives having higher informational value than non-executives, this paper joins criticisers of the IHH and thus provides support for the semi-strong form of the EHM.

7. Suggestions for future research

Regarding the final section of this paper, the underlying idea of forming a trading strategy based on the findings of short-term excess returns remains to be investigated with statistically significant results. Future research could increase the chances of reaching significance by for example investigating a longer time interval, leading to more observations and thus reducing the variance of the sample. This would be a step in the right direction towards closing the existing literature gap related to replication strategies in the Swedish stock market.

8. References

There are three different types of references used throughout this paper; periodicals, internet sources and textbooks. Periodicals have formed the ground of this study, representing the reference literature that has been continuously leaned upon throughout the course of the paper. Internet sources have been used to collect data for the raw data set as well as for downloading earnings announcement dates in order to control for disturbing events. Lastly, a textbook in econometrics was used as a guide in different statistical concerns that came up along the composition of the paper.

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Finansinspektionen. (2016) [Online]. Available at: www.finansinspektionen.se (Accessed: February, 2016)

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8.3 Textbooks

Wooldridge, 2014, Introduction to Econometrics (Cengage Learning EMEA)

9. Appendix

9.1 Definitions

A *corporate insider* refers to anyone that possesses particularly good prerequisites for receiving insider information due to their position in a company comprised by the Swedish insider law Lag (2005:377). Examples of insider positions include board member, alternate director, chief executive officer, auditor, large shareholder owning more than 10 % of the capital or votes, and anyone else having a leading position in the company.

An *executive director* is a person holding a formal decision-making position in a company. Examples include CEO, chief operating officer (COO), chief financial officer (CFO), and executive board members. On the contrary, a *non-executive director* is a person not holding a formal decision-making position. Examples include large shareholders (holding more than 10 % of capital or votes) and non-executive board members. Non-executive directors are also commonly referred to as "outside directors".

Disclosure requirements on the Swedish market are defined by the central administrative authority Finansinspektionen. Companies are required to disclose any changes in the ownership of corporate insiders within 14 days of the transaction as well as any changes to the insider's position within the firm. Insiders are required to disclose any insider securities owned by themselves or near relatives within 5 days of the transaction.

The efficient market hypothesis (EMH) states that all investors unanimously capture all relevant information. It can be categorised into three basic levels with the weak form stating that the market captures all market information, the semi-strong form stating that the market captures all publicly available information, and the strong form stating that the market captures all public and private information.

The information hierarchy hypothesis (IHH) states that the informational value of an insider trade depends on the type of director making the trade, with directors closer to the daily operations having higher informational value.

9.2 Additional tables and graphs

Table 8 – Buy-and-hold abnormal returns
This table shows the sample firms in the second part of the study, their matched firms and their associated BHAR for both the reference portfolio and the matching firms approach.

Transaction	Sample firm	Matched firm	BHAR (reference port.)	BHAR (match)
1	I.A.R. Systems Group	Midsona	0.5%	16.7%
2	Ework Scandinavia	Endomines	15.4%	34.3%
3	Enea	Vitrolife	-5.8%	1.1%
4	Svedbergs i Dalstorp	Raysearch laboratories	-19.6%	-11.0%
5	Vitec software Group	Odd molly	24.1%	65.2%
6	Svedbergs i Dalstorp	Doro	-34.8%	-20.3%
7	Cellavision	Moberg pharma	29.3%	-47.0%
8	Probi	DGC one	7.6%	3.3%
9	Net Insight	Pricer	-15.2%	-42.0%
10	Rnb Retail And Brands	Cloetta	-23.5%	-34.9%
11	Biotage	Bong	40.6%	101.2%
12	Elanders	RNB	-5.1%	32.3%
13	Svedbergs i Dalstorp	Doro	-44.7%	-25.6%
14	Addnode Group	Cloetta	10.6%	21.1%
15	Know It	Cloetta	-10.2%	11.6%
16	Cellavision	Alltele	1.8%	38.7%
17	Avega Group	CTT systems	-38.1%	-32.7%
18	Ghp specialty Care	Venue retail	32.0%	43.7%
19	Studsvik	GHP	-48.3%	-75.7%
20	Addnode Group	Svolder	-8.5%	-8.1%
21	Acando	Cavotec	-52.4%	-78.4%
22	Feelgood Svenska	Prevas	-22.4%	4.2%
23	I.A.R. Systems Group	Anoto	47.9%	148.7%
24	Elanders	Concordia maritime	68.8%	52.2%
25	Arise Windpower	MQ Holding	-45.3%	-99.6%
26	Black Earth Farming	Formpipe	-66.1%	-69.3%
27	Semcon	Kabe	-43.5%	-18.7%
28	Havsfrun Investment	Anoto	1.9%	19.2%
29	Doro	Malmbergs	-24.8%	-51.3%
30	Ghp specialty Care	Bergs timber	7.8%	34.9%
31	Elanders	Black earth farming	-7.1%	41.8%
32	Prevas	Nordic service	-41.4%	-25.0%
33	Micro Systemation	Bioinvent	253.7%	267.3%
34	Alltele Allmänna Svenska	Doro	-49.0%	-58.9%
35	Beijer Electronics	BTS group	-37.4%	-47.8%
36	Pricer	NAXS	49.2%	49.7%
37	Precise Biometrics	Sensys	339.6%	-90.7%
38	Ework Scandinavia	Sintercast	13.4%	27.3%
39	Dedicare	Uniflex	-2.9%	9.1%
40	Bong	Venue retail group	-33.5%	2.7%
41	Ework Scandinavia	Precise biometrics	11.5%	-93.3%
42	Black Earth Farming	Endomines	7.1%	-20.9%
43	Semcon	Kabe	-10.6%	-23.0%
44	Micro Systemation	eWork	13.5%	11.0%
45	Svedbergs i Dalstorp	Alltele	-5.9%	14.9%
	Mean		**6.2%**	**1.7%**
	Standard deviation		**0.71**	**0.65**

Figure 1 – Cumulative average abnormal return buy transactions

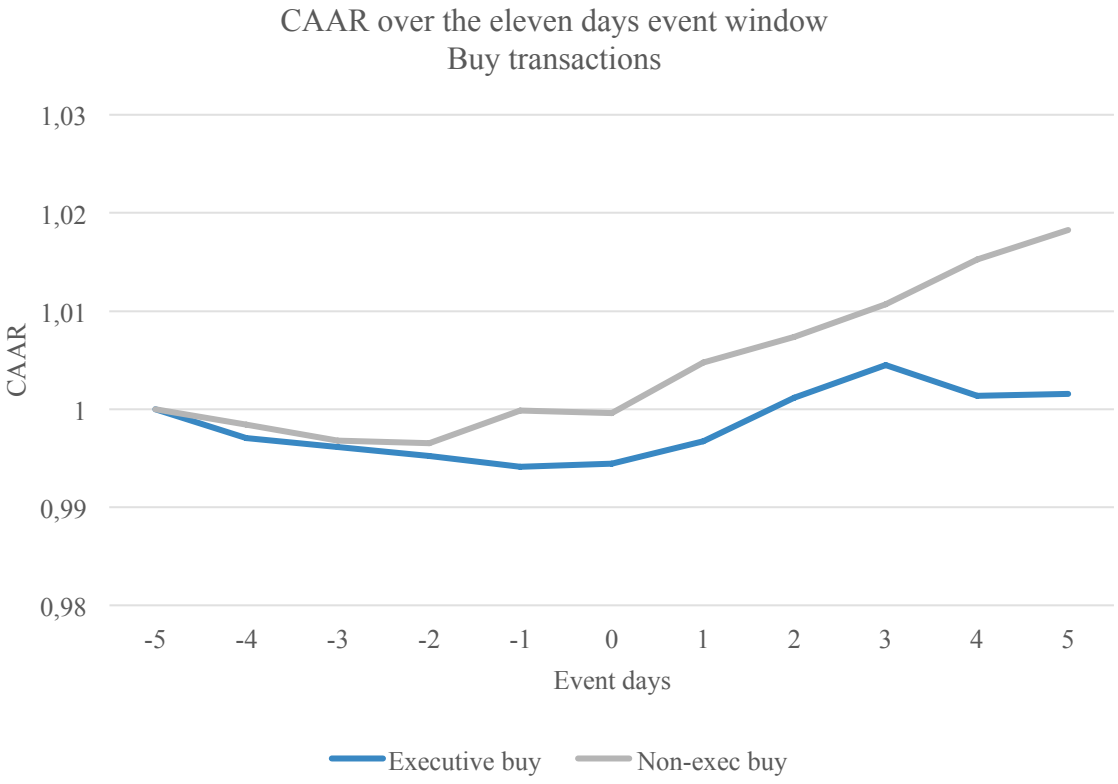

Figure 2 – Cumulative average abnormal return for sell transactions