

-Master Thesis-

- Is it possible to earn abnormal returns by following Insiders? A study from Oslo Stock Exchange (OSE) -

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Abstract

The main purpose of this paper is to study whether it is possible for an outsider to earn abnormal returns by following insider's transactions. The special focus will be to revise both previous research and Dovre studies by splitting the insider transactions into separate groups according to their respective characteristics. In the center of our study we wish to clarify if there are any informational advantages across industries on the Norwegian Stock Exchange. To do so we studied 1 628 insider trades made on the Norwegian Stock Exchange throughout the period 2011 until 2015. To observe the insider effects we followed in the footsteps of earlier research by applying the same methodology as outlined in MacKinlay (1997). From this we found abnormal returns within some groups, namely industries related to domestic business models along with insider trades related to momentum strategies, and market capitalization. In addition we constructed trading strategies based on these results in order to verify their applications by applying them into actual trades. As a result we did not find any significant alphas. Supporting the conclusion in this study that the Norwegian stock market seem to behave according to the semi-strong efficiency hypothesis.

1 Introduction

Over the history both researchers and investors have tried to challenge the market efficiency hypothesis. Insider trading has always been a popular topic of discussion both within the financial industry, the media and the academic environment. The attraction to the topic must be seen in line with the fact that we are constantly faced with speculations that trading on insider signals is profitable, hence making outsiders able to earn abnormal returns by following them. Some will also go as far as to state that insiders use their superior information to gain advantage over non-informed investors, and hence creating abnormal profits.

In this thesis we wish to introduce our thoughts and approach to study whether there is possible to obtain abnormal returns by following the transactions made by insiders. To do so we have formulated many sub-hypotheses, basing each hypothesis by grouping certain characteristics for every individual firm. The characteristics were segregated and created in the following way; first we divided between stocks in high momentum and stocks in low momentum. Secondly we, separated stock into certain financial ratios, for example by grouping firms depending on their market capitalization, price-earnings and price-book value. Thirdly, we distinguished between insiders according to their announced position in the firm. Moreover, we segregated between insider trades made across industries to study if any industries had a more profitable insider. This led us to another idea on how to test for insider trading, where we chose to divide stocks based on their sensitivity towards macro/micro-economic factors. Furthermore, we went out to test if trade volume could reveal different insider effects (appendix 3). Though the main hypothesis tested on Oslo Stock Exchange (OSE) for each of the hypotheses will be:

*H₀: Following insider trades at OSE **does not** give any abnormal returns*

*H₁: Following insider trades at OSE **does** give abnormal returns*

Research evaluating the performance of insider transactions became popular in the 1960s. Consensus seemed to support both Glass and Rogoff (1966) and (Finnerty (1976)) conclusion, that insiders could earn abnormal profits. For example, both

Lakonishok and Lee (2001) and Jeng, Metrick and Zeckhauser (2003) found that insiders in smaller capitalized firms, and insiders trading in large volumes were capable of beating the market with a significant amount of abnormal returns. A research method that will partially be revised in this thesis. However, studies provided by the Norwegian pioneers Eckbo and Smith (1998) believed otherwise. Instead of using the “old” unconditional model they used a new methodology, where they were able to constantly risk adjust the returns from each of the stocks. Their conclusion showed that insiders were unable to achieve abnormal returns on Oslo Børs. They even got some results suggesting that insider’s made negative returns in some incidences

In the light of earlier conducted research, and as were mention in the abstract chapter above, the main part of this study will be to clarify if there are any informational advantages across industries on the Norwegian Stock Exchange. The inspirations to our study were motivated by the facts that there have been made very few documented studies on insiders trading across industries. So far, the only acknowledged paper regarding this was conducted by Seyhun (1998). He studied the *insider effect* among different industries basing each industry on their sensitivity to information. The research in this paper will though be conducted by studying if there are any differences in the information level of insider trades amongst industries (SIC-codes). Furthermore, we intend to supplement the knowledge around insider trading by pursue an unprecedented inquiry to whether there are any different in returns between what we call Macro and Micro sensitive firms. The general idea is that securities that are more exposed and correlated to Macro trends will have a higher level of transparency then firms exposed to the domestic markets, named Micro firms. Knowing that Oslo Børs contains a two folded industry composition mainly incorporating companies being either commodity or service determined. Therefore we assumed Oslo Børs to be a reliable and solid test group to answer attempt to produce ground breaking knowledge.

Given our study that is conducted by studying 1628 insider trades on the Oslo Stock Exchange (OSE) in the timespan between 2011-2015, we will apply both an

event study approach, and a trading strategy approach based on significant results from the event study. Two models were used in the event study, namely the Market Model (MM) and the Carhart Model (CM). In order to obtain the factors, we first created the CM factors (SMB, HML, PR1YR), by applying Kenneth French's method (Appendix 4). However, in order to make the results more reliable we downloaded and decided to use the factors from Professor Bernt Arne Ødegaards webpage¹. Though both methods yielded very similar results, we concluded that Ødegaards were more robust and reliable. Further, all the tests are conducted by applying OLS² regressions with Newey-West robust standard errors, in order to fulfill the OLS requirements and assumptions.

When analyzing the results, we observed that insiders in most occasions were not capable of earning abnormal returns. However, in the situations where we found significant results, these often had too low returns, or a questionable methodology. In those cases where the returns were too low it would be hard, if not impossible to earn abnormal returns if controlling for transaction costs. Also, a well-known fact when conducting event studies is that longer event windows gives higher uncertainty amongst the beta values, as these might change the further out in the event window that is being tested. In order to test these long term abnormal returns further, we made a realistic trading strategy. This trading strategy confirmed our beliefs, and showed either insignificant alphas, or significant underperforming alphas. Hence the conclusion of this thesis is that it is impossible for outsiders to earn abnormal returns by following insiders.

1.1 What is Insider trading?

An Insider is defined by The Norwegian Securities Trading Act (Section 4-2, and 3-6) as: any board of director, manager, or person who are associated with the company as these are subjects for fulfilling certain requirements when conducting a trade within a company³. In that instance inside information is precise

¹ Downloaded Carhart factors from Bernt Arne Ødegaards web page:
http://finance.bi.no/~bernt/financial_data/ose_asset_pricing_data/index.html

² Ordinary Least Squares – OLS

³http://www.finanstilsynet.no/Global/English/Laws_and_regulations/Securities_market/Securities_Trading_Act.pdf

information that is likely to have a significant effect on the price of the security and is not publicly available for the market if traded upon⁴. Insider trading is often generalized and interpreted to be an *illegal* conduct. However an insider is legally permitted to trade shares or other securities in his firm, as long as the intention of the trade is not based on non-public information. Furthermore, in this thesis we will only focus on the legal aspect of Insider trading, assuming that none of the Insider's transactions are made by trading on illegal information.

OSE was long known as the “*Insider Stock Exchange*”⁵ in the media, where the big issue related to this was that private information were leaked to the market and exploited by outsiders, an action that is also regarded as an illegal conduct. However this and a stricter law system both internationally and nationally has made Norway one of the most restricted Stock Exchanges in the world regarding Insider trading. One of the restrictions is that the security act demands an insider to file a notification to the Financial Supervisory no later than the start of the following trading day, hence minimizing the window where information could have been leaked.

The structure of the thesis is as follows: Chapter 2 describes our motivation for this topic with an example of what seems like market efficiency. Chapter 3 summarizes relevant theories and previous research. Chapter 4 describes the data, and contains some summary statistics about the data. Chapter 5 describes the hypotheses, the literature and motivation behind these. Chapter 6 describes the methodology applied in the event study. Chapter 7 is a presentation of the empirical results, containing both theoretical and economic interpretation. Chapter 8 describes the construction of the strategy and the presentation of the results. Chapter 9 describes the implications, and suggestions for further studies, and chapter 10 is the brief conclusion of the thesis.

⁴ http://www.oslobors.no/ob_eng/Oslo-Boers/Trading/Market-surveillance/Insider-trading

⁵ <http://www.hegnar.no/Nyheter/Boers-finans/2009/04/Oslo-Boers-er-innsidboersen>

2 **Motivation**

Through our paper we wish to apply knowledge gained over our two year-long master degree. We therefore felt comfortable to choose a subject that would challenge our prior knowledge from both financial and quantitative courses. As both of us are highly interested in the financial markets, we early on decided to select a thesis concentrating on market principals and arbitrage. Another important feature to our motivation was that we got in contact with the investment fund Dovre Forvaltning. Dovre is a Norwegian fund managed by the acknowledged stock strategist Stig Myrseth who is both founder and CEO of Dovre. Mr. Myrseth has made research on insider trading, claiming to have found a successful recipe to use insider information to create abnormal returns.

“The cornerstone of the investment strategy of Dovre Inside Nordic is investing in Nordic listed shares where there have been significant insider purchases”. Subsequently, insiders have an information advantage, it is therefore reasonable to assume that they over time will do better than the average investor. Dovre are not alone in their beliefs for a success recipe to gain abnormal returns. Trygve Hegnar’s Finansavisen with its “Innsideportefølje” claims to have found an investment strategy that beats the market. Since its startup, back in 1996 Finansavisen claim to have gained excess return 17 out of 18 years. An impressive result, that are in conflict with some of the most accepted financial theories.

Dovre’s success and business concept combined with our beliefs in the market efficiency theory made us curious whether it will be possible to beat the market by taking advantage of insider trading. We therefore felt very lucky when Stig Myrseth promised to supervise and contribute to our thesis granting us access to their database for our study of the insider effect.

2.1 **Motivating example of market inefficiency**

Are markets efficient, and if so, at what degree? Below follows a stock price chart for Eitzen Chemical (ticker ECHEM). Eitzen Chemical is a Norwegian shipping company struggling with high financial distress cost. To save the company, the

board ordered extraordinary meeting on Friday 19th of December to discuss debt restructuring. On Monday 23 December, Eitzen Chemical announced that it had new revolving credit and term loan facility worth USD 100 million, with an option to increase the aggregate principal amount to USD 150 million. This should have led to a stock price to about 6,5 NOK per share. The news were published on Oslo Børs, however investors seemed to overlook this information as the price didn't move through the whole day. During the days after the announcement, it seemed like Mr. Market incorporated the new significant information reacting by sending the share price from around 2 kr to its "true value" of 6,5 kr. According to Dovre this was an obvious arbitrage where Mr. Market mispriced the companies share value by a significant amount. The point we want to bring home is the idea that markets might act inefficient. And if so, why shouldn't insider trade work to generate abnormal returns?



Graph 1: Eitzen Chemical price movement – source: Dovre

3 Theory

3.1 Theory

There are three good reasons to study reported insider trading, as these can be based on different motives such as: science, profit and policy. Science examines the implication of the findings for market efficiency. The profit motive seeks out to develop optimal trading strategies, following the actions of insiders. Moreover the policy motive seeks to determine the effectiveness of insider trading rules, and the implications of any insider advantages for both fairness and market performance.

3.2 *Why do we need to control the insiders?*

In this paragraph we will discuss and present an important backside to why we need market regulation on insider trading along with its relevance to the market efficiency hypothesis. This will be an important framework and needs to be fully understood by the reader before we continue discussing the theories made on insider trading.

Starting by presenting earlier discussions on pros and cons for insider trading. Laffont and Maskin (1990) stated that abnormal returns made by insider transactions creates imperfect competition, which adds a new complication to the efficient market question. Oslo Stock Exchange addresses this issue and claims in their statement that: *“The issue that arises with insider trades is that insiders typically have greater knowledge of what is happening in the future and is therefore better suited to evaluate the future direction of the company’s stock price”*⁶. Transactions made by such insiders might therefore be of highly interest for the non-informed market, and the investor’s decisions regarding their investments.

Although, markets are built upon assumptions and rules, there is a wide agreement that insider trading is something that must be prohibited in order to protect the general public’s confidence in the stock market (Hetzler, 2001). This means that investors need a regulated and transparent market. If there were to be any disbelief about the market regulations, this could bring along market hysteria where the investors refuse to invest in the market. The lack of faith could damage the market, and in the long run destroy the liquidity. Despite the support for market regulation, Finnerty 1976, Haddock and Macey (1987) argues that non-regulated markets could improve market efficiency, believing that transactions made by insiders would reveal the real value of the company, hence the markets would regulate themselves. Manne (1966) argued that by removing the regulation the asymmetric information in the stock prices would decrease. Therefore, resulting in reduced volatility and more accurate stock prices in the advance of an insider’s trade.

⁶ http://www.oslobors.no/ob_eng/Oslo-Boers/Trading/Market-surveillance/Insider-trading

3.3 What is the relationship between Fama and insider regulation?

In Fama's (1970) study regarding the efficient market hypothesis (EMH), he states that it is impossible to earn any abnormal returns above the market. The EMH claims that we expect stock prices to reflect all information at all time. This infers that we would not gain any risk adjusted excess returns over the market and therefore, eliminating the possibility to systematically beat the market over time. Prices are therefore believed to move randomly and only change significantly if new information are published, for instance due to a profit warning. The variation in the stock price is thus reflected in the expected returns, as risks and returns are correlated. As a result of this Fama extended his theory by disaggregating the hypothesis into three groups by classifying the degree of information that the stocks contains. This gave the birth to the new definitions on market information namely the weak form, the semi-strong form and the strong form. The difference among the three is their level of information that is incorporated in the price (Bodie 2005).

The least strict form is the *weak-form* efficiency; this form states that *all historical information* should be included in the stock price. The following form is called *semi-strong-form* efficiency, stating that *all public information* is reflected in the stock price. The strict form is called *strong-form* efficiency, and states that it is not possible to earn abnormal profits at all, as *all information* about a stock is already included in the stock price. When conducting studies regarding *Insider Trading* it is important to make a distinction between the two most strict forms, namely the *semi-strong*, and *strong form*. As the *semi-strong* form implies that an insider can earn abnormal profit if trading on relevant inside information about the security. Thus our main focus will be on whether the insiders are breaking the semi-strong form or not. By that we wish to study if it is possible for an outsider to profit by following an insider, assuming that the insider is not trading on any unpublicized information. Having this in mind and the short time interval on OSE from the trade to the announcement, it becomes interesting to study if we can find some anomalies in the stock market relating to insider trading.

3.4 Price Drift

One of the most acknowledged theories regarding prices movement were made in M. Kendall's (1953) article suggesting that stocks moves randomly. Consequently, rejecting the beliefs that prices follow any kind of fixed behavior or pattern. Kendall compared the stock returns to a coin toss, claiming it to randomly changing from one period to the next. The idea is that the expected price movement was within an upper and lower boundary, having a 50-50% chance to move either direction. Later research on this matter were presented by Foster, Olsen, Shelvin (1984) finding proof of post drift in the period close to firm specific announcements. However, their study concluded that prices tend to have either a stronger positive or negative drift when the announcement was higher or lower than expected. Hence, concluding that investors might earn abnormal returns when purchasing shares close to the announcement date.

3.5 Literature on Insider trading

One of the first acknowledged research ever made on insider trading was presented by Glass and Rogoff (1966) in the 60's. Their study was conducted by dividing monthly returns from buy and sales portfolios based upon transactions and frequency. They created the cumulative abnormal returns by comparing the performance on the security towards the stock exchange. Glass and Rogoff result's showed that their portfolios had a significant higher return than its benchmark.

Lorie and Niederhoffer (1968) did a similar approach as Glass and Rogoff (1966). Their results indicate that data on insider trading can be profitable; concluding that stocks with more frequent transactions conducted by insiders outperformed the market over the following six months. They also found that insiders tend to buy more frequently, but though in smaller portions than they do when selling. More evidence was presented where they observed that after an insider sales transaction, the stock price tended to underperform compared to the index.

As more knowledge about statistical testing along with better market data became available, Jaffe (1974) and Finnerty (1976) made an improved effort to study the

significance on insider trading. Jaffe approached his studies by focusing on larger sample sizes using 200 companies in the period 1962-68. He was the first in his league to adjust for market risk by using a version of the market model. Thereby, his findings were consistent with previous results, finding that insiders do possess valuable information that can provide positive abnormal return up to as long as 8 months after a transaction.

Even so, there was some debate about the quality on the applied data. One of the knockers was Finnerty, who were critical to Glass, Rogoff and Jaffe's material. Believing their data to be unreliable, he stated that the data were as if they had been "skimming the cream of the crop in their sample selection". By this Finnerty meant that research data were biased and only contained the most significant insider returns. After providing his own data Finnerty conducted his own research on insider trading using dividend adjusted data from 1969 – 1972. By constructing buy and sales portfolios. Finnerty found that insiders made positive abnormal return the first two months after the trade were done. He also concluded that even uninformed investors, so called outsiders could earn abnormal profits by imitating the insiders.

Baesel and Stein (1979) studied if insiders could use their superior information by using data provided from the Canadian stock exchange. They found evidence that insiders do earn abnormal returns. However, they also concluded that outsiders could not react to insider trading as a signal about the change in the stock price. This was in line with the findings made by Pope, Morris and Peel (1990) that made a study on stock returns from the United Kingdom.

3.6 Segregation of Insider Transactions accordingly to Characteristics.

The now wide supporting literature on the insider's influence inspired the upcoming research to focus on the characteristics behind the insider transactions. The idea that grew forward was whether some characteristics were more valuable to trade on than others. This subsection will therefore describe the theory behind the hypotheses that will be tested.

3.6.1 Literature on Firm Characteristics:

At the end of the 1970s the researchers now focused more on the relationships between insider's return and their actions regarding firm specific characteristics like: events, size, price, growth and multiples. An example of this was Basu (1977) et.al. who found that stocks with high P/E ratios had higher risk-adjusted returns than low P/E stocks.

Later on Banz (1981) studied the size effect and found that shares in smaller firms earned a higher risk adjusted return than shares in larger firms. Therefore challenging the in-favored CAPM, claiming it to bias the securities expected returns, as the CAPM does not adjust for firm size anomalies. Suggesting that using CAPM as a model when studying insider trading should be used with caution. Further, Lakonishok and Lee (2001) concluded in their study that insiders managed to predict returns in smaller firms, i.e. finding the asymmetric information to be greater in smaller firms than in medium, and bigger sized firms, due to greater scrutiny in higher market capitalized firms. This research was then again confirmed by Jeng, Metrick and Zeckhauser (2003) who came to the same conclusion, indicating that in general, insiders trading in small firms tend to earn abnormal returns.

On the contrary Elliot, Morse and Richardson (1984) and Givoly and Palmo (1985) studied the relationship between insider trading on events and announcements. The study cited evidence on the possibility to profit on insider trading, although they also stated that a lot of the insiders' trades were not related to informational events.

3.6.2 Literature on trade sizes & buy/sell

Continuing on Jeng, Metrick and Zeckhauser's research, they also studied whether or not there was a distinct difference in the insider's abnormal returns by studying the trade volume. They found significant evidence that high-volume and medium-volume purchase portfolios were significant on all tests, over all time horizons. Likewise, they also found that high volume sales, earned positive abnormal returns in the short run, but that this effect diminished in the longer run. Similar results were also found by Lakonishok and Lee, in their study they made 10

portfolios where they grouped and ranked the transactions accordingly to NPR (number of purchases minus number of sales, and then divided by the number of transactions). They found the group with the most purchases compared to sales to yield abnormal returns. In addition, when only looking at small firms they found an abnormal return of 7,7% but when adjusting for size and B/M-effects they still obtained a highly significant result of 4,8%. Thus indicating that insider purchases are more informative than insider sales. Frederich (2002) et.al. explained this by the fact that there can be many more reasons to sell stocks than buying them, for example due to liquidity or tax benefits.

3.6.3 Literature on Insiders Position

Throughout the late 1990's the academics beliefs that insiders could achieve abnormal return increased as more research supported the hypothesis. Though, very few studies concluded that it was possible for an outsider to earn abnormal returns by imitating insiders. Conversely, new evidence made by, Bettis, Vickrey and Vickrey (1997) studying insiders position, concluded that it was possible for outsiders to earn abnormal profit net of transaction costs. Research like this had then earlier been conducted by Seyhun (1986) who studied if there were any difference in the quality level of information between different types of insiders. For example insiders that were expected to have more knowledge about the firm, such as chairmen of the boards, were more successful predictors of abnormal returns than lower positioned executives. In short, the idea behind the research is that higher positioned insiders would have access to more *valuable* information and hence be able to earn higher abnormal profits. Hence, concluding that it was some kind of information hierarchy with top executives at the top, other officers in the middle, and directors at the bottom. In the same study he found evidence that when controlling for transaction cost all the profits for an outsider would disappear, hence making it only possible for insiders to earn abnormal profit on the trade. In further studies Jeng Metrick, and Zeckhauser (2003) finds that all the groups earn abnormal returns, but they were not able to find any differences between the groups, they also argue against Seyhun's findings as top executives are more likely to be scrutinized both by shareholders and regulators. Lakonishok and Lee (2001) split between large shareholders and managers, concluding that managers gives a better signal, and are thus more informative than trades done by

large shareholders. They argue that the most likely reason for this could be explained by the assumption that large shareholders often are excluded from the decision making process of the firm.

3.6.4 Literature on Momentum

The previous research on momentum (Jegadeesh and Titman (1993) et.al.) suggests that stocks that perform well (poor) over a period of 3 to 12 months tend to continue to perform well (poor) over the next 12 months prior to the estimation period. Indicating that stocks tend to be positively auto-correlated over short horizons before they start to mean-revert i.e. they become negatively auto-correlated. In case of insider trades, earlier research (Frederich 2002, Seyhun 1998, Lakonishok and Lee 2001) concludes that insiders tend to buy past losers, and sell past winners. In other words they are not motivated by momentum strategies, in fact they tend to act contrary to the market, and hence they manage to *time the market* better than the average investor.

3.7 Earlier research and Eckbo and Smith

In sum, the research presented in this thesis indicates that insiders tend to outperform the market when using the traditional method. As older research indicated that you could earn abnormal profits by generally following insider signals. More recent research often arrives at the conclusion that trades needs to be segregated into separate groups with similar characteristics in order to make it possible to obtain abnormal profits. Though, the big question still left on the table is whether an outsider can earn abnormal profits by following an insider's trades. Hence the challenge according to previous research for the outsider is either that the market stabilizes to fast, or that the transaction costs usually are too high. For example, in the US where most of the studies are conducted the time from the trade until it must be reported is two days, in other words the window where information about the trade might leak out is twice as big as at OSE⁷. Another issue is that some of the studies are conducted upon daily prices which might be a poor measurement when measuring immediate effects. Inci, Lu and Seyhun (2010) used more accurate data in order to study the immediate intraday effect of an insider trade. They found significant results both for purchases and sales

⁷ <https://www.sec.gov/answers/form345.htm>

throughout the day of an announcement, before the prices tended to mean revert throughout the rest of the day. They also found evidence for increased trade-volume in the minutes after the trade. The intraday study conducted by Inci, Lu, and Seyhun is something that we would have liked to revised, but due to lack of accurate data in our dataset we will not be able to do so (ref. Data).

Despite the old research beliefs in insider effects, most of the methodology that has been applied has been provided by using an unconditional model, a type of model that bring along some obvious sources of error. The most criticized weakness is the estimation of normal returns, which are being estimated in a predetermined time interval. As this interval is an inefficient measure for the actual time period the insider hold the stock. In other words, the risk by applying the unconditional model is that it will give an inaccurate result of the returns. Due to this fact, Eckbo and Smith (1998) provide their own study using a new approach by applying a conditional research model.

In a brief view, Eckbo and Smith used a multifactor model permitting the expected returns to be time dependent through frequently updating its weights as insiders bought and sold stocks. Constantly rebalancing the weighting based upon the size and type of the transaction that were made over the time period. Ultimately resulting in a more accurate measure of the realized returns. Not only were their method original, but they also had an interesting data set containing 18 000 transactions made on the Norwegian stock exchange from 1985-92. This was a period where Norwegian insiders owned a very high portion of the Norwegian stock exchange (average 14%) in period of lax enforcement from governmental regulations. During the study, Eckbo and Smith found similar results as Seyhun and Basel when using a conditional event-study. However, when they applied a value weighted portfolio using a multifactor model with time varying returns the abnormal returns disappeared. In addition, none of the performance indicators that were used to study the performance indicated positive abnormal returns. They even got some results suggesting that insider's made negative returns in some incidences. An opposite result compared to the traditional method made by Finnerty and Glass. In short, Eckbo and Smith believed that the estimation method is the reason to the positive abnormal returns

in the traditional method. Claiming that when the estimation is correctly done the insiders does not earn any significant excess returns.

4 Data

4.1 Data

In this chapter we will describe how we obtained the data that we will use in this thesis. We will describe what the datasets consists of, criteria to the data, and some descriptive statistics of the cleaned datasets.

4.2 Obtaining and cleaning the data

We obtained this dataset from Thompson Reuters DataStream. The dataset consist of all the daily prices, Price-Earnings ratio, Price-Book ratio, and the market value of all the securities trading at OSE from 1.1.2010 until 03.03.2016. (Appendix: 1).

From Dovre, we obtained data on all the insider trades made at OSE between 11.11.2008 and 28.07.2015, which resulted in 3709 transactions. The dataset also includes information like the name of the company, name of the insider, position of the insider within the company, date of the transaction, announcement date, whether the transaction is a buy or sell, volume of the trade, price, value of the transaction, and the insiders holdings after the trade was done (Appendix: 2). The reader should note that from now on we will only be interested in the announcement date of the trade, as this determines when the trade is tradable for outsiders. For a transaction to be tradable the information about the trade must have reached the market before traded on. Hence announcement date will be denoted as: $\tau = 0$. In practice there may be some trades that will be published after closing time at OSE (16.30), and hence not tradable that day. Nonetheless we find it reasonable to still use publication date $\tau = 0$, as this does not affect any of our hypotheses, and as the returns will be calculated from $\tau = 1$ and so on. In our hypotheses regarding *1 day returns* it is worth noting that some of the returns measured here will in practice be the returns obtained one day after publication, i.e. two closing prices from the trade itself.

4.3 Data cleaning

In order to make inference of our study we had certain criteria's to the final data set.

- **Length of the study – All Insider *trades* in advance of 14.12.2010 are excluded**

An important aspect both when estimating normal returns and measuring abnormal returns is that the markets are stable. The need for stable markets is that returns in these periods could be extraordinary. A drop or high volatility in the returns could therefore affect the estimation of the normal returns, and the calculation of abnormal returns, potentially leading to unrealistic results in the regression. Recalling that OSEBX from its top the autumn of 2007 until February 2009, OSEBX lost more than half of its value, and as it may take some time before the stock returns to stabilise we choose to exclude all the historical returns before 01.01.2010 to get a best possible power in the tests⁸. Note that we excluded all returns before 01.01.2010, and bearing in mind that we will use an estimation window of 240 trading days. Thereupon all insider trades made before 14.12.2010 are excluded⁹.

- **Trades in other securities than A –and B shares equity are excluded**

It is worth noting that when we obtained the dataset from Dovre regarding the Insiders transactions all other than trades in A and B shares equity were already excluded. In other words reportable trades in options, warrants or other derivatives were left out from the original dataset.

- **Trade has to have an absolute value of at least NOK 25 000**

To ensure that the trade has some economic value for the insider, it is important that the insider takes a degree of economic risk, identified by trade volume. We are therefore excluding all trades below the absolute value of NOK 25 000, as these don't signal to the market that the insider is taking on a significant economic risk by conducting the trade. Optimally this criteria should have been calculated

⁸http://www.finanstilsynet.no/global/venstremeny/rapport/2010/tilstanden_i_finansmarkedet_2009.pdf - report regarding the financial crisis in Norway

⁹ 14.12.2010 – Is the date 240 Trading days from 1.1.2010.

relative to each insiders net fortune, but considering the difficulties of obtaining these, and also the lack of the names on the insiders at some trades, we choose to only use the maximum value of 25 000 as the criteria¹⁰.

- **Trades made on the same day is aggregated (Netting the trades)**

In order to exclude the possibility to test a trade more than once, we aggregate trades conducted by the same insider on the same day. I.e. if an insider is listed with two buy transactions; one of 100 shares, and another one at 50 shares, the net purchase will be 150 shares that day.

4.4 Descriptive Statistics

<i>Buy & Sell</i>	<i>Trade Volume</i>							
	<i>N</i>	<i>N %</i>	<i>Average</i>	<i>Median</i>	<i>25% - quartile</i>	<i>75% - quartile</i>	<i>Min</i>	<i>Max</i>
<i>Buy</i>	1259	77 %	4170844	249750	106091	800000	25057	900000000
<i>Sell</i>	369	23 %	9209600	1042067	232907	4044334,5	25000	521400000
<i>Sum</i>	1628	100 %	5312000	329155	16963	2240	N	N

Table 1: Descriptive statistics

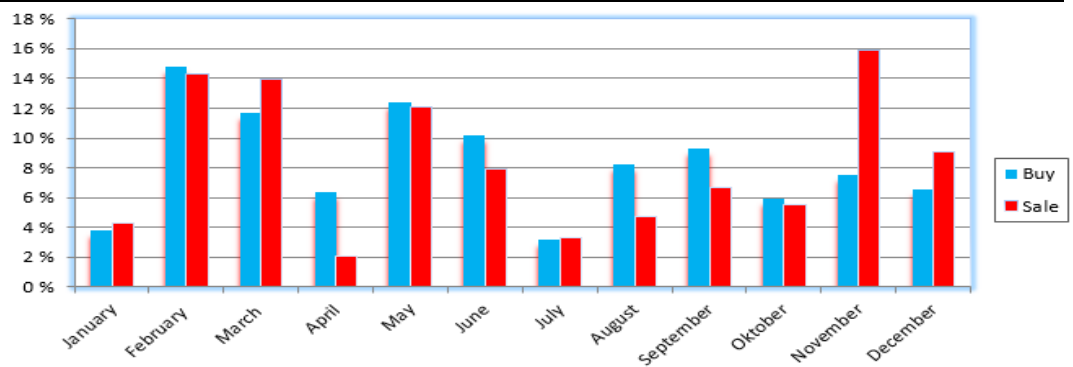
After cleaning the dataset, we end up with 1 628 trades in 170 companies listed on the OSE an average of 10,3 trades in each company. Splitting these up in buy and sales we ended up with 1259 buy and 369 sell transactions. Compared to other countries' stock exchanges the buy/sales ratio on insider trades is relatively high. For example, comparing the ratio to the Swedish stock exchange where there is only twice as many buy to sales transactions¹¹. From table 1 we can see that the average transaction value including buy and sales was 5 312 000 NOK, comparing this to the median which takes on a value of 329 155 NOK, making the distribution positively skewed as a result of extreme outliers. This can also be seen by investigating the 75% - quartile that is way lower than the mean. The maximum value for a buy transaction is at the net value of 900 000 000 NOK which is notably greater than the highest observed sales value, and came in Marine Harvest in 2013.

¹⁰ Average median Net Salary after taxes in Norway between 2010 – 2015 equalling approximately to NOK 25 000. Because of outliers the measurement Median is used.

<https://www.ssb.no/statistikkbanken/selectvarval/saveselections.asp>

<https://skort.skatteetaten.no/skd/trekk/trekk>

¹¹ <https://www.dovreforvaltning.com/no/content/det-er-bedre-p%C3%A5-innsiden>



Graph 2: Trades according to Identity (Buy/Sale) and Activity in %. Noted in monthly number of buy transactions divided by the total number of buy transactions, and similarly with the sales transactions.

When looking at how insiders trade over the different months, we clearly observe a pattern that most of the trades occur the month prior to the filings of quarterly/yearly reports. This is because of the blackout period that forbids insiders to trade 30 days in advance of the filing of quarterly reports. It is also worth noting that insiders tend to have a greater buy frequency early in each of the calendar years, while the sales have some of the same pattern except a peak in November. An explanation for this could be that insiders want to liquidate their positions in order to gain tax benefits.

4.5 MarketCap

In this study we will make distinctions between small-, medium-, and big capitalized firms. As previous studies have shown investors demand higher risk premiums when investing in small cap firms (Fama and French 1993). When defining the sizes of each of the three categories. We chose to split the groups in to three groups based on 25% and 75% levels where the size of the firm is measured by the market value at the time of the insider trade, i.e $\tau = 0$. In market capitalization value this gives the following groupings (in Mill NOK):

- Small-size: [0 - 537)
- Medium-size: [537 – 7 628)
- Large-size: [7 628 - ∞)

4.6 Insiders position

As mentioned in the dataset that we got from Dovre there was information about each insider’s position in the firm. This is also one of our hypotheses that we wanted to test, and as the original dataset contained of 25 different insider positions we had to group the different insider types. Optimally we would have

preferred to construct the same groups as Jeng, Metrick and Zeckhauser (2003) in order to make it directly comparable, but due to lack of information about this in our dataset, we end up with constructing the five groups based on the biggest group-sizes in our original dataset. The groups are: (1) CEO/CFO's, (2) Managers, (3) Members of the Board, (4) Primary Insiders, and (5) Others¹².

The first group is a combination of all the *CEO and CFO's*, as we believe these insiders to have the most recent and accurate information about the firm. Also by combining these two groups we end up with a satisfying number of observations to be able to conduct the hypothesis. In the second group we grouped all the managers and directors that are not CEO or CFO's, as these are likely to have the same level of information about the firm. In the third group we put all the members of the board, by definition we combined the two groups board members and chairmen. In the fourth group we have the *primary insiders*, this is a group already defined in the dataset that we obtained from Dovre. OSE defines a *primary insider* as a person who is associated with the company in some way, this is roughly the definition of every person who need to report its trade. It is therefore reasonable to believe that these are persons involved in the firm but are not reported in as either *managers* or *members of the board*. The last category is also a category already defined in the dataset obtained, named *others*. This is a group consisting of insiders that does not directly work with the firm, such as large shareholders, relatives, and consultants.

<i>Insider Positions</i>	<i>Trade Volume (1000 NOK)</i>					
	<i>N</i>	<i>% -N</i>	<i>Average</i>	<i>Median</i>	<i>Min</i>	<i>Max</i>
<i>CEO/CFO</i>	295	18 %	1575	266	26	43500
<i>Managers</i>	408	25 %	2510	216	26	539700
<i>Members of the Board</i>	545	33 %	6559	350	25	232500
<i>Primary Insider</i>	214	13 %	10914	619	25	900000
<i>Others</i>	166	10 %	7535	310	25	521400
<i>All Trades</i>	1628	100 %	<i>N</i>	<i>N</i>	<i>N</i>	<i>N</i>

Table 2: Trades according to position and values

From the table above we can see that the category *Primary Insiders* clearly trades on the highest volume, both the average and the median is way greater than all other categories. It is also the category where we find the highest trade made in

¹² We do not allow overlapping, hence an observation is only present in one of the groups.

the dataset. On the contrary the categories with the lowest trade volumes are Managers and CFO/CEO. Both are categories more related to the core operative part of the companies. This is a reasonable finding as these two categories are likely to have lower income than the other groups.

Industry

Recalling that our dataset contains a large variety of firms across different industries we chose to divide the dataset into sectors. Although, the data downloaded from DataStream already contained 16 different industry classifications. In some cases we noticed that we had way too few observations to conduct a robust statistical test, as can be seen on the number of observations in the table below. Also bearing in mind that this would have weakened our results by having very few observations in some industries, we had to generalize the industries. This were done by sorting more companies into wider and more generalized categories. For example, when we created the identity shipping, we identified all companies with the same business model and similar value drivers (sensitivity) into this category. Altogether we ended with the following 9 industries: *Consumption, Financial&Insurance, Health Care, Industry, Oil/Gas - Production&Exploration, Oil/Gas - Equipment, Seafood, Shipping and finally Technology & Telecom.*

Industry	MarketValue (Million NOK)							
	N	% - N	% - Buy	% - Sell	Average	Median	Min	Max
<i>Consumption</i>	194	12 %	47 %	53 %	26462	7028	333	135067
<i>Financial & Insurance</i>	237	15 %	82 %	18 %	11236	1646	68	222983
<i>Health Care</i>	75	5 %	77 %	23 %	302	176	54	952
<i>Industry</i>	250	15 %	86 %	14 %	7102	1713	77	93746
<i>Oil & Gas (Production and I</i>	231	14 %	84 %	16 %	46455	3056	122	578739
<i>Oil & Gas (Equipment)</i>	261	16 %	90 %	11 %	3723	2007	5	22186
<i>Seafood</i>	111	7 %	68 %	32 %	11578	2512	75	62104
<i>Shipping</i>	64	4 %	81 %	19 %	4868	5251	202	10384
<i>Technology & Telecom</i>	205	13 %	71 %	29 %	23025	1071	110	270263
<i>Sum</i>	1628	100 %	77 %	23 %	16963	2240	N	N

Table 3: Trades according to industry and values

In table 4 (Industry table) we have chosen to look at the market value related to each industry at $\tau = 0$, note that all market capitalization values are in million NOK. It is worth noting that we have way more buys than sales transactions. Although, we can see that within the industry *Consumption* more than 50% of the transactions are sales. When looking at the market capitalization of firms within

each industry, we see that some industries contain a lot of big companies, and not surprisingly observe this to be the case firms within the *Oil & Gas (Production and Exploration)* industry. Where Statoil is the largest capitalized firm with a market capitalization of 578 739 million NOK. On the contrary the *Health Care* industry is significantly smaller than all the other categorized industries. Also note that some industries have high maximum, - and average values, but low medians. These industries are examples of industries that mainly contain an unbalanced ratio between large and small companies. Taking *Technology & Telecom* as an example, where Telenor are present with its market capitalization of 270 263 mill NOK the second largest value observed in the dataset, while the median is only at 1 071 mill NOK, the second lowest median of all the industries.

Micro and Macro

Considering the fact that 30% of the companies in our dataset are exposed to the oil price, and in total as much as 56 % of the dataset are sensitive to Macro variables (see hypothesis 8) we chose to divide the data into Micro and Macro sensitive companies. Macro companies are therefore segregated to be companies which are sensitive towards lager markets, for example aluminum or oil prices, i.e. companies in very cyclical markets where the returns highly depend upon non-domestic markets. These industries are often known to be very cyclical. The macro category will therefore include the following industries: *Oil/Gas - Equipment, Seafood, Industry, Shipping, Oil/Gas – Production & Exploration*. In the micro category, we identify companies that concentrate on the domestic markets, hence the following industries: *Consumption, Financial&Insurance, Health Care and Technology&Telecom*.

<i>Industry</i>	<i>Micro</i>	<i>Macro</i>
<i>Consumption</i>	x	
<i>Financial & Insurance</i>	x	
<i>Health Care</i>	x	x
<i>Industry</i>		x
<i>Oil & Gas (Production and Exploration)</i>		x
<i>Oil & Gas (Equipment)</i>		x
<i>Seafood</i>		x
<i>Shipping</i>	x	
<i>Technology & Telecom</i>	x	
% - N	44 %	56 %

Table 4: Segregation of Micro/Macro according to industry

Index

An important issue when doing studies is to choose a suitable proxy. Ikenberry, Lakonishok and Vermaelen (1995) and Lee (1997) clearly points out this issue, concluding that long horizon abnormal returns are extremely sensitive to the benchmarks used. It is important that the proxy we use are directly comparable to all of the securities. As we have chosen all the companies that are listed on OSE with insider transactions in this study, we will therefore use the OSEBX index as the proxy for our analyses when estimating the normal returns through our different models. As OSEBX is an index constructed by OSE in a way to be a representative sample of all the stocks listed on the OSE¹³.

5 Hypotheses

5.1 Introduction to Hypotheses:

Our motivation behind the construction of the hypotheses is to get a deeper understanding of how the insiders and the market corresponds along with the scientific, profit and political value behind insider trading. Hoping that our contribution can be used as a motivation and starting point to further inquiry. Or as Newton said, “If I have seen further, it is by standing on the shoulders of giants”. Recalling that Eckbo and Smith closed the thread by showing that insiders are unable to earn abnormal return when measuring expected return to be time dependent by frequently updating its weights. Even so, we intend to pick up the tread from earlier research by disaggregate and study the patterns made by insiders trading. Talk of the town will be to investigate the hypothesis whether there is an informational gap between industries, and whether this might generate different abnormal returns. Please have a look at appendix 3 for futher explanations of hypotheses.

5.2 Are Dovre’s arguments consistent with the academic methodology?

The main hypothesis in this thesis will be to study whether it is possible to earn excess returns for an insider. Since we are writing this thesis in collaboration with Dovre we wish to test whether their returns are consistent with an academic

¹³ <http://www.oslobors.no/markedsaktivitet/#/details/OSEBX.OSE/overview> - OSEBX def.

approach. This will be done by following in the footsteps of Dovre using the same time periods as they claimed to find the most significant returns. In Dovre's study they find evidence that the insider effects are highest the first month after the event, and then slowly decreasing at a 3-and 6 months horizon after the trade. All hypotheses will be tested with event windows of; 1 day 1 week, 1 month, 3 months, and 6 months. This will be the alternative hypotheses, as the null hypothesis always will be the conservative hypothesis indicating that it is impossible to earn abnormal returns. Note that we still assume only legal trades, and thus we only study the signaling effect that insiders provide the market with.

5.2.1 By following an insiders transaction you can make abnormal returns

The research question in this thesis is whether it is possible to earn abnormal returns for an outsider by following an insider's trade. Bearing this research question in mind and the theory listed above we will further split this hypothesis into several sub- hypotheses to observe if some insiders are better to follow in the search for abnormal returns.

5.2.1.1 Outsiders trading on Insider's purchase will obtain abnormal returns

5.2.1.2 Outsiders trading on Insider's sales earns abnormal returns

Previous research indicates that buy trades tend to earn higher abnormal returns than sales trades (Lakonishok and Lee (2001), Jeng (2003) et al). Hence indicating that buy signals has a better positive predictive power of the future stock price compared to sales. The reason for this is that sales transactions might be more related to the liquidation motive than a profit motive (Lakonishok and Lee (2001)).

On the contrary Dovre claims that on OSE the market reacts stronger to an insider's sale than at other stock exchanges, due to the extraordinary high number of purchases to sales at OSE. Insiders on OSE tends to buy in small quantum's more frequently and sell in big portions (ref. Data)¹⁴, and thus they argue that this *big sales effect* reflects in a more significant signal to the market of the direction

¹⁴ <https://www.dovreforvaltning.com/no/content/hva-innsiderne-ikke-vet>

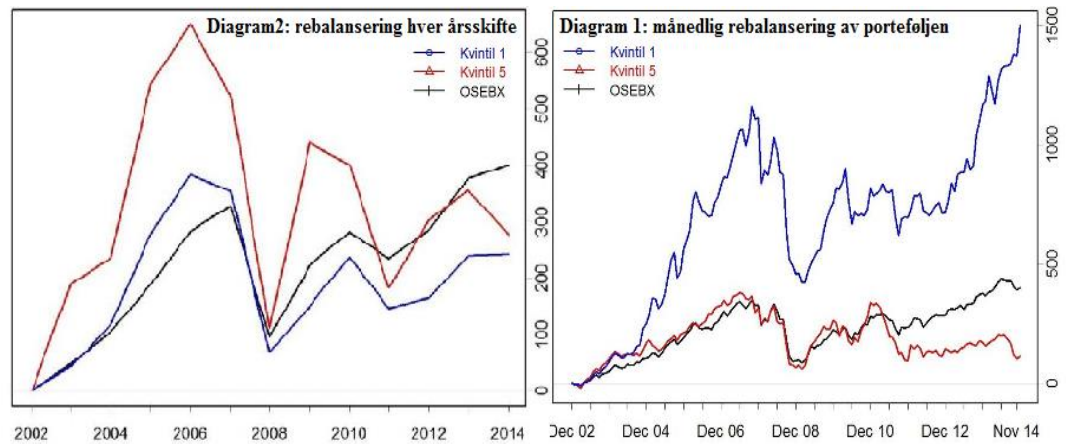
of the stock price. We therefore find it interesting to split the main research question into buy and sales transactions in order to be able to directly compare our results to previous studies, to see whether any of the two effects are present at OSE today.

5.2.2 Following Insiders that buys stocks in non-momentum earns abnormal return. Also Insiders selling stocks in momentum earns abnormal returns.

In finance, momentum can be defined as the rate of acceleration, usually in a share related factor. In another way one could say that momentum is a statistical pattern where the price is more likely to move in the same direction than to change. As there exist a numerous amount of variables to measure momentum in a stock price, like; volume, sale/buy ratio etc. There have been conducted a lot of studies stating that momentum strategies can be profitable. Jegadeesh and Titman (2001) found in their study that stocks that had over/underperformed over a period tended to persist the same patterns in some cases as long as up 1 year. Korajczyk and Sadka (2004) suggested in their article, that it is possible to earn excess returns even when adjusting for transaction costs. Even so, Seyhun (1998) argues in his paper that insiders tend to behave opposite to the stocks momentum, by selling stocks in positive momentum and buying securities in a negative momentum. Hence following a contrarian momentum strategy.

Dovre also claims to have found evidence for momentum in their studies on Oslo Børs 60 most liquid companies. Their strategy is: *“The first day of each month you rank all the OSEBX companies based on their total returns the last twelve months. Then buy all the shares in the top quintile, i.e. the top 20 percent. After a month, repeat the operation, and so on”*. Though, Dovre claims that this strategy only works when conditioned upon only buying stocks in a positive momentum and selling them within the next 6 months as the effect tend to mean revert.

Following below is Dovre’s results. As can be seen in diagram 1, the trading strategy containing *quintile 1 (20% highest momentum)* is superior when monthly rebalancing the portfolio compared to the *5th quintile (20% lowest momentum)*



Graph 3: strategy containing quintile 1 (20% highest momentum) is superior when monthly rebalancing the portfolio compared to the 5th quintile (20% lowest momentum)

By expecting insider's transactions to affect momentum and in the light of both previous research and Dovres results, we wish to investigate the performance of stocks after an insider transaction has occurred in stocks with either positive or negative momentum. To make inference of the hypothesis and to make it directly comparable with previous research we have to divide this hypothesis between buys and sales. By doing so we are able to study whether insiders tend to time the market when buying stocks where they are categorized as insiders. Hence we will expect stocks that have performed poorly and where the insiders make a buy transaction to outperform the market, on the contrary we also expect *past winner stocks* where an insider have sold to also outperform the market.

When conducting this hypothesis we have chosen to use a similar approach as Jegadeesh and Titman (2001). In their approach they used three different time-horizons when estimating whether or not if the trade was in momentum (3, 6, 12 months). We chose to use the 6 months horizon, and thereby calculated the cumulative average daily return 120 trading days (6 months) for each stock in advance of the trade. Then we split the returns into four quartiles, where the 25% with the highest cumulative average daily return were defined as *high-momentum stocks*, the 25% poorest performing as *low-momentum stocks* and the rest as *medium momentum stocks*. All the results from each of the groups will be presented.

5.2.3 Following some types of insiders results in different abnormal returns

Dovre states that it is a difference in returns across different insider positions. Claiming to have found evidence that top management possess more valuable information than other related insider, for example, board members. Earlier research (Seyhun (1986) & Lakonishok (2001)) concludes that different insiders earn significantly different amounts of returns. When considering the fact that companies have a hierarchical labor model, this may give an indication of a world containing a distinct level of asymmetrical information between the decision makers within a firm. For example, important decision makers and people in higher ranked positions like CEO's will most likely possess more valuable information than someone at a lower level. It is therefore reasonable to disaggregate insiders into their titles and positions (ref. Data), when measuring the abnormal returns. With this hypothesis we are also able to partially revise Jeng, Metrick and Zeckhauser's (2003) study (ref. Theory).

5.2.4 Following Insiders trades in Small-Cap firms generates higher abnormal returns than following Insiders trades in Large-Cap firms.

Fama and French found back in 1993 through their asset pricing research that firm characteristics do affect returns. Their results conclude that investors required a greater risk-premium when investing in small-capitalized firms. Seyhun (1986) suggested with his research that smaller insiders who are buying and selling in small sized firms, earned higher excess returns than insiders trading in bigger firms. Later studies conducted by Lakonishok and Lee (2001) came to the same result as Seyhun, arguing that insiders have both information and timing advantage when trading in smaller-sized companies. Further studies conducted by Johansson (2005) studying the Nordic market, suggests the same, concluding that insiders buying in smaller firms earn higher abnormal returns. Johansson argues that his findings seem to be in line with Fama's beliefs and research, namely that the smaller the company size, the less distributed information. The rationale behind this may for instance be that less analytics and hence a smaller part of the market monitoring the stock price. Take for example Statoil, the company with the highest market value at OSE, and compare it to Borregaard a chemical producing company. We would expect insiders in Statoil to have a lower effect on

the stock price then Borregaard due to the degree of monitoring of the Statoil stock compared to Borregaard.

5.2.5 Following an Insider in firms with high Price Earnings ratio earns you greater abnormal returns than following Insiders in firms with low PE ratio.

PE is a multiple often used in the valuation and comparing processes between firms. The multiple is calculated as the market capitalization value over the company's earnings. Thus giving a ratio that will be equivalent to how many years a firm with its current earnings will need to earn its current market value. Companies with a high PE ratio can usually be identified as companies with growth opportunities, as the current market price reflects the markets future beliefs to the company's future cash flow. With this hypothesis we find it interesting to study if insiders trading in companies with growth opportunities are seen as a greater signal of future prospects than in well-established value firms, as growth firms are more sensitive to "big news". When conducting this study we group the 25% highest PE-ratios into the group high PE, and do the same with the 25% lowest quartile. Note that PE-ratios are calculated at the day of the event. Though the problem by using PE-ratios is that some firms have negative earnings, we are therefore forced to exclude these from our sample when testing this hypothesis, as firms with negative PE does not help us distinguish between value and growth firms.

5.2.6 Is there a difference in abnormal return between firms with high and low price/book ratio

Bearing in mind the weaknesses of the PE-ratio as were argued above, we also choose to use the PB-ratio to determine whether following insiders in value firms earns abnormal returns. Here we define firms with high PB as growth firms, firms with low PB as value firms, and the rest as mid PB firms.

5.2.7 Following insiders in some industries earns greater abnormal returns

The Norwegian stock exchange contains an umbrella of different industries from oil and gas to technology and biotech. The huge variety between industries and company activities brings along different characteristics and value drivers for each industry. For example, the oil industry is far more correlated to commodity prices than the service or finance industry. Therefore, considering the deviation between industries in form of; sensitivity, behavior, regulation, growth and other factors we would expect insiders to have various power. Also because there might be some regulatory barriers between insiders and outsiders in some industries, the level of asymmetric information in different industries may be distinctive. For example in a volatile and highly regulated industry such as the *health care* industry, there may be possible for an outsider to take advantage of the volatility and earn extraordinary returns.

There have been little documented previous studies on insiders trading across industries. However, Seyhun (1998) conducted research studying the relationship among insider's returns in the same industries. His results showed that when aggregating insider trading across businesses in the same industry strengthens the signal effect. In the light of Seyhun's study, this hypothesis seek out to study whether there are any difference between insiders returns among industries.

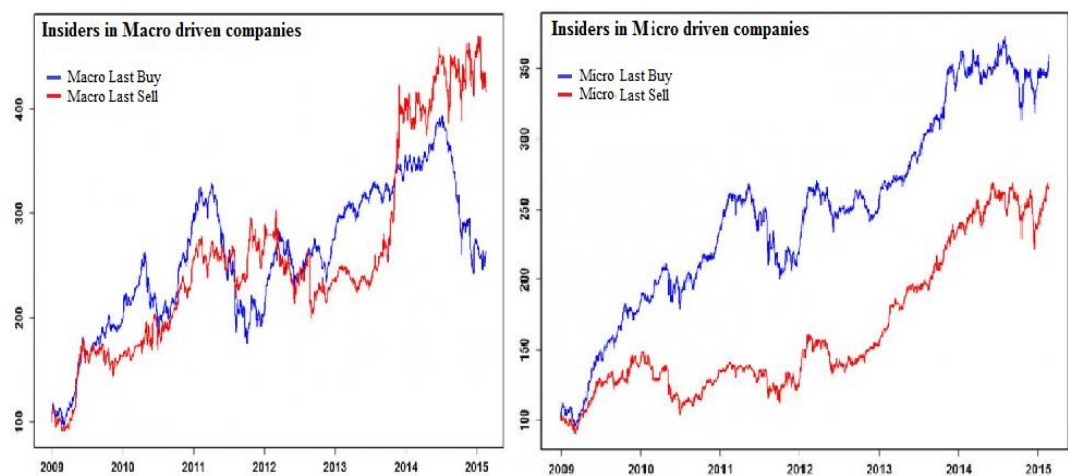
5.2.8 Outsiders can earn abnormal returns by following insiders in Micro firms

Since Oslo Børs contains a two folded industry composition, and mainly incorporates companies being either commodity or service determined. Therefore we also find it reasonable to disaggregate the data between *Macro* and service oriented (*Micro*) companies. The general idea will be that securities that are more correlated to macro trends will have higher transparency and asymmetric information than its peers industries.

Dovre Forvaltning presented to us their studies on insider's returns among industries. They claim to have found evidence that insider's trading in "macro companies" can safely be ignored. Their argument is that it makes no sense for an

executive committee to better foresee the future commodity price than outsiders, and hence the inside information will be less valuable¹⁵. However, they claim that micro firms systematically perform better, hence creating abnormal returns. We will therefore follow their approach and group the companies regarding to their exposure to macro and micro related activities. We put all oil companies, oil service, shipping, aluminum, seafood and fertilizer in the macro exposed group. The micro group will therefore contain the Telecom/Technology, Finance/Insurance, Health care, and Consumption.

Below follows a graph presenting Doves results. The graphs contain the performance of four different portfolios, split between *buy* and *sales*, and *Micro* and *Macro* firms. Note that Micro companies where an insider has made a purchase performs systematically better than the other portfolios. Dovere claims the portfolio to have generated an abnormal return of 94% since 2009. In this hypothesis we will do the same split as Dovere in order to be able to confirm their results or not i.e. we study these groups separately: *Macro Buy*, *Macro Sell*, *Micro Buy*, and *Micro Sell*.



Graph 4: Doves returns dividing between Macro and Micro driven companies

5.2.9 Following Insider's trading in higher volume earns abnormal returns

As mentioned earlier we know that insiders tend to buy more frequently and in smaller volumes than they do when selling. This hypothesis will therefore study whether larger transactions provide the market with a stronger signal to the future

¹⁵ <https://www.dovreforvaltning.com/no/content/hva-innsiderne-ikke-vet>

direction of the stock price, as we expect that insider's confidence about their own firm is correlated with their trading risk. A hypothesis that is also supported by Seyhun (1986) et.al. Who states that insiders tend to increase their volume when they have more valuable information. Thus, we therefore expect larger trades to earn abnormal returns. We conduct this study by splitting the transactions accordingly to their net value. Since different insiders have different wealth level, we will try to control for this by studying both the absolute and the relative trade size. The relative size is defined as the percentage change in insider's holdings in a given stock after the transaction. In this hypothesis we will make a distinction between buy and sales, as this has yielded significant different results in previous literature.

6 Methodology

6.1 Event Study

The results in this thesis will be studied and calculated by using an event study. An event study is defined as a statistical method to measure the impact of an event by studying the change made by the event itself. For the changes to be notable it will be necessary to assume rational and efficient markets (McWilliams & Siegel, 1997). Nonetheless, event studies has been a frequently used method and is a robust measurement to study abnormal stock returns MacKinlay (1997), our study will therefore be based on the methodology used in MacKinlay (1997).

In order to do a proper event study we need to define when the event occurred, and the period of which the stock price has developed MacKinlay (1997). There are several ways to do this, however, we have chosen the same approach as described by MacKinlay (1997), calculating the normal-, abnormal-, and cumulative returns using daily data. The rationale behind our choice to study daily data are justified by MacKinlay, stating that shorter data are better to detect abnormal returns compared to weekly or monthly observations. Further, our study will be conducted on when an insider's transaction is announced on Oslo Stock Exchange, and find the abnormal returns on the stock by looking at different time periods after the announcement. In order to estimate the returns of the stock, we first need to find the normal returns. We will do this by using the Market Model

and Carharts four-factor model to find the normal returns of the stock. Further we will compare these normal returns with the actual returns in the event window for each firm i , in order to find abnormal returns. Then different test-statistics will be used to conclude whether there is a statistically significant abnormal return different from zero. We will now present the methods that we will use for the event study:

6.2 Estimation window and event window

The event window is the time when the abnormal returns are measured. We have chosen to look at different time measures in order to measure the abnormal returns over different time horizons. In order to determine the length of the event window, we have chosen to use the same length as Dovre does in their studies, which is 1 month, 3 months, and 6 months. We also find it interesting, to investigate if there are any immediate effects of an insider's trade, therefore we also include the 1st day and the 1st week after the trade is published by Oslo Stock Exchange. We define each month as 20 trading days, and we therefore end up with an event window consisting of the following days: 1, 5, 20, 60, and 120 days.

The returns in the event window are dependent on the parameters estimated by the estimation models that we will use. These parameters are very important as they are the explanatory power for the risk adjusted returns. In order to choose the length of the estimation window it is important to choose one that is both long enough, as longer estimation windows in general will increase the precision of parameter estimation, although long estimation windows increase the probability of structural breaks. Armitage (1995) and Peterson (1989) suggests when using daily data that the estimation window should be somewhere in between 100 to 300 trading days. MacKinlay (1997) uses in his studies 120- and 250 trading days prior to the event. Due to this theory we will use a 240 trading days estimation window, i.e 1 year when estimating the parameters. Though in order to obtain a best possible statistical reliable result we have chosen to exclude the five trading days prior to the announcement. Due to potential information leakage to the market, we will be able to avoid this, so that we don't bias the estimates regressed.

6.3 Estimation of normal returns

There are several ways to calculate the abnormal returns of different stocks. These are most commonly divided into both economical models and statistical models. Where the statistical are based on statistical assumption concerning the behaviour of stock return and are therefore not dependent on any economic arguments. The economic models on the other hand rely on assumptions concerning investors behaviour and are not based solely on statistical assumptions. By using the statistical models it is assumed that the stocks are independent and identically distributed through time. Though this assumption seems to be strict MacKinlay (1997) argues that in practice this does not lead to problems as inferences from the models seem robust to deviations from this assumption.

According to MacKinlay the economic models are a bit out of date and are rarely used in studies, as they are based upon several questionable assumptions. We have therefore chosen to only focus on statistical models in this thesis. MacKinlay presents the *Constant Mean Return Model*, the *Market Model*, and *Multifactor models* as the most frequent used models. The constant mean model assumes that the returns for each asset are given by an arithmetic mean of the returns during the estimation window. The market model can be seen as an improvement to the constant mean return model. It reduces the variance of abnormal returns as it removes the portion of return that is related to the variation in the market return. The gain of using a multifactor model is that it should give a reduction in the variance of the abnormal return. Though MacKinlay argues that the gains of applying multifactor models in event studies are limited, he also argues that if the firms are within one industry or have similar characteristics, multifactor models could improve the returns estimate. Another argument for using this factor model is that Jeng Metrick and Zeckhauser (2003) found the model to explaining about one fourth of the returns using CAPM. We are therefore using both the Market Model and Carhart's four factor model in order to estimate our returns. Bearing in mind that our hypotheses are segmented in a way where we find it beneficial to adjust for firm characteristics, as these are shown to be superior when estimating returns (Carhart 1997).

6.4 Estimation of the models

The returns are calculated logarithmically form, this for two reasons. The first reason is that they are calculated as continuously compounded returns (geometric). This makes it easier to aggregate the returns across time periods, in other words we can say that they are time-additive. The second reason is that we need the normality assumption to hold in order to test our models, and the fact that geometric returns have been proven to give stronger normality returns (Henderson 1990), we use the following equation in order to do the calculation:

$$R_{it} = \ln\left(\frac{p_{it}}{p_{it-1}}\right) \quad (1)$$

6.5 OLS Estimation

The method to be used when estimating the normal returns is the ordinary least squares regression (OLS). However, this method assumes BLUE (best linear unbiased estimators), and thus need to fulfil the following assumptions:

1. Expected value of the error term are zero, and the variance of the error term are constant: $E(u_{it} = 0)$
2. The variance of the error term are constant: $var(u_{it} = \sigma_{u_i}^2) < \infty$
3. The error terms are uncorrelated: $cov(u_i, u_j) = 0$ for $i \neq j$
4. Market returns and error terms are uncorrelated: $cov(u_t, x_t) = 0$

The first assumption requires the average value of the errors to be zero, in order to fulfil this assumption; we will include a constant term in our regression. This will make the expected error terms equal zero, and thus the assumption will never be violated. The second and third statement assumes no heteroscedasticity and no autocorrelation. In order to control for this we will use *Newey-West* robust standard errors in the estimation process. When estimating the parameters we regress historical returns for firm i (240 trading days in advance) against the historical returns from the index (OSEBX) at the same time span.

6.6 Market Model:

The market model for stock i at time t in the estimation period is given by:

$$R_{it} = \alpha_i + \beta_{it}R_{mt} + u_{it} \quad (2)$$

Where:

R_{it} : Return on stock i at time t

α_i : Intercept (Return of R_i if R_m is zero)

β_{it} : Slope, systematic risk for stock i

R_{mt} : Return on the market portfolio

u_{it} : Error term (firm specific risk)

The OLS estimators of the model will be calculated by the following equations:

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\mu}_m \hat{\beta}_i \quad (3)$$

$$\hat{\beta}_{i,m} = \frac{\sum_{\tau=245}^{\tau-5} (R_{it} - \hat{\mu}_i)(R_{mt} - \hat{\mu}_m)}{\sum_{\tau=245}^{\tau-5} (R_{mt} - \hat{\mu}_m)^2} \quad (4)$$

$$\hat{\sigma}_{ui}^2 = \frac{1}{L_1 - 2} \sum_{\tau=245}^{\tau-5} (R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt})^2 \quad (5)$$

Where the average stock returns μ_i , and average market returns $\hat{\mu}_m$.

6.7 Carhart's Multifactor Model:

The Multifactor Model is based upon the study done by Fama and French (1993), and Carhart (1997). Fama and French argued that many of the anomalies associated with the CAPM are related, and argued that their three factor model captures them. The three-factor model extends the traditional CAPM by including one factor that controls for size-effects SMB (small minus big), and one that controls for book-to-market effects HML (high minus low). They stated that these factors not necessarily are obvious to include as risk factors, although, they may work as fundamental variables where the investors demand compensation for investing in these stocks. Carhart (1997) made an extension of the three factor model by including a momentum effect. Jegadeesh and Titman (1993) found that simple trading strategies made up by ranking the stock after past the 3-12 months performance could predict the performance over the next 3-12 months. That recent winners continued as winners, and recent losers continued as losers. They

found that the effect lasted for as long as 12 months, though after 12 months the profitability tends to drop a lot and go towards a mean reversion phase. Carhart made this momentum effect based on these findings, and constructed a factor prior-one-year (PR1YR) capturing these anomalies.

When controlling for these factors we first constructed the factors manually and in line with Kenneth French's framework for the construction¹⁶ (see appendix 4 for construction). However after a consultation with our supervisor we came to the conclusion that we will use the factors that Bernt Arne Ødegaard has constructed, and made public through his webpage¹⁷. As these are more quality assured and therefore also more reliable.

The Four-Factor Model for stock i at time t in the estimation period is given by:

$$R_{it} = \alpha_i + \beta_{i,M}R_{Mt} + \beta_{i,SMB}SMB_t + \beta_{i,HML}HML_t + \beta_{i,PR1YR}PR1YR_t + u_{it} \quad (6)$$

Where the additional parameters to the Market Model is:

$\beta_{i,SMB}$ = Coefficient for SMB (estimate of risk for size)

SMB_t = Small minus big factor (Returns on small capitalized firms minus returns on big capitalized firms)

$\beta_{i,HML}$ = Coefficient for HML (estimate of risk for Price/Book ratios)

HML_t = High minus low factor (Returns on high book-value firms minus returns on low book-value firms)

$\beta_{i,PR1YR}$ = Coefficient for Momentum (estimate of risk for Momentum effects)

$PR1YR$ = Momentum factor

The regression follows the same assumption and method as the Market Model.

The estimators of the multifactor model parameters are:

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\beta}_{i,M}R_{m,M} - \hat{\beta}_{i,SMB}SMB_t - \hat{\beta}_{i,HML}HML_t - \beta_{i,PR1YR}PR1YR_t \quad (7)$$

$$\hat{\beta}_{i,M} = \frac{\sum_{\tau=245}^{\tau-5} (R_{it} - \hat{\mu}_i)(R_{mt} - \hat{\mu}_m)}{\sum_{\tau=245}^{\tau-5} (R_{mt} - \hat{\mu}_m)^2} \quad (8)$$

¹⁶ http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/f-f_factors.html

¹⁷ Downloaded Carhart factors from Bernt Arne Ødegaards web page:

http://finance.bi.no/~bernt/financial_data/ose_asset_pricing_data/index.html

$$\widehat{\beta}_{i,SMB} = \frac{\sum_{\tau-245}^{\tau-5} (R_{it} - \widehat{\mu}_i)(SMB_t - \widehat{SMB})}{\sum_{\tau-245}^{\tau-5} (SMB_t - \widehat{SMB})^2} \quad (9)$$

$$\widehat{\beta}_{i,HML} = \frac{\sum_{\tau-245}^{\tau-5} (R_{it} - \widehat{\mu}_i)(HML_t - \widehat{HML})}{\sum_{\tau-245}^{\tau-5} (HML_t - \widehat{HML})^2} \quad (10)$$

$$\widehat{\beta}_{i,PR1YR} = \frac{\sum_{\tau-245}^{\tau-5} (R_{it} - \widehat{\mu}_i)(PR1YR_t - \widehat{PR1YR})}{\sum_{\tau-245}^{\tau-5} (PR1YR_t - \widehat{PR1YR})^2} \quad (11)$$

$$\widehat{\sigma}_{ui}^2 = \frac{1}{L_1 - 2} \sum_{\tau-245}^{\tau-5} (R_{it} - \widehat{\alpha}_i - \beta_{i,M} R_{Mt} - \beta_{i,SMB} SMB_t - \beta_{i,HML} HML_t - \beta_{i,PR1YR} PR1YR_t)^2 \quad (12)$$

6.8 Abnormal Returns

Given the estimated parameters from the models we can and calculate the abnormal returns. Abnormal returns will be calculated for each firm during the event window, by the following equations:

$$AR_{it} = R_{it} - \widehat{\alpha}_i - \widehat{\beta}_i R_{Mt} \quad (13)$$

$$AR_{it} = R_{it} - \widehat{\alpha}_i - \widehat{\beta}_i R_{Mt} - \widehat{\beta}_{i,SMB} SMB_t - \widehat{\beta}_{i,HML} HML_t - \widehat{\beta}_{i,PR1YR} PR1YR_t \quad (14)$$

The abnormal returns will be normally distributed and have an average equal to zero and a variance equal to:

$$\sigma^2(AR_{it}) = \sigma_{ui}^2 + \frac{1}{L_1} \left[1 + \frac{(R_{Mt} - \widehat{\mu}_m)^2}{\widehat{\sigma}_m^2} \right] \quad (15)$$

The variance of the abnormal returns consists of two components. Where the first component is the disturbance variance calculated from the estimation model (in our case either the market model or the multifactor model), and the second term is the sampling error that occurs in the estimation. MacKinlay et.al argues that as the estimation window increases the sampling error term will converge to zero.

6.9 Aggregation of abnormal returns

In order to make inference from this study we have to aggregate all the abnormal returns for the event of interest, both over time and across stocks to obtain the cumulative abnormal return (CAR):

$$CAR_t(\tau_1, \tau_2) = \sum_{t=\tau_1}^{\tau_2} AR_{it} \quad (16)$$

Given N events of insider trades we also have to take the average of the cumulative abnormal returns for the period. Given by:

$$\overline{AR}_t = \frac{1}{N} \sum_{i=1}^N AR_{it} \quad (17)$$

$$var(\overline{AR}_t) = \frac{1}{N^2} \sum_{i=1}^N \sigma_{u,i}^2 \quad (18)$$

Hence the cumulative average abnormal return and variance:

$$\overline{CAR}_{(\tau_1, \tau_2)} = \sum_{t=\tau_1}^{\tau_2} \overline{AR}_t \quad (19)$$

$$var(\overline{CAR}_{(\tau_1, \tau_2)}) = \sum_{t=\tau_1}^{\tau_2} var(\overline{AR}_t) \quad (20)$$

6.10 Statistical tests:

To test the null hypothesis that the abnormal returns of the tests are zero we will use MacKinlay's version of a standard t-test:

$$\theta_{(\tau_1, \tau_2)} = \frac{\overline{CAR}_{(\tau_1, \tau_2)}}{\hat{\sigma}^2(CAR_{(\tau_1, \tau_2)})^{1/2}} \quad (21)$$

Furthermore, the use of standard t-values to test for significance might be a poor choice to use when conducting event studies. This is due to overlapping event windows, which could result in a cross-sectional correlation in the abnormal returns (Kolari and Pynnönen (2010) et.al). Hence, this could lead to a downward bias in the standard deviations, and thus resulting in an over-rejection of the null hypothesis (type 1 error). In order to get more reliable and statistical results, we will also use a non-parametric sign-rank test to compare the results from the standard test statistic. The sign rank test statistic is similar to the framework that Wilcoxon (1945) developed, where the null hypothesis is that the distribution of a random variable has median equal to zero. The test-statistic is as follows:

$$\theta_t = \sum_{j=1}^n r_j = (\text{sum ranks for + sign}) - (\text{sum ranks for - signs}) \quad (22)$$

Where r_j are the observed signed ranks¹⁸.

6.11 Drawbacks by conducting Event-Studies

Even though event studies are widely used among previous studies, it also contains some weaknesses in its approach. For small companies that are not traded frequently, an issue of obtaining enough trading days could occur. This could result in biased beta estimates, when applying the return estimation models. To deal with this Scholes and Williams (1977) have presented a consistent beta estimator in case of non-trading days. This results in an upward adjustment of the beta value, something that will result in lower abnormal returns. However, Jaim (1986) finds little difference in using consistent beta estimates.

Another issue by applying an event study is that it holds the level of risk constant, something that could bias the long run testing and therefore affect the measure of risk adjusted abnormal returns (Kothari and Warner 1997 et. al). However, Eckbo and Smith (1998) used a different approach to avoid this long run bias. By using different weighting algorithms in addition to equally weighting, they constructed monthly portfolios that could adjust the risk in order to provide a more reliable result. As we are only applying an event window of up to six months, we find it applicable to conduct the event study approach. Though we are aware that there might be some biases in the three and six months event windows, as the *real* beta values might change over this range, however this will be discussed in the results chapter.

7 Results

7.1 Introduction:

The following chapter contains the introduction and structure from all the hypotheses. Each paragraph and following hypotheses will contain a brief

¹⁸<http://www.stata.com/manuals13/rsignrank.pdf>

presentation of the results before moving on to discussion and conclusion. The reader should note that all the results are presented in tables where we separate between *Market Model (MM)* and *Carhart Four Factor Model (CM)*. Thereby expecting the *Carhart Model* to be a more efficient and robust model. Due to different efficiency between the Carhart Model and the Market Model we expect the two models to give somewhat small deviating results. Furthermore, all the results are presented methodically according to their test period. Presented in the purpose of getting a clear picture of the results, the significance level will be presented in the following way: $p < 0.10^*$, $p < 0.05^{**}$, $p < 0.01^{***}$. Where one star implies significant at a 10% level, two stars are significant at 5%, and finally three stars are significant at a 1% level. All the figures marked in parentheses contain the respective standard errors measured through the estimation period. Conversely, recall the issues by using t-statistics to conclude for significance as pointed out in the methodology chapter. We therefore applied the *Wilcoxon-sign-rank* test as an alternative approach to the t-test. However the results from the Wilcoxon-sign-rank test will only be presented in the results regarding the hypotheses; *all trades, only purchase, only sales, and industry*. The outputs are presented in appendix 5.

Before we begin interpreting the results we need to announce some obvious weaknesses to our dataset. To begin with the fact that we know our dataset contains returns from the Norwegian stock exchange which is highly sensitive to the oil price, where 30% of the stocks are correlated to oil and oil service (ref. data chapter). Secondly as much as 56% of the stock exchange are exposed to Macro factors (ref. hypothesis 8). We therefore expect it to be a causal link to our results especially in the case for insider sales correlated to the oil price, as the oil price decreased by 60% from June 2014 to 2016. Considering that about 32% of our data contains prices in the same period as the turmoil in the commodity markets, we expect the high volatility to affect the return rates. Consequently, we expect the high returns on insider's sales portfolios to be explained by this fact.

Note that all the sales are inverted before aggregating the returns of all the trades. Hence a positive *CAR* on sales is equivalent to going short in a stock if an insider sells, and the positive (negative) abnormal returns will display the actual positive

(negative) returns that you would have obtained by following this strategy. Also there might be other factors explaining the abnormal returns. Though we only use the publication date as the event date, and therefore hold everything else equal when conducting the study. We are thereby assuming that the only reason for any abnormal returns is the value of the information signaled to the market through the insider transaction. The reader should also be aware that due to the amount of information in each table, that some hypothesis will only be presented results from the *Carhart Model*. The full analysis containing both the Market Model and Carhart Model are presented in *appendix 6*.

7.2 By following insiders transactions, you can make abnormal returns

This hypothesis seek out to study whether insider trades possess superior information compared to the market, and whether outsiders can earn abnormal returns by coping insider transactions. By following in the footsteps of Inci, Biao Lu, and H. Nejat Seyhun (2010) who claimed that insider transaction do possess valuable information, we wish to test their results by dividing the returns into 1) all trades, 2) Purchase portfolio and, 3) Sales portfolio. Below follows the results which are presented according to model and time window. To get an alternative perception of all the results we chose to present a graphical presentation at the end of each discussion.

	<i>Market Model</i>			<i>Carhart Model</i>		
	<i>All trades</i>	<i>Purchases</i>	<i>Sales</i>	<i>All trades</i>	<i>Purchases</i>	<i>Sales</i>
1 Day	0.00110 (0.000715)	0.00127 (0.000790)	0.000493 (0.00164)	0.00120 [*] (0.000712)	0.00149 [*] (0.000785)	0.000201 (0.00164)
1 Week	0.00339 ^{**} (0.00137)	0.00470 ^{***} (0.00154)	-0.00108 (0.00296)	0.00320 ^{**} (0.00136)	0.00440 ^{***} (0.00153)	-0.000859 (0.00292)
1 Month	0.00591 ^{**} (0.00262)	0.00443 (0.00310)	0.0109 ^{**} (0.00467)	0.00579 ^{**} (0.00260)	0.00414 (0.00308)	0.0114 ^{**} (0.00463)
3 Months	0.00783 (0.00527)	-0.00379 (0.00629)	0.0475 ^{***} (0.00871)	0.00743 (0.00525)	-0.00340 (0.00624)	0.0444 ^{***} (0.00887)
6 Months	0.00672 (0.00866)	-0.0134 (0.0103)	0.0754 ^{***} (0.0146)	0.00473 (0.00872)	-0.0146 (0.0103)	0.0706 ^{***} (0.0149)
<i>N</i>	1628	1259	369	1628	1259	369

*Table 5: Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

All Trades – insider transactions

This hypothesis studies the combination of all trades. Because we are studying the combined results from both *purchases* and *sales*. Note that all the sales are inverted before aggregating the returns of all the trades (ref introduction chapter 7 and chapter 5).

From this, as can be seen in the table above the sample results are somewhat mixed. We find evidence supporting that the insider's effect is highest close to the event date. From the table we see that the significance level for both Market Model (MM) and Carhart (CM) models decrease the longer we define the event window. However, we see an increasing change in returns from time period to time period. One interpretation for the increasing returns could be that the standard deviation is increasing more than the returns, and hence becoming insignificant for both models. Correspondingly indicating a decreasing effect from the insider's transactions. Under these circumstances, our results do give some consistent support for abnormal returns in the short event windows.

Insider Transactions - Purchases:

This hypothesis aims to isolate and study the *purchase* effect created by insiders. When interpreting the table above, we see the same patterns as in the case for the *all trades* portfolio. Showing highly significant results for the first two periods and generating increasing abnormal returns. However, as the time horizon increases we see a decreasing return rate, where it turns negative for the 6 months' event window. This might be explained to be a result of mean reversion, where the share price returns back to earlier levels. If so, then the market indicates that the insiders purchase transactions don't bring along any long lasting value to the share price. Hence, suggesting that the insider's information value is limited. Further comparison of the results across our asset pricing models, that is, MM and CM appear to be consistent in both periods and significance level.

Insider Transactions – Sales:

This hypothesis aims to isolate and study the *sales* effect created by insiders. Both the MM and CM model are consistent in their outcomes showing insignificant returns the first trading days after the announcement. However, when interpreting

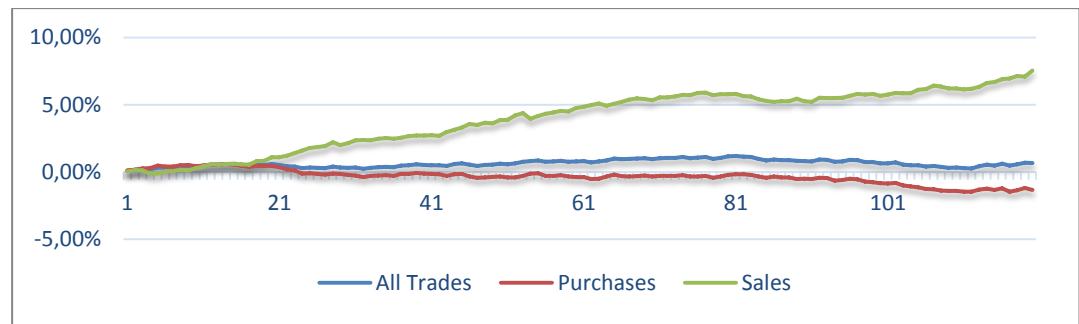
the outputs we get somewhat surprising results. The returns changes and becomes significant at almost all times-horizons from the 1 month period through the rest of the event periods. The results also suggest a correlating pattern between the increasing length in the event windows and the CAR rate of change. For example in the CM we see that the CAR is increasing when comparing the 3 to 6 months returns from 4,4% to 7,1% and in the MM the returns increases from 4,75 to 7,54%. This return pattern might be a result from our sample population which is sensitive towards commodity prices (recall introduction part). Consequently, we expect the increasing CAR on insider's sales to be explained by the information value that insiders possess in *sales* transactions. Even so, we must recall that our dataset is fairly biased due to turmoil in commodity prices (ref. Introduction Results chapter). Despite our biased dataset we find signs that insiders might create a positive CAR for outsiders in longer event windows.

Insider Transactions - Discussion:

Although our results in the *purchase* scenario are significant and positive for the 1 day and 1 week horizon, we experience a different result than (Lakonishok and Lee (2001), Jeng (2003) et al), who concluded that buy transactions should generate higher positive returns compared to sell transactions. When comparing the results we find the opposite results, that is, insider's sales transactions outperform buy signals. On the contrary, our results are more in line with Dovres beliefs that the market reacts stronger to an insider's sale than a buy transaction. One explanation to our findings might be as were suggested by Dovre, that an insider's sales transaction is a better indicator of the future stock price compared to a buy transactions. Another possible reason for our deviating result when comparing previous academic studies might be explained by the fact that our dataset contains a high number of insider's sales which mainly occur within distressed firms in the oil sector. Recall, that we expect falling oil prices to have a causal link to our results. If so, then we see a stronger effect in the insider's sales signals in financial distressed firms, causing any outsider to trade on this transaction to earn abnormal returns in the longer event-windows.

Insider Transactions - Conclusion:

In the graph below we see how the CAR in insider *Sales* develops an increasing return rate as the event window increases. While we see a more modest development in both the CAR for *All trades* and *Purchases*.



Graph 5: Returns according to insiders characteristics

Our results give some evidence that an outsider might outperform the market in most of the time horizons when following certain insider transactions. This can in short be summarized from the purchase hypothesis where we observe a positive and significant CAR after the trade, before the returns decreases and becomes insignificant. This is in line with the Jaffe's (1974) results claiming the market to overreact before mean reverting. In contrast new research conducted by Cohen, Malloy & Pomorski (2012) suggested in their article that returns rates should decrease slightly as the event period expands. On the contrary, outputs from sales showed an increasing return rate as the event window increases. This can be due to either a long lasting insider effect or a result of weaknesses in the methodological framework.

In sum we conclude that; (1) the sales hypothesis deviate from previous studies, but supports Dovre's findings at OSE, (2) the results are more similar to previous studies for the all trades and purchase hypothesis, (3) the results are consistent between the MM and CM. Environmental factors that denigrates our conclusion is that (1) our results vary substantially between the event periods, (2) our sample population is fairly small and (3) our methodology is far from perfect.

7.3 Following Insiders that buy stocks in non-momentum earns abnormal returns. And Insiders selling stocks in momentum earns abnormal returns.

The following hypothesis aims to study whether insider’s returns are higher for momentum (glamour stocks) than low-momentum (out of favor) stocks. According to previous findings, glamour stocks are those which first have performed well in the past, and second are expected by the market to perform well in the future. Similarly, underpriced stocks (out of favor) are those who have performed poorly in the past and are expected to do so in the future (Lakonishok and Lee 2001). Following in the footsteps of these giants, we chose to do the same by splitting the dataset into buy and sales transactions. Note that the table only contains results from the Carhart Model where the Market Model can be found in *appendix 6*.

<i>Carhart Model</i>						
	<i>Buy Low MOM</i>	<i>Buy Med MOM</i>	<i>Buy High MOM</i>	<i>Sell Low MOM</i>	<i>Sell Med MOM</i>	<i>Sell High MOM</i>
1 Day	0.00442 *** (0.00168)	0.00109 (0.000931)	-0.00197 (0.00197)	-0.000559 (0.0123)	0.000875 (0.00145)	-0.000268 (0.00194)
1 Week	0.00797 ** (0.00316)	0.00376 ** (0.00181)	0.000543 (0.00415)	-0.0340 (0.0206)	0.000316 (0.00300)	0.00521 (0.00329)
1 Month	0.00864 (0.00667)	0.00404 (0.00349)	-0.00264 (0.00823)	-0.0365 (0.0261)	0.00807 (0.00492)	0.0249 *** (0.00659)
3 Months	0.0389 *** (0.0142)	-0.0173 ** (0.00681)	-0.0313 ** (0.0156)	-0.0376 (0.0324)	0.0142 (0.0104)	0.0906 *** (0.0141)
6 Months	0.109 *** (0.0206)	-0.0498 *** (0.0129)	-0.110 *** (0.0238)	-0.141 * (0.0700)	0.00350 (0.0153)	0.180 *** (0.0214)
N	370	653	236	51	162	186

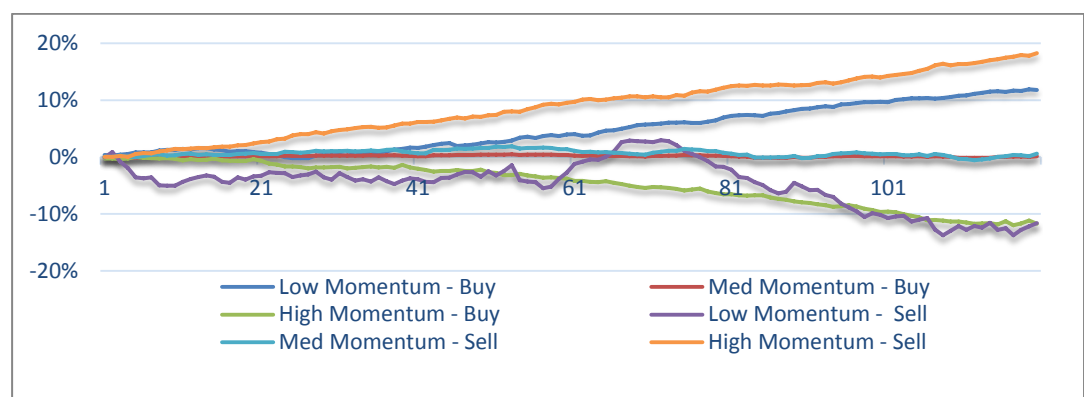
*Table 6: Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

Results Momentum – Buy Transactions:

As can be seen in the tables below the low momentum stocks outperform both the high and medium momentum stocks. This is not in line with Jegadeesh and Titmans (2001) conclusion that loser stocks should consequently continue to perform poor. On the other hand, Khaneman and Tversky (1982) explain this to be a psychological behavior, resulting from the beliefs that individuals form their predictions of the future without a full appreciation of mean reversion. In other words, investors lean towards expectations from past data, hence biasing their

expectation of future outlook. The superior strategy would therefore be to sell stocks with high past growth, and buy stocks with the low past growth.

Again, further interpretation of our results supports that there is a huge difference in the returns for high and low performing stocks after 3 -and 6 months of trade. The Carhart model with the 6 months' event window gives a CAR of 10,9% being significant at a 1% level for the low momentum. While on the other hand High – and Medium momentum generates significantly negative returns at a 1% significance level. Moreover, this is in line with Lakonishok and Lees (2001) conclusion that insiders tend to act in a contrarian momentum strategy. Even so, when moving back to the results presented in the graph bellow, we see how the returns distribute differently according to event window and portfolio.



Graph 6: Returns according to insiders characteristics Momentum

Results Momentum – Sale Transactions:

Regarding the sales transactions, we see that high momentum strategy generates a significantly high CAR for both the 3 and 6 months' time horizons. When studying the results further we see that the CAR for the 6-month event window is 18,2%, which is improbable. One explanation to these extreme returns might be explained to be a result of our chosen methodology. Recall that the estimated betas are constant over the whole event window; but in fact the beta values might change significantly the larger event window gets. This is due to the fact that well performing stocks will not perform at the same rates, and hence the estimated beta values from the estimation process will over-estimate the betas that is being used in the event-window. This is also a reasonable explanation as stocks tend to mean-revert, which is seen in the shorter event windows where the CAR is insignificant.

Remember that shorter event windows are better suited for event studies, as these betas are more accurate the closer you get to the event date, which might be the reason for the extreme returns.

Regardless of the methodology the results are consistent with Lakonishok and Lee (2001) and Seyhuns (1998) conclusion that insiders act contrarian compared to the market. Implying that insiders tend to sell stocks when they are overpriced, and buy stocks when they are underpriced, as can be seen in the performance from the different strategies in graph 6. This is not withstanding with Dovres results where they claimed the only profitable momentum strategy to be buying glamour stocks, and selling them within the next 6 months as the effect tends to mean-revert. Then again, Dovres methodology and disputed results has not been approached within the framework of academic research. Making their results highly questionable as Dovre is a commercial investment fund with vested interests. It is therefore important to question both Dovres perspective and motives before embracing their findings.

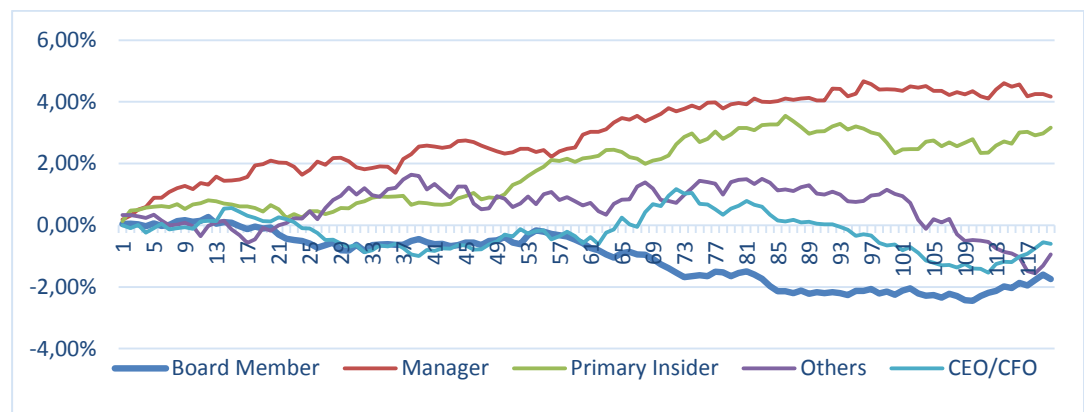
7.4 Following some types of insiders results in different abnormal returns

This hypothesis studies whether there are any differences in CAR among the returns across different positioned insiders. Correspondingly to our arguments and expectations made in the hypothesis (ref chapter 5.7), we see a noteworthy variation in returns across different insiders.

<i>Carhart Model</i>					
	<i>CEO/CFO</i>	<i>Members Of The Board</i>	<i>Managers</i>	<i>Primary Insiders</i>	<i>Others</i>
1 Day	0.000307 (0.00177)	0.000473 (0.00126)	0.00188 (0.00133)	0.00113 (0.00146)	0.00360 (0.00276)
1 Week	-0.000587 (0.00343)	-0.0000738 (0.00221)	0.00873 *** (0.00297)	0.00608 ** (0.00287)	0.00341 (0.00449)
1 Month	0.00225 (0.00578)	-0.00250 (0.00446)	0.0194 *** (0.00604)	0.0113 ** (0.00562)	-0.00138 (0.00749)
3 Months	-0.00337 (0.0131)	-0.00842 (0.00892)	0.0277 ** (0.0109)	0.0249 ** (0.0122)	0.00627 (0.0165)
6 Months	-0.00390 (0.0227)	-0.0213 (0.0146)	0.0377 ** (0.0180)	0.0394 ** (0.0196)	-0.0203 (0.0276)
N	295	545	408	214	166

Table 7: Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Once interpreting the results from the market model we see that the only significant insiders are *Managers* and *Primary Insiders*. However, it is noteworthy that the 1 day event window is insignificant for both parties, indicating that we don't have any immediate short term effects. However, the CAR for both *Managers* and *Primary Insiders* turn positive and significant from the 1 week until the end of the event of interest. When comparing the MM to the CM we find inconsistent results in the CAR. In the CM we observe a greater amount of significant observations, this especially accounts for the group *Primary Insiders*, where the positive returns are significant at 5% at all observed event windows from 1 week and further on which is visualized in graph 7.



Graph 7: Returns according to insiders position

All things considered our results seem to be in line with both our anticipations and previous findings in similar studies. One example of a similar study was conducted by Fidermuch (2006) who also studied the short term excess returns. In his approach Fidermuch segregated the insider's transactions into groups for higher and lower positioned insiders. For example, CEO and top executives were bundled into the top positioned group, while less updated directors and chairmen were labeled as lower positioned insiders. Altogether, Fidermuch found that in the shorter event windows all insider positions, which are both top –and low positioned insiders were significant except from the insiders labeled as former directors. Lakonishok and Lee (2001) also found similar results, that lower positioned insiders tended to earn greater abnormal returns than higher positioned insiders. Explaining this to be a result by the fact that higher positioned insiders

are more likely to be scrutinized by shareholders and regulators. For example, insider trades made on the Norwegian stock exchange are controlled by the Norwegian Security Agency (Finanstilsynet) who has strict guidelines for insider to trade. Therefore making higher positioned insiders more monitored, and hence controlling the insiders possibility to misuse potential information advantages (ref chapter 1).

Likewise, our results are in line with Lakonishok and Lees (2001) findings where lower positioned managers generate greater significant CARs than higher positioned insiders. Even so, we see that the CAR is very small being below 1 % for both *managers* and *primary insiders*. In addition to generate a tiny CAR we see a low significance level on 5% for the *primary insiders*. Thus, we only feel confident to conclude that *managers* seem to provide the market with valuable information. Again when comparing our results to Dovres findings. Recalling the discussion from chapter 5.4, where they stated that top management possess more valuable information than other related insider. In the light of their findings, we conclude that insiders possess different information and that lower level insiders create positive CAR. Nonetheless, our results deviate from the finding that *CEO/CFO* insiders are insignificant.

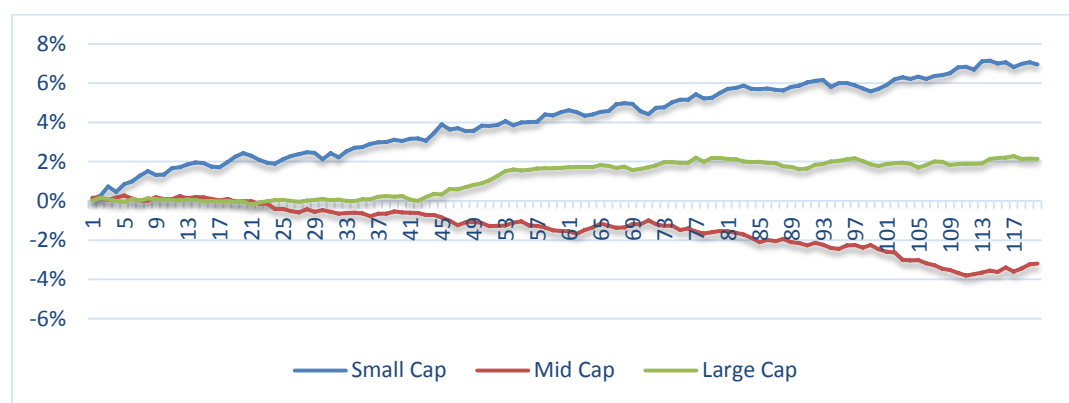
7.5 Following Insiders trades in Small-Cap firms generates higher abnormal returns than following Insiders trades in Big-Cap firms.

This hypothesis studies whether different firm characteristics measured in financial ratios can generate different abnormal returns for insiders. Recalling our discussion from chapter 5 where we discussed the results found by Fama and French, that firm characteristics do affect returns. And that investors required a greater risk-premium when investing in small-capitalized firms.

	<i>Market Model</i>			<i>Carhart Model</i>			
	<i>Smallcap</i>	<i>Midcap</i>	<i>Largecap</i>	<i>Smallcap</i>	<i>Midcap</i>	<i>Largecap</i>	
1 Day	0.000974 (0.00197)	0.00158 (0.000965)	0.000244 (0.000764)	0.00130 (0.00193)	0.00170* (0.000971)	0.000102 (0.000779)	
1 Week	0.00844** (0.00357)	0.00281 (0.00194)	-0.000492 (0.00146)	0.00836** (0.00351)	0.00256 (0.00193)	-0.000656 (0.00149)	
1 Month	0.0243*** (0.00597)	-0.000191 (0.00391)	-0.000275 (0.00346)	0.0263*** (0.00603)	-0.00204 (0.00383)	0.000968 (0.00348)	
3 Months	0.0451*** (0.0107)	-0.0153* (0.00820)	0.0168** (0.00748)	0.0442*** (0.0106)	-0.0155* (0.00814)	0.0166** (0.00757)	
6 Months	0.0695*** (0.0175)	-0.0320** (0.0135)	0.0214* (0.0123)	0.0646*** (0.0177)	-0.0335** (0.0135)	0.0213* (0.0125)	
N	407	814	407	N	407	814	407

Table 8: Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The result from this hypothesis shows that *Smallcap* firms outperform both its peers, by being highly significant at almost all events, except in the 1 day event window. The accumulated returns are also visualized in the graph where we observe a constantly positively trending CAR for *Smallcap* firms. While for the *Midcap* and *Largecap* we observe an insignificant CAR around zero until approximately 40 days. This is when the *Midcap* starts to trend slightly negative, and turns significant at a 10% level after 3 months, before it gets significant at a 5% level at the 6 months event window. The *Largecap* have a different behavior where it starts to trend slightly positive after 40 days and accumulates a significantly positive CAR at the 3 and 6 months event window.



Graph 8: Returns according to firm characteristics

When comparing the two models from table 8 we observe consistent and insignificant differences between the CM and MM. However, knowing that the CM gives a more conservative measurement we find it interesting that the CARs

maintain positive and significant after being adjusted for the HML and SMB effects. This can be interpreted as a result where *Smallcap* firms outperform the greater capitalized firms. A result that is in line with previous studies (Fama and French (1993)), which states that *Smallcap* firms outperforms the greater capitalized firms due to the investors demand for greater risk premiums in these stocks.

7.6 Following an Insider in firms with high Price Earnings ratio earns you greater abnormal returns than following Insiders in firms with low P/E ratio

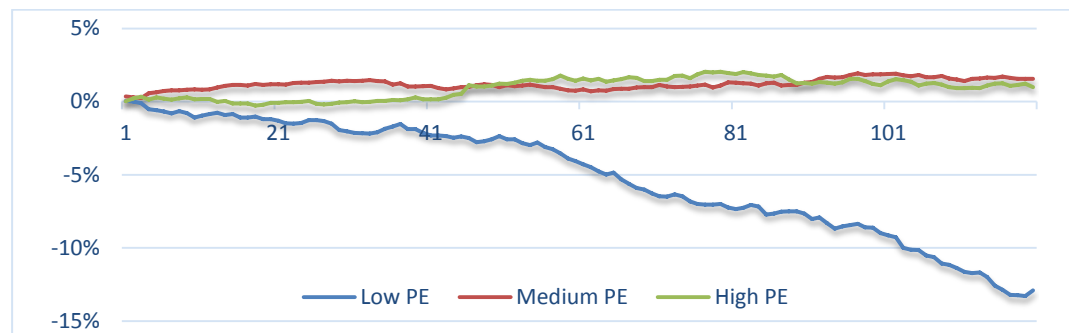
This hypothesis studies whether different firm characteristics can generate different abnormal returns for insiders by studying the relationship between Price-Earnings. As were mentioned in both hypotheses 7.5 and chapter 5.6 we expect there to be deviating results across different P/E multiples.

	<i>Market Model</i>			<i>Carhart Model</i>			
	<i>LowPE</i>	<i>MidPE</i>	<i>HighPE</i>	<i>LowPE</i>	<i>MidPE</i>	<i>HighPE</i>	
1 Day	0.000423 (0.00120)	0.00349 *** (0.00113)	0.000320 (0.00120)	0.000225 (0.00124)	0.00359 *** (0.00112)	-0.0000118 (0.00120)	
1 Week	-0.00582 * (0.00316)	0.00637 *** (0.00183)	0.00290 (0.00244)	-0.00614 * (0.00322)	0.00554 *** (0.00181)	0.00277 (0.00243)	
1 Month	-0.0120 ** (0.00586)	0.0119 *** (0.00323)	-0.000794 (0.00492)	-0.0108 * (0.00595)	0.0112 *** (0.00315)	-0.000678 (0.00502)	
3 Months	-0.0406 *** (0.0127)	0.00751 (0.00640)	0.0143 (0.0108)	-0.0410 *** (0.0126)	0.00744 (0.00636)	0.0140 (0.0109)	
6 Months	-0.129 *** (0.0255)	0.0156 (0.0111)	0.00987 (0.0181)	-0.128 *** (0.0257)	0.0143 (0.0113)	0.0126 (0.0178)	
N	262	522	261	N	262	522	261

*Table 9: Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

When narrowing the focus to the shorter event windows, as can be seen in the table above, we find significant positive CARs for the *MidPE* firms. Even though the results are significant at a 1% level, the CAR is fairly low, and the results turn insignificant at the longer event-windows. For the *LowPE* case we observe opposite results, where the CAR is insignificant close to the announcement day, before it changes and becomes significant for the longer event windows. One

observation to notice is the increasing negative returns which is showing a CAR of -12,9% in the 6 months case.



Graph 9: Returns according to firm PE

Such an excessive negative return for low PE firms are very questionable and is suspected to be a result of our poor dataset. Especially when comparing the result to earlier studies. For example, in our further analysis we do not observe any significant results for the *HighPE* case, which brings along contradicting results as Basu (1977) who found that high PE firms do generate greater risk-adjusted returns. Our result, that is, showing unlikely negative CAR from low PE firms, is therefore surprising. Especially when considering that the underlying consensus from previous research support that insiders in growth firms (*HighPE*) possess more valuable and asymmetric information. Henceforth, we would expect growth firms to outperform both *mid* –and *low PE* firms, as they are known to be more sensitive to news. By news we mean transactions made by insiders where the market interprets the insiders behavior as news. Moreover, another sobering conclusion is that *HighPE* stocks perform in average worse than *MidPE* firms in the shorter event windows up and until 1 month which is opposite to other studies. On the other hand Basu found the same result as us where Low PE firms underperformed when risk adjusting its returns, and hence showing the same results as in this thesis.

Brief Conclusion to P/E

Due to our deviating outputs from this hypothesis when comparing it to earlier studies, we feel somewhat critical to our interpretation of the results. Especially when we observe how the CAR develop extreme returns as the event window increases. However, assuming their validity we see that *MidPE* is the superior strategy generating significant positive CARs for the 1 day until the 1 month event window which can be seen in the graph below.

7.7 Is there a difference in abnormal return between firms with high and low price/book ratio

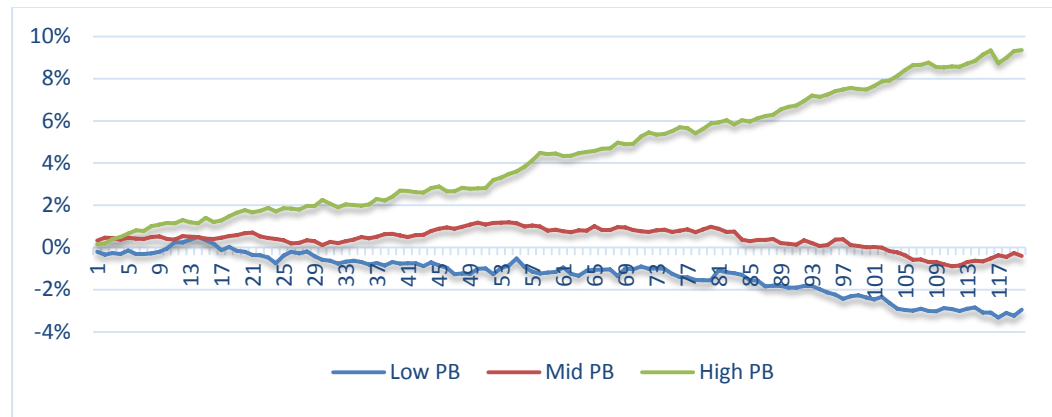
This hypothesis studies whether different firm characteristics can generate different abnormal returns for insiders, focusing on results from the Price-Book ratios.

	<i>Market Model</i>			<i>Carhart Model</i>		
	<i>LowPB</i>	<i>MidPB</i>	<i>HighPB</i>	<i>LowPB</i>	<i>MidPB</i>	<i>HighPB</i>
1 Day	-0.00203 (0.00157)	0.00322 *** (0.00101)	0.00144 (0.00121)	-0.00162 (0.00157)	0.00319 *** (0.000996)	0.00139 (0.00121)
1 Week	-0.00151 (0.00272)	0.00455 ** (0.00194)	0.00659 *** (0.00236)	-0.00167 (0.00272)	0.00445 ** (0.00192)	0.00645 *** (0.00236)
1 Month	-0.00205 (0.00627)	0.00668 * (0.00366)	0.0176 *** (0.00504)	-0.0177 ** (0.00731)	0.00522 (0.00387)	0.0418 *** (0.0101)
3 Months	-0.0116 (0.0111)	0.00832 (0.00816)	0.0445 *** (0.00993)	-0.0109 (0.0108)	0.00602 (0.00820)	0.0449 *** (0.00987)
6 Months	-0.0296 (0.0182)	-0.00409 (0.0131)	0.0935 *** (0.0159)	-0.0368 ** (0.0182)	-0.00799 (0.0131)	0.100*** (0.0161)
N	383	741	363	N	383	741

Table 10: Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The table incorporates two very different results as can be seen in the *MidPB* and *High PB* columns. Here we see that the *MidPB* generates positive significant CARs in the shorter event windows. That is, the 1day and 1 week event window. When focusing on the *HighPB* column we see a different time effect where the 1 day time period is insignificant, before turning significant at a 1% level in the rest of the event window. One interpretation of the different significance levels across the time horizons might be related to the fact that *MidPB* and *HighPB* contain an umbrella of different firms (Appendix 3). It is therefore naturally to expect a market reaction with respect to the study group’s firm characteristics to behave differently. Henceforth, we would expect growth firms to outperform both mid and low P/B firms, as they are known to be more sensitive to news. Further extension of our analysis, when comparing *PB* towards the other results from the *PB* hypothesis, we find similar characteristics where *MidPE* and *MidPB* outperforms the market the first trading days after the announcement. Another

contrast to the results found in the Carhart model is that *LowPB* is statistical significant 1 and 6 months' time period, generating negative CARs.



Graph 10: Returns according to Firms PB

Even so, the inconsistent results between the MM and CM is believed to be a result due to the fact that CM adjust for additional factors. That is the Price-Book effect through its HML and SMB coefficients. Knowing that CM is a more conservative asset pricing model, we therefore expect somewhat deviating results where the HML effects are affecting the returns. The returns from the table are visualized in graph 10, where we see that *MidPB* and *HighPB* firm generates positive CARs.

7.8 Following insiders in some industries earns you greater abnormal returns

This hypothesis studies whether different industries can generate different abnormal returns for insiders. Both the rationale and essence behind the hypothesis is detailed explained in chapter 5.8. In short, we wish to investigate whether different insiders across industries generate different returns. Expecting the huge variety between industries and individual company activities to bring along different characteristics and value drivers for each industry. Henceforth assuming that different insiders across industries generates different CAR's.

<i>Carhart Model</i>									
	<i>Consumption</i>	<i>Financial Insurance</i>	<i>HealthCare</i>	<i>Industry</i>	<i>OilGasProd Explor</i>	<i>OilGasEquip</i>	<i>Seafood</i>	<i>Shipping</i>	<i>TechTelecom</i>
1 Day	0.00320 ** (0.00159)	-0.000255 (0.00167)	-0.00992 ** (0.00483)	0.00315 (0.00240)	0.000407 (0.00195)	0.00275 (0.00171)	0.00206 (0.00179)	0.00131 (0.00295)	0.00111 (0.00166)
1 Week	0.00583 * (0.00329)	-0.00477 (0.00366)	-0.000597 (0.00923)	0.0101 *** (0.00360)	0.000644 (0.00389)	0.00255 (0.00360)	0.00118 (0.00484)	0.00640 (0.00596)	0.00373 (0.00322)
1 Month	0.0162 *** (0.00565)	-0.000221 (0.00477)	0.0141 (0.0180)	0.00855 (0.00729)	0.00139 (0.00920)	0.00600 (0.00653)	-0.0129 (0.00996)	0.000568 (0.00993)	0.0129 ** (0.00557)
3 Months	0.0338 *** (0.00963)	-0.00686 (0.00827)	0.0310 (0.0296)	0.0134 (0.0153)	0.0135 (0.0171)	-0.00763 (0.0142)	-0.0503 ** (0.0248)	-0.0333 (0.0207)	0.0393 *** (0.0128)
6 Months	0.0526 *** (0.0148)	-0.0398 *** (0.0144)	0.0186 (0.0533)	0.0119 (0.0213)	-0.00531 (0.0290)	0.00815 (0.0231)	-0.118 ** (0.0470)	-0.0220 (0.0281)	0.0791 *** (0.0233)
N	194	237	75	250	231	261	111	64	205

Table 11: Standard errors in parentheses * p < 0.10, ** p < 0.05, * p < 0.01**

In our analysis of industry returns we see, as expected, that the returns deviates a lot across industries. *Consumption* and *Tech&Telecom* all generates significant abnormal returns. Thereupon, the *Consumption* industry is significant at all event windows. One glance at the table shows that the immediate short term effect of the abnormal returns after the announcement date is significantly positive, even though its fairly low. The abnormal return pattern is consistent when extending the event windows to one week where the CAR is only significant at a 10% level. Further interpretation of the consumption results show that the CAR continues to have a positive trend with an increasing rate of return all the way through the rest of the time-horizon. When comparing this result with *Tech&Telecom* we observe similar behavioral trend in the longer event windows. That is the from the 1 month event window and throughout the 6 months event window the CAR trends positively upwards and ends up with the supreme CAR compared to its comparable. These results are in line with Fama and French (1993) stating that small capitalized firms outperform the market. Being the case for the industry *Tech&Telecom*, where the data behind the classification incorporates many small capitalized firms (ref data). In addition, recall our results from hypothesis 4 where we found similar findings regarding market capitalization.

When focusing on the results from the industry *Consumption* we see significant results through all event windows. A result we find strange when considering that the industry group contains many large capitalized firms (ref data) as; Orkla,

Royal Carribean Cruises, Norwegian Air Shuttle, SAS, and Ekornes. Knowing that these firms is a large part of the index, it is reasonable to expect the same logic as is argued above. Mainly that high analytical coverage will be present and hence these stocks should not be able to earn any abnormal returns. Another argument is that within this industry we observed 53% of the insider signals to be sales. Bearing in mind the results from hypothesis 1, and Dovres study where they found insider sales to be more informative to the market, we also find the greater number of sales to be an important factor for this significantly positive CAR. Further analysis, when conducting the Wilcoxon rank-sign test we observe similar significance levels through the entire event windows, except in the 1 week window, where the CAR is not significant at any level. This is due to fairly equaled signs in the CAR at this event window.

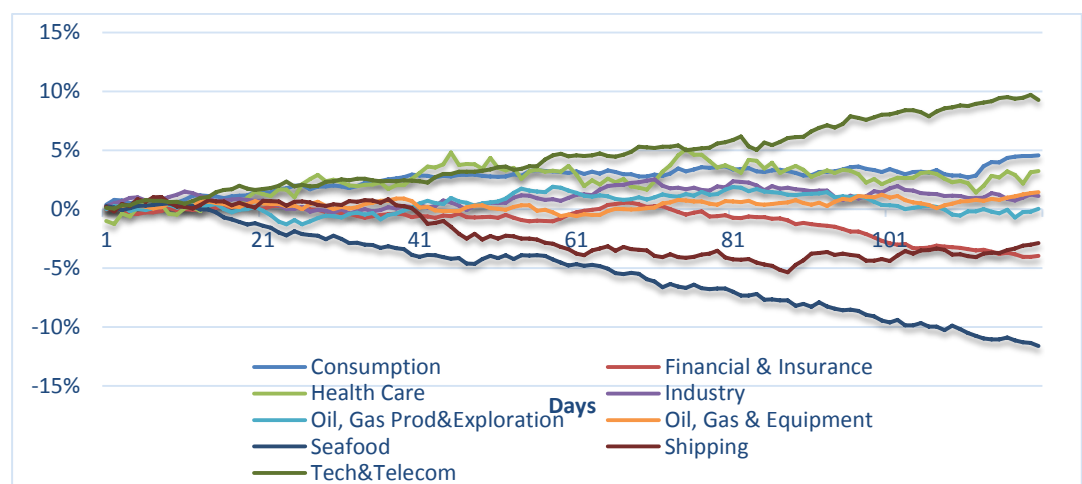
Regarding the other results we see that the most noteworthy outlier is the returns generated by the industry *seafood* in the 6 month horizon with a CAR of -11,6%. Conversely the industry does not seem to earn any significant CARs on the shortest event windows where the CAR turns significantly negative at the 3 months window, and continues to trend negatively throughout the rest of the event windows. One reason for the extremely bad negative results might be that we observe a great number of insider sales (ref. data) in the seafood sector. A trend which is very unlucky from a return perceptible for the insiders, when considering that the seafood sector has been in a major bullish trend since 2011 increasing by approximately 433%¹⁹. Therefore we expect the negative returns from the sales transactions to be a results of insiders who underperformed by misjudging the megatrend within the salmon sector. If so, then it is fair to oppose further question marks to whether insiders information can generate CAR. Also note that when conducting the Wilcoxon rank-sign test we get the same results regarding significance level which again underpins our logic.

Other results from the sectors *Financial & Insurance*, *Health Care*, and *Industry*, shows significance at only one of the event windows, though in different time horizons. *Health Care* is the industry where we observe an immediate short term

¹⁹ <http://www.oslobors.no/markedsaktivitet/#/details/OSLSFX.OSE/overview>

effects and is earning a negative CAR at almost 1%. When expanding the event window the effect turns positive but though insignificant, and continues in this track through the rest of the event windows. Recalling that *Health Care* is a very volatile industry containing of very few companies where the size of the companies are small (ref data). The volatile insignificant results can be explained by the fact that *Health Care* incorporates pharmaceutical companies which are known to be very sensitive towards “big” news, depending on their success rate of their products and inventions. Due to the high uncertainty and few observations regarding this industry we have chosen not to emphasize these results in our conclusion.

While on the other hand, when comparing *Health Care* to the results from *Financial & Insurance* we observe a completely opposite pattern. Being insignificant through nearly all event windows, before turning negative significant at the 6 months event window. Recalling that our methodology is more reliable the shorter the event windows are, and due to the fact that we have not observed any statistical significant results in the shorter event windows, we choose to exclude this result in our conclusion. When moving on to the group *Industry* the only significant result is the 1 week CAR at 1%, significant at a 1% level. Due to the fact that *Industry* is very sensitive towards macroeconomic factors we expected industry to be insignificant at all levels, ref (chp 5; Micro/Macro).



Graph 11: Returns according to industry

Moreover when comparing results with the industries; *Oil, Gas Production & Exploration*, and *Oil, Gas Equipment and Shipping* we get insignificant returns. A result that is a prior to our expectations stated in the hypothesis chapter, where we argued that low degree of information asymmetry and high analytic coverage would eradicate the possibility of generating CAR.

Conclusion

In sum, from the discussion above, we can conclude insider trades within *Consumption* outperform at all event windows. While *Tech&Telecom* also outperforms the market, though this is only in the longer time windows from the announcement date of the insider trade. However, these results differ somewhat from Seyhun (1998) who stated that insiders within industries with more sensitive information generate greater abnormal returns. In our case *Tech&Telecom* which is an industry that is highly sensitive to news, confirms Seyhun's conclusion and outperforms the market when we don't consider the weaknesses in the methodology due to the long event window. On the contrary, when concluding for the industry *Consumption* we don't oppose the same methodological challenges concerning the length of the event windows. However, because of the bundle of firms which is categorized as *Consumption*, we find it hard to divide between so called high-sensitive firms, and less sensitive firms within this industry in order to make the study directly comparable to Seyhun (1998). Even so, our results and arguments points out that there is some evidence that insiders across different industries generates significant positive CARs. Having concluded this, we feel reluctant to believe that from an external investors perspective it would be hard if not impossible to make any significant returns by mimicking the insiders. Reasoning this by referring to the small returns found in our analyses which are too small to generate positive significant returns when including transaction costs. In other words, the low CAR will be balanced out by the transaction cost.

7.9 Outsiders can earn abnormal returns by following insiders in Micro firms

To further investigate the information asymmetry as were found in the hypothesis 7, we chose to divide the sample into *Macro* and *Micro* sensitive companies (ref chapter 5.8). This hypothesis can therefore be thought to be an extension or sub-

hypothesis to the industry hypothesis. Also recalling that we wanted to investigate the robustness behind Dovres research, we chose to follow their approach by distinguishing between buy and sales for each of the groups.

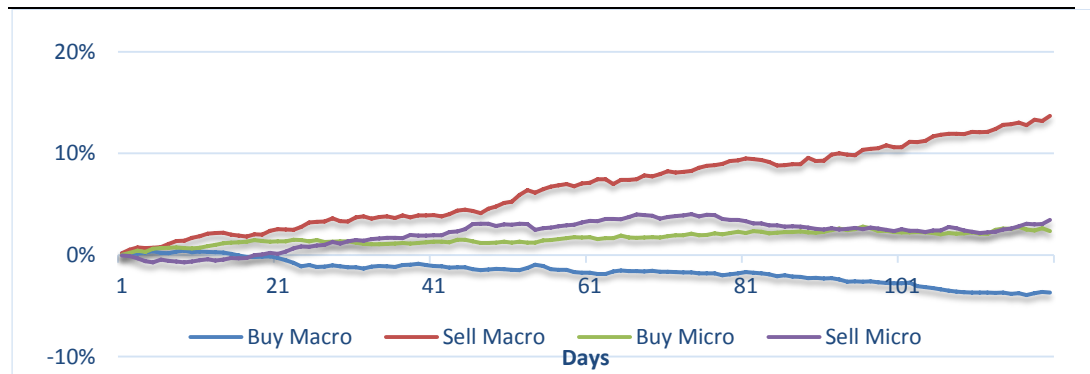
<i>Carhart Model</i>						
	<i>Buy Macro</i>	<i>Sell Macro</i>	<i>Buy Micro</i>	<i>Sell Micro</i>	<i>Buy&Sell Macro Combined</i>	<i>Buy&Sell Micro Combined</i>
1 Day	0.00224 ** (0.00106)	0.00125 (0.00279)	0.000314 (0.00113)	-0.000494 (0.00201)	0.00208 ** (0.000998)	0.0000619 (0.00100)
1 Week	0.00357 * (0.00206)	0.00816 ** (0.00411)	0.00580 ** (0.00224)	-0.00683 * (0.00397)	0.00430 ** (0.00185)	0.00185 (0.00199)
1 Month	-0.00129 (0.00432)	0.0246 *** (0.00752)	0.0128 *** (0.00406)	0.00267 (0.00581)	0.00286 (0.00383)	0.00962 *** (0.00333)
3 Months	-0.0173 * (0.00897)	0.0684 *** (0.0151)	0.0185 ** (0.00754)	0.0285 *** (0.0108)	-0.00352 (0.00798)	0.0216 *** (0.00618)
6 Months	-0.0434 *** (0.0165)	0.141 *** (0.0278)	0.0585 *** (0.0144)	0.0206 (0.0223)	-0.0130 (0.0146)	0.0463 *** (0.0121)
N	770	147	489	222	917	711

Table 12: Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Results - Macro Buy and sell

From table 12 we observe contradicting results for *Macro* related firms in the shortest event windows showing rather small but significantly positive CAR. A rather surprising finding as we expected *Macro* related firms to be bigger firms that have a higher analytical coverage compared to *Micro* firms. However, a denigrating finding is the significance level where we see that the results have week statistical support as the significance level for the 1 day and 1 week are at only 5% and 10%.

When looking at the table we see that in the longer event windows the CAR turns negative and becomes highly significant at the 6 months event window with a CAR of negative 4,34%. A development that is neither in line with our expectations, as we are critical to why should an insider be better at predicting the future development of macro factors than an average investor.



Graph 12: Returns according to Macro & Micro

On the other hand we have the Macro Sell variable. Through the red line in the graph along with the results in the table we see that the *Macro sell* variable is at first insignificant, before starting a positive trend generating significant and highly positive CARs over the rest of the event windows. Likewise in the Macro Buy results we see how the shorter time horizon, this time in the 1 week window, contain weak statistical support being significant at 5%. Regarding the high returns from the 1, 3 and 6 months returns we believe this to be a result related to the decreasing commodity and oil prices, which fell by 60% from June 2014 to 2016. Knowing that macro firms often are large and are in very cyclical markets, where the returns highly depend upon non-domestic factors can be one explanation of the trending returns. Due to this fact we observe a high amount of insider sales signals in these companies in the time before and during this period. Therefore when accumulating the returns we obtain highly significant positive returns. Also bearing in mind the weaknesses with the methodology and especially when the volatility is high, as it is in this group, the *real* beta values of each individual company might be changing throughout the event period. The results should therefore be taken with a grain of salt.

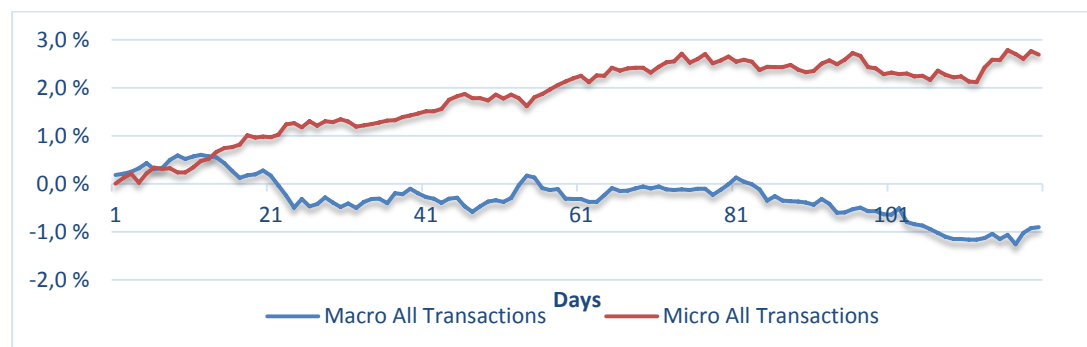
Results - Micro buy and Sell

The *Micro buy* result shows no immediate effects after the insider's transactions, which is the opposite of what we observed in the *buy Macro* case. Even so we observe a smooth positive trend in the CAR (graph 12), being significant at either 1% or 5% in all other event windows. Though the CAR is very small being between 0,5 and 2% in the period 1 week, 1 and 3 months. These results are more

in line with our expectations from the hypothesis chapter. (ref chapter 5). Where we presented a logical perspective discussing how micro firms are expected to perform better than macro firms.

When moving on to *Micro Sell* we see at first glance that the *Micro Sell* is insignificant in the short event windows, before it turns positive and significant after the three month window. Also when conducting the Wilcoxon rank-sign test we find significance in both MM and CM at the 3 -and 6 months window. One explanation to these abnormal returns in the Micro sector might be that these companies are less related to macroeconomic factors. It is therefore more reasonable to believe that outsiders have less information about these firms, and hence the information given by insiders, here through stock buys and sales, are seen as more valuable for investors.

Micro and Macro Combined

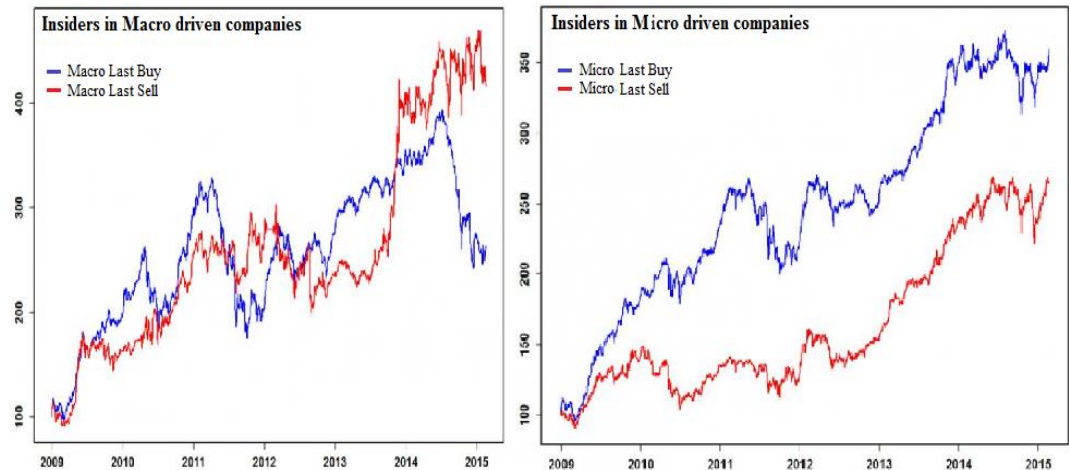


Graph 13: Returns according to Macro/Micro all trades

Moving on to the combined results for buy and sale for both the two groups *Micro* and *Macro*, we observe a significant short term effect in the macro combined buy and sales, before it turns insignificant on the longer event windows. A reasonable explanation to the combined buy and sales, is that the sum is simply a weighted average among the buy and sale within each of the two categories. Hence, the combined *Micro* has the opposite pattern starting of insignificant before turning significant at a 1% level through the rest of the event windows.

Discussion and conclusion – Macro Micro

Further analyses when comparing our results to Dovres we find some similar results. That is, *Buy Micro* generate positive CARs where they both outperform the alternative strategies *Buy Macro* and *Sell Micro*. However, our outputs from the *Buy Macro* deviate by being a better strategy compared to *Sell Macro* see (graph 4 below). Being that as it may, we can't conclude whether these strategies would be profitable due to the small positive CAR in the shorter event.



Graph 4: Dovres returns dividing between Macro and Micro driven companies – source: Dovre Forvaltning

The final results can be summarized to be dependent upon the same challenges as has been the topic through the whole thesis. Namely how reliable are the long term event windows, and hence the question is how trustworthy the methodology is. For example if the methodology applied is trustworthy and truly reflects the returns of the insiders, we can conclude that *Micro* firms outperform *Macro* firms, in addition they are also able to earn abnormal returns. Thus on the other hand if we are more skeptical to the methodology applied, as we see no short term abnormal returns for *Micro*. We reject the hypothesis that *Micro* firms outperform *Macro* firms, as *Macro* firms have proven to be significant at the short term, and hence these results are more robust. Further when comparing our results to Dovres outputs, we do not feel confident to conclude that insiders trading in *Micro* firms incorporate more valuable information to the market compared to *Macro* firms.

7.10 Following Insider's trading in higher volume earns abnormal returns

This hypothesis will study whether insider transactions measured in volume provide the market with a signal for the future direction of the stock price. In this hypothesis we will make a distinction between buy and sales, as this has yielded significant different results in previous literature. We also make a distinction between absolute trade volume, and the relative change in holdings of stocks for the individual insiders. The reason for this is that when we only study the absolute volume of the trade, this could bias the results as these might be correlated with the firms-size. The relative size is defined as the percentage change in insider's holdings after the transactions. From this we assume that the insider's confidence about their own firm will be correlated with their trading risk in volume, which we hope will be reflected in the actual trade volume (ref chapter 5.10). Hence, hoping that the insiders willingness to invest will reflect their level of information.

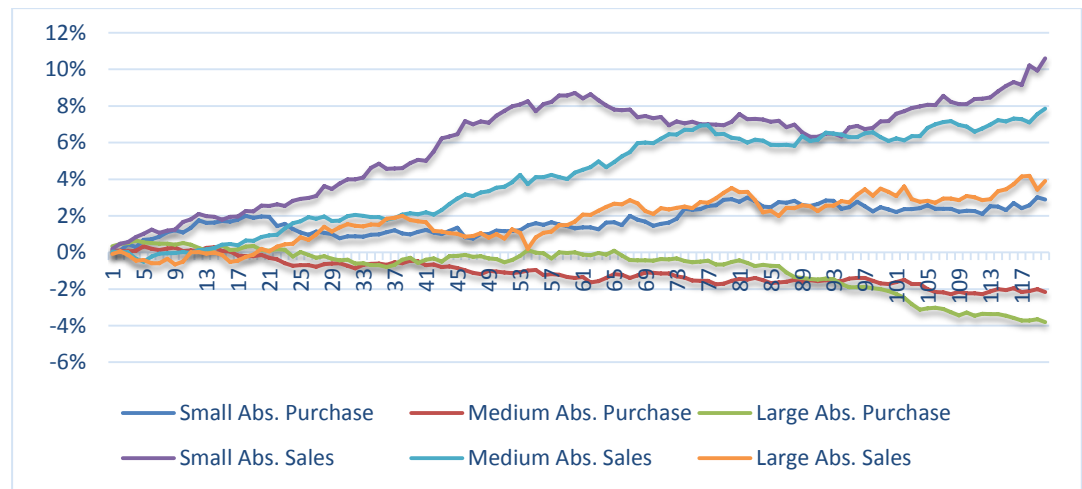
Absolute trades

	Carhart Model					
	<i>Small Absolute Purchase</i>	<i>Medium Absolute Purchase</i>	<i>Large Absolute Purchase</i>	<i>Small Absolute Sale</i>	<i>Medium Absolute Sale</i>	<i>Large Absolute Sale</i>
1 Day	0.00362 ** (0.00167)	0.00128 (0.000998)	-0.000226 (0.00178)	0.00168 (0.00210)	0.000357 (0.00264)	-0.00154 (0.00324)
1 Week	0.00715 ** (0.00316)	0.00296 (0.00221)	0.00461 (0.00285)	0.0101 ** (0.00442)	-0.00378 (0.00478)	-0.00564 (0.00484)
1 Month	0.0195 *** (0.00734)	-0.000898 (0.00413)	-0.000751 (0.00547)	0.0256 *** (0.00865)	0.0107 (0.00687)	-0.000896 (0.00876)
3 Months	0.0137 (0.0141)	-0.0127 (0.00844)	-0.00117 (0.0119)	0.0860 *** (0.0184)	0.0439 *** (0.0115)	0.00522 (0.0191)
6 Months	0.0259 (0.0216)	-0.0203 (0.0145)	-0.0203 (0.0145)	0.108 *** (0.0264)	0.0784 *** (0.0218)	0.0188 (0.0305)
N	308	638	312	90	195	93

Table 13: Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

At first glance at the table we observe that the only significant results are to be found in the *small absolute purchases*. However, when comparing our results to Jeng, Metrick, and Zeckhauser (2003), we get some deviating results as we do not find any significance at either medium or high absolute trade volumes. They also found that high sales volume, earned positive abnormal returns in the short run, but that this effect diminished in the longer run. Similar results were also found by Lakonishok and Lee (ref chapter 3.8). Our result is therefore different from what we expected. Recall our arguments above where we assumed that medium and

larger buy transactions should reflect the insiders willingness to invest. Despite our beliefs, the results suggest that there exists an immediate short term effect for smaller absolute purchases.



Graph 14: Returns according to Absolute Trade Volume

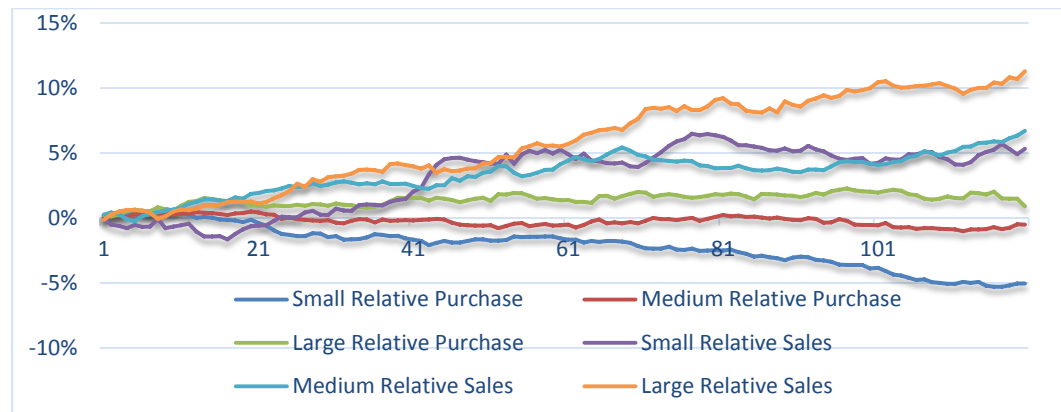
When studying the absolute trade volume for sales, we also find the most significant outputs in the *Small Absolute Sales* group, which is significant from the 1-week event window, until the 6-month event window. Though, our results are significant at a 5 % level and having a CAR on 1%. One explanation for this might be as stated above (ref chapter 5.10), that small absolute sales are more likely to be sales in smaller capitalized firms. Recall the results and arguments from hypothesis 3 where smaller capitalized firms outperformed the other groups. Furthermore, we do not find any significant CARs for the *Large Absolute Sales*. A result supporting Jeng, Metrick and Zeckhauser’s arguments that larger sales made by insiders may have mixed underlying motivations and hence making them insignificant. For example, a sale transaction might be motivated by the need to diversification -, liquidity -, or a risk reducing motives. Even so, we expected larger sales to be more significant than its peers, *medium* and *small* sales as were discussed in the hypothesis chapter 5.10.

Relative Change in Insiders Holdings

	Carhart Model					
	<i>Small Relative Purchase</i>	<i>Medium Relative Purchase</i>	<i>Large Relative Purchase</i>	<i>Small Relative Sale</i>	<i>Medium Relative Sale</i>	<i>Large Relative Sales</i>
1 Day	0.00194 (0.00160)	0.000775 (0.00112)	0.00232 (0.00155)	-0.00123 (0.00465)	0.00211 (0.00187)	-0.00214 (0.00286)
1 Week	0.00441 (0.00285)	0.00283 (0.00216)	0.00659** (0.00332)	-0.00571 (0.00644)	-0.00164 (0.00439)	0.00524 (0.00435)
1 Month	-0.00127 (0.00535)	0.00407 (0.00479)	0.00964 (0.00594)	-0.00465 (0.0112)	0.0205*** (0.00659)	0.00896 (0.00671)
3 Months	-0.0154 (0.00973)	-0.00467 (0.00992)	0.0130 (0.0124)	0.0430** (0.0198)	0.0440*** (0.0119)	0.0464*** (0.0176)
6 Months	-0.0527*** (0.0179)	-0.00647 (0.0155)	0.00884 (0.0215)	0.0305 (0.0292)	0.0744*** (0.0214)	0.101*** (0.0297)
N	338	601	312	90	184	95

*Table 14: Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01*

When studying the relative change in insider’s holdings, we find more mixed results when comparing the insignificant results found in the purchase effects towards other studies. For example, this result breaks with the previous research stating that purchases should earn positive abnormal returns (Jeng, Metrick, and Zeckhauser (2003)). Secondly as we do not observe any significant CARs in the shorter event windows (except for the 1 week CAR in large relative purchases), we will not exclude the possibility for a weakness in the event study, or in the calculation of t-values.



Graph 15: Returns according to Relative

Moving the focus towards the *Relative Sales* results we observe the same patterns as in hypothesis 1. From the table we see that only two significant CARs are of interest from the transactions. That is the 6 months event window for *Medium Relative Small*, and for the *Large Relative Sales* group. Being so at is may, we do not see any significant short term effects in any of the shorter event windows for

the 1 day, 1 week and 1 month window. On the other hand the returns from the longer event windows turns out to be trending in a positively. However, knowing that longer event windows are a source of error because of the methodology, we choose not to emphasize on these result

Conclusion Trade Volume

Over the whole we observe that the only short time effect was found in the case for *Small Absolute Purchase* generating small positive CARs. A result that might support our beliefs that there is a correlation between insider trading in *small absolute volumes* and firm size (ref hypothesis 3). Even so, when considering the other significant results we feel reluctant to acknowledge the insider effects, due to the fact that they are only significant in the longer event windows. In addition we also have a very low sample population that distorts the reliability to our results.

8 Testing trading strategy and portfolios

8.1 Introduction

As the purpose of our study is to see if it is possible to earn abnormal returns by following the insiders transactions, we will make use of the results we found in the event study to make a realistic trading strategy, treating the insiders' transaction as a buy or sale signal to the market.

8.2 Constructing Portfolios

We have constructed 4 portfolios based on the results from our study with holding period of 1 month from the publication of the trade. The returns of these portfolios are calculated as a daily average return of all the stock, where all the stocks are equally weighted in the portfolio in the timespan between (2010) and (2015). The returns will be compared to OSEBX. Another advantage of constructing these portfolios is that we can test if our methodology will make inference in the real world. Recalling the weaknesses of event studies where the betas are constant over the whole event window, we have picked out some hypotheses that had great abnormal returns over the longest event windows (1-, 3, -and 6 months). Thus we are able to make these results, if proven significantly positive, more robust. This

especially accounts for the momentum hypotheses, where poor performing stocks might get negative betas in the estimation process, whilst after the estimation process these betas might change drastically over the 3 –and 6 months horizon. Resulting in spurious results when regressing the cumulative abnormal returns. Note that a graphical presentation of the results will be found in *appendix 7*.

8.3 Hypotheses to be included

To make inference of this trading strategy we will only study some given hypotheses that showed to earn abnormal returns in the event study. Recall that our hypothesis including *all trades* did not show any statistical significant abnormal returns. By dividing the strategy into distinctive criteria we will be able to study if some insider signals are more valid signals regarding abnormal returns than others. In order to have enough trades to make the results more robust a we have chosen to use only one criteria when constructing the portfolios. This forces us to exclude the possibility to combine different hypotheses in order to make a most optimal trading strategy. It is also worth noting that all portfolios are *long (Buy)*, hence excluding insider sales. This is because of the lack of observations and also because we here have to assume that investors are able to go short in the stock at the exact date of the publication, something that are not possible. Thus, the portfolios will have this composition:

Portfolio #1 – Stocks in low momentum with a buy signal

Accordingly to previous theory (Lakonishok and Lee (2001) and Seyhun (1998)) insiders buying stocks with poor performance the past 6 months tend to significantly outperform the market in the days following the events. Given the significant abnormal returns over the time-period of 3 -and 6 months makes it highly interesting to investigate if it is possible to follow these signals and earn the same risk adjusted returns.

Portfolio #2 – Stocks bought by insiders titled as “Managers”

In line with Lakonishok and Lee (2001) study we find the same results, indicating that managers give a more informative signal to the market. Where the argument is that managers often are the main decision makers in the firms, also recall that

Metrick, Jeng and Zeckhauser (2003) argues that top executives and large shareholders suffers a higher level of scrutinization by stakeholders and regulators. Again the significance level of the abnormal returns from the event study makes it interesting to test this trading strategy.

Portfolio #3 – Stocks bought in firms categorised as “Micro firms”

In a study published by Dovre they find that insiders trading in *Macro* firms easily can be ignored, where the argument is that insiders in *Macro* firms are not better at predicting macro related factors, such as the oil price, the salmon price, or the aluminium price etc. The interesting part here is that we find some similar results in our study. This triggers us to construct a trading strategy where we use this logic, and thus only trade in companies categorised as *Micro* firms and where an insider has triggered a buy signal.

Portfolio #4 – Stocks in high momentum with a buy signal

Due to the results in *Portfolio #1*, as presented in table 5 (results chapter), and in addition to Dovres findings. That is stocks that have performed well and continues to perform well, we want to investigate the results that we obtained from the event study to make a realistic trading strategy. Conducting this strategy also makes us able to further study if the estimation process in the event study overestimates the betas in the estimation process. Also by bearing in mind that previous research (Jegadeesh & Titman (2001)) also came to the conclusion that stocks performing well continues to perform well over the next 12 months, we find this portfolio sufficient to create.

8.4 Portfolio Construction

Date of inclusion

Whenever an insider triggers one of the signals as stated above it will be seen as a valid insider signal, and thus be included in the portfolio. The date where we include the stock in the portfolio will be the day of the publication, as we assume that at this date the information is tradable for all market participants at that time.

Holding period

When choosing an appropriate holding period for each stock in the portfolio we choose to imitate Dove by setting the same holding period length. Hence we end up with a holding period of 1 month all portfolios, as they find returns to slowly decrease at longer time-spans. However we also want to check the long-term effects in two of the hypotheses as this was shown to earn great significant abnormal returns in the event study. Hence we end up at a 1 -and 3 month holding period for *Portfolio #1* and *Portfolio #4*. The portfolio will be rebalanced whenever there is a signal accordingly to the portfolio description, and be held as long as the holding period implies. The portfolio will at all-time be equally weighted, and there will be no restrictions on either the amount invested or number of shares held in the portfolio. For instance if there are 4 stocks in the portfolio, each stock will be weighted at 25% each, and a sale of one of the stocks will lead to a portfolio of 3 stocks weighting at 33% each. If we observe an insider signal in a stock that is already included in the portfolio, this will be considered as a new trade signal. Though a new signal will not lead to a new purchase, instead the position will be held, and the trading period will be extended with the respective holding period. This could in theory lead to an infinite position in the stock. Also we do not make any distinction between insiders, treating an insider signal in the stock as the same signal regardless of position, identity and trade volume etc.

8.5 Portfolio performance

In the presentation of the performance, we will mainly present the yearly performance of the portfolio. However, returns of the portfolios are calculated logarithmically and are measured on a daily basis. Thus when making the data yearly we use the following formula to obtain the yearly returns:

$$r_{p,yearly} = (1 + r_{p,daily})^{\# \text{ of yearly trading days}} - 1 \quad (23)$$

When measuring the risk of the portfolio we look at the volatility of the portfolio, as with the returns we choose to make this measurement yearly to be consistent in the study. The levels of yearly volatility are calculated as followed:

$$\sigma_{p,yearly} = \sigma_{p,daily} \times \sqrt{\# \text{ of yearly trading days}} \quad (24)$$

As our portfolio only will contain a few stocks at every time, the portfolio will not be diversified, and thus the level of unsystematic risk will be fairly high compared to other funds, or portfolios. We will therefore use different performance measurements in order to conclude whether some of the portfolios outperform the market. Among the portfolio measurements we have chosen to focus on the three following famous measurements: Sharpe's-ratio, Treynor's Measure, and Jensen's alpha.

8.5.1 Sharpe's – Ratio

$$S_p = \frac{r_p - r_f}{\sigma_p} \quad (25)$$

The Sharpe's ratio is known as the most widely used method for calculating risk-adjusted return by measuring the reward to total volatility trade-off. It does so by taking the portfolios average excess return over the sample period, divided by the standard deviation of returns over the period. Hence, a higher ratio indicates a greater risk adjusted return. According to portfolio theory a more diversified portfolio should increase the Sharpe's ratio, as one can decrease the total portfolio risk without sacrificing the returns by diversify, this is something we also expect to see in our portfolios.

8.5.2 Treynor's Ratio

$$T_p = \frac{r_p - r_f}{\beta_p} \quad (26)$$

As can be seen the Treynor's ratio is very similar to the Sharpe's ratio. The notable difference is that the Treynor's ratio gives us the risk adjusted return on the systematic risk. This measurement therefore completely excludes the unsystematic risk, and looks at the portfolio as if it was completely diversified, such that the only risk you take is the systematic risk. The reason why we want to study this measurement is that it will give us an indication of the performance if the portfolio were included into a well-diversified portfolio.

8.5.3 Jensen's Alpha

Finally we have the Jensen's alpha measurement; this is the measurement that we will have the greatest focus on in the presentation of the results. The equation is as following:

$$\alpha_p = r_p - r_f - \beta_p(r_m - r_f) \quad (27)$$

The Jensen's alpha is simply just a rewriting of the traditional CAPM, where the constant (α_p) is put to measure the portfolio given the beta of the portfolio. The α_p is of interest precisely because it tells us if the portfolio is able to outperform the market on a risk adjusted basis. Therefore, if the concept of market efficiency, (Fama 1965) holds, α should not be significantly different from 0. We will therefore test for a significant positive α across the different portfolios performance. The OLS regression will be conducted in STATA, and will hold the OLS assumptions, hence we will use Newey-West consistent standard errors to correct for autocorrelation and heteroscedasticity.

8.5.4 Index & Risk Free Rate

As in the event study it is important to choose a suitable benchmark that is directly comparable, for the same reasons as in the data chapter also here we will use OSEBX as the benchmark. The risk free rate is the 3-month annualized average on government bonds downloaded from *Norges Bank*²⁰. The interest rate will then be calculated on daily basis, and then subtracted from the daily portfolio return, hence constructing the risk premium.

8.6 Portfolio performance

Portfolio #1

In this portfolio we had the first valid insider signal the 27.12.2010, and the last stock invested in were sold the 26.10.2015. During this period we had 370 valid insider signals. Very interestingly we find a great negative return when following this strategy. In comparison this strategy earned a highly significant result in the

²⁰ Risk free rate: <http://www.norges-bank.no/en/Statistics/Interest-rates/Government-bonds-annual/>

long run, but not on the one month basis where the results were shown to be insignificant.

Holding Period 1 Month

<i>Portfolio #1 - 1 Month HP</i>									
<i>Performance & Regression results</i>					<i>Yearly Risk & Return</i>				
	α	β	Treynor	Adjusted R^2		R_p	σ	r_f	Sharpe
<i>Low Mom - Buy</i>	-26,81 %	0,85	-26,12 %	0,17	<i>Low Mom - Buy</i>	-20,78 %	42,26 %	1,48 %	-0,53
<i>P> t </i>	0,049	0,00	-	-	<i>OSEBX</i>	6,82 %	18,86 %	1,48 %	0,28

Table 15: Portfolio #1 – 1 Month Holding Period

The returns of the portfolio are on annual basis negative 20,78%, over the whole period. This implies that the portfolio has lost 76% of its value, showing a terrible performance compared to the index that has obtained a return of 6,82% during the same period of interest. Thus with such poor performance all the performance measurements are negative. However when we regress the alpha we find that this is significant at a 5% level, and we can conclude that this portfolio significantly underperform the OSEBX.

Holding Period 3 Months

<i>Portfolio #1 - 3 Months HP</i>									
<i>Performance & Regression results</i>					<i>Yearly Risk & Return</i>				
	α	β	Treynor	Adjusted R^2		R_p	σ	r_f	Sharpe
<i>Low Mom - Buy</i>	-32,61 %	0,91	-30,69 %	0,22	<i>Low Mom - Buy</i>	-26,47 %	34,94 %	1,48 %	-0,80
<i>P> t </i>	0,006	0,00	-	-	<i>OSEBX</i>	6,60 %	18,85 %	1,48 %	0,27

Table 16: Portfolio #1 – 3 Months Holding Period

When we constructed this portfolio we expected this portfolio at least would leave us with least some positive returns. Though, the portfolio seems to follow in the footsteps of the 1 month holding period portfolio, resulting in an even worse performance, showing a return of negative 26.47%. Thus all the performance measurements are negative. The interesting thing to note here is the alphas p-value of 0,006, thus implying that the portfolio systematically underperforms the market with a highly significant negative return. We also observe an increase in the R^2 , the reason for this is that we will at all-time hold a greater amount of stocks in our portfolio. Therefore when more stocks are included in the portfolio the portfolio will start to act more in line with the index, and we will observe an increase in the R^2 .

Conclusion Portfolio #1

As mentioned earlier we expected if not significant, at least positive returns from this portfolio due to the results that were found in the event study in the long run. The reason for this is when estimating betas these betas might change over the time-horizon in the event study. This especially accounts for the betas of stocks in firms that have either been in a high momentum or low momentum, as both poor and good performing stocks will mean-revert after a certain amount of time (Jegadeesh and Titman (1993)). Hence, firms in low momentum that have performed poor will have unrealistically great negative or positive values, and when these are included into the event window the under-estimated beta values will under-estimate the normal return in the window, and hence the abnormal returns will be great. Thus we feel reluctant to conclude that looking at long event windows (i.e 3 –and 6 months) will lead to misleading results in the model. As all performance measurements are shown to underperform, we conclude that this portfolio significantly underperforms the market.

Portfolio #2

<i>Portfolio #2 - 1 Month HP</i>									
<i>Performance & Regression results</i>					<i>Yearly Risk & Return</i>				
	α	β	Treynor	Adjusted R^2		R_p	σ	\bar{r}_f	Sharpe
<i>Managers-Buy</i>	9,72 %	0,68	19,77 %	0,15	<i>Managers-Buy</i>	14,95 %	34,94 %	1,48 %	0,39
<i>P> t </i>	0,440	0	-	-	<i>OSEBX</i>	6,98 %	18,86 %	1,48 %	0,29

Table 17: Portfolio #2

In this portfolio we experienced the first valid insider signal the 22.12.2010, and the last stock invested were sold the 26.10.2015. During this period we had 323 valid insider signals. When studying the yearly returns we can see that this portfolio outperform the market with 14,95% compared to the OSEBX who has had a yearly average return on 6,98%. If we look at the Sharpe’s ratio we can see that also here the insider portfolio performs better, though at a lower level as the standard deviation of the portfolio are greater than for the OSEBX. The portfolio has a beta of 0,68, and to look closer into the relationship between the portfolios return and beta value, we calculate the Treynor ratio. A Treynor ratio of 19,77% implies that the portfolio earns 19,77% in excess return for each unit of market risk, hence the ratio excludes all the unsystematic risk. Thus the portfolio would be a good supplement in a well-diversified portfolio. By calculating Jensen’s alpha we find this value to be 9,72%. A positive alpha value implies that we have

earned an excess value of 9,72% over the expected return calculated from the CAPM. However when calculating the significance level of the alpha we find this to be insignificant, and hence concluding that this portfolio does not significantly earn abnormal returns over the market. Thus obtaining contradicting results from the event study, and Metrick, Jeng and Zeckhauser's (2003) previous research regarding manager's abnormal returns. An adjusted R^2 as low as 0,15 implies that our portfolio has a very low similarity in its moving pattern compared to the index. This is due to our low sample size of trades, and the fact that we only hold each stock for 1 month, thus this leaves us sometimes with only one stock in the portfolio, and hence the variation of one single stock will not be similar to the index.

Portfolio #3

Portfolio #3 - 1 Month HP

	<i>Performance & Regression results</i>				<i>Yearly Risk & Return</i>				
	α	β	Treynor	Adjusted R^2	R_p	σ	r_f	Sharpe	
<i>Micro - Buy</i>	12,06 %	0,61	24,76 %	0,17	<i>Micro - Buy</i>	16,60 %	28,91 %	1,48 %	0,52
<i>P> t </i>	0,257	0	-	-	<i>OSEBX</i>	6,49 %	19,93 %	1,48 %	0,25

Table 18: Portfolio #2

In this portfolio we found the first valid insider signal to be at the 14.12.2010, and the last stock sold in the portfolio was the 19.09.2015. During this time-horizon we counted 401 insider signals where we invested in a stock. The returns of the portfolio were high compared to the market, ending up at an average yearly return of 16,6% while OSEBX only experienced an average yearly return of 6,49%. Regardless of a high standard deviation the Sharpe's ratio also indicates that the portfolio outperforms the market, when using the volatility as the risk adjusting tool, the ratio shows a value of 0,52 compared to the market that obtains 0,25. The Treynor ratio is calculated to be 24,76%, and hence for every unit of market risk the portfolio takes, it outperforms the index by 24,76% in terms of returns.

In line with Dovre's similar study we find excess returns when studying the alpha of the portfolio. The portfolios alpha takes a value of 12%, implying that the portfolio earns an excess return on average as much as 12%. However, we find this alpha to be insignificant, and hence we are forced to conclude that following only this strategy will not earn an investor abnormal returns. Also in this portfolio we obtain a very low R-squared, for the same reasons as above. Then again implying that we invest in too few stocks to have a well-diversified portfolio, and

as a cause of this the correlation between the portfolio and the benchmark index gets fairly low.

Portfolio #4

In this portfolio we observe 236 valid insider signals, where the first valid signal was observed the 22.12.2010, and the last stock were sold the 18.08.2015.

Holding Period 1 Month

Portfolio #4 - 1 Month HP									
<i>Performance & Regression results</i>					<i>Yearly Risk & Return</i>				
	α	β	Treynor	Adjusted R^2		R_p	σ	r_f	Sharpe
<i>High Mom - Buy</i>	36,58 %	0,62	64,05 %	0,08	<i>High Mom - Buy</i>	41,49 %	43,96 %	1,48 %	0,91
<i>P> t </i>	0,062	0	-	-	<i>OSEBX</i>	6,98 %	18,36 %	1,48 %	0,30

Table 19: Portfolio 4 – 1 Month Holding Period

The yearly return of this portfolio is remarkably high, yielding a return of 41,49% on a yearly basis. Despite a great standard deviation of 43,96% on a yearly basis, the portfolio also outperforms the market when looking at the Sharpe’s ratio scoring as high as 0,91, compared to the market who only scores 0,30.

Due to the low beta of the portfolio of 0,62, and the great returns regardless of the level of risk, the portfolio scores extraordinary high when applying the Treynor’s ratio. With a Treynor’s ratio of 64,05% the portfolio outperforms the market with as much as 64,05% for every additional unit market risk the portfolio takes, a remarkable return. The alpha also takes on a great value of 36,58, and hence outperforming the market by a fairly amount. Due to the high scores on all these measurements, we almost feel tempted to conclude that this portfolio can earn abnormal returns compared to the OSEBX. Though we have to regress the alpha before we take a final conclusion. The regression shows an alpha with a p-value of 0,062, implying that it is significant on a 10% level. Thus as it does not show a significance at a 5% level we do not feel comfortable to conclude that this portfolio systematically outperforms the market. In a search for significant alphas we extend the holding period to 3 months.

Holding Period 3 Months

Portfolio #4 - 3 Months HP									
<i>Performance & Regression results</i>					<i>Yearly Risk & Return</i>				
	α	β	Treynor	Adjusted R^2		R_p	σ	r_f	Sharpe
<i>High Mom - Buy</i>	18,81 %	0,70	32,50 %	0,15	<i>High Mom - Buy</i>	24,12 %	36,58 %	1,48 %	0,62
<i>P> t </i>	0,185	0,00	-	-	<i>OSEBX</i>	6,98 %	18,90 %	1,48 %	0,29

Table 20: Portfolio 4 – 3 Month Holding Period

As for the 1 month holding period portfolio, this portfolio also earns great returns, even though not as great as the 1 month holding period portfolio. The portfolio earns a return of remarkable 24,12%. When holding the portfolio for 3 months the standard deviation also goes down a bit to 26,58%. Risk-adjusting the portfolio by using its volatility (standard deviation) as the risk measurement, the portfolio obtains a Sharpe's ratio of 0,62. A lower ratio than for the 1 month portfolio, though a remarkably greater ratio than the market takes. With a beta of 0,70 the portfolio takes on a greater amount of systematic risk, therefore the Treynor's ratio has almost decreased by 50%, and now takes the value 32,5%, still implying that the portfolio could be a good addition to a well-diversified portfolio. The alpha is no longer significant at a 10% level, and thus we conclude that this portfolio does not outperform the market, but it does also perform worse than the 1 month holding period portfolio containing the two stocks.

8.7 Conclusion:

Due to the results in the event study we at least expected some of the portfolios to have positive and significant alphas. The closest to positive significance found was in *Portfolio #4* held for 1 month, which obtained a p-value of 0,062 a result that is significant at a 10% level. But as it is not significant on a 5% level we can't conclude that the portfolio systematically outperforms the market. On the other hand regardless of the positive returns when increasing the holding period the momentum effect decreases, and thus the alpha is not significant at a 10% level, implying that the returns mean reverts throughout the time-horizon. When examining *Portfolio #1* containing of poor performing stocks we find the opposite effect, namely that both these portfolios underperforms when applying the portfolio measurements. Also when studying the alpha we obtain significance, implying that the portfolio systematically underperforms the market. And hence we see some of the same effects as outlined in Jegadeesh and Titman (2001).

Additionally when examining *Portfolio #2* and *Portfolio #3*, we obtain the same results for both. That is we find an over performance in all the portfolio measurements applied, though when checking the alphas significance we don't find any of them to be significant. Thus concluding that following these strategies does not outperform the market.

8.8 Implications to the strategy, and suggestion to further testing

The drawbacks of using this method to test for insider effects is related to the weighting, having enough valid signals, and as well as transaction costs related to the rebalancing.

Transaction Costs

In order to construct a realistic trading strategy, one should be taking transaction costs into account every time the portfolio is rebalanced. Seyhun (1986) argued that when adjusting for transaction costs the abnormal returns earned by insiders vanished. In this strategy we have not taken transaction costs into account. The reason for doing so is that we do not find any portfolios to earn significant positive abnormal returns, and hence by including these costs the conclusion does not change. Also the weighting mechanism used contains a lot of rebalancing, and hence that the transaction costs would be big following this technique.

Further implications

Recall the low R-squared that we obtained in all the portfolios. This implies that the portfolio does have a low correlation to the benchmark used. Usually a low R-squared might imply that the choice of benchmark might be poor. In this case we have chosen the OSEBX as the benchmark, as this is a representative sample of all the stocks at OSE, and as we are testing a variety of all types of companies at OSE the benchmark used must be concluded to be sufficient. On the other hand the main implication is that we have too few stocks included in the portfolio at all times, this especially accounts for the 1 month period, where we at some dates only are long in one stock. And thus all the portfolios variations are only dependent upon one stock, these variations might therefore be extremely low correlated to the OSEBX. Further, few stocks in the portfolios also leave the issue

with poor-diversified portfolios, leaving the portfolios with a huge amount of unsystematic risk. A risk that easily could be diversified away by including more stocks. Due to these weaknesses we encourage to further testing of strategies in order to find out if following insiders could earn an investor abnormal returns, and also if the event study is a sufficient method in over longer time horizons.

Suggestion to further testing

As argued earlier including more stocks into the portfolio would leave some economic advantages. One way to do it would be to combine more of the results, etc including both *Managers* and *Micro firms*. Or even to include three or four different results, in order to get a well-diversified portfolio, and hence hopefully obtain a lower standard deviation in the portfolio. Furthermore it could also be interesting to use different weighting strategies, to see if any of these makes it possible for the portfolio to outperform the market, basing the weightings on certain criterias.

9 Review of thesis

9.1 Research critique

The fact that we apply an event study to preforms our studies brings along some obvious weaknesses. The following subsection will therefore briefly discuss and announce some potential challenges. We already know that the most obvious challenges are as have been discussed earlier, our data and methodology. While other more not so obvious sources of errors are overlapping events, event clustering and liquidity.

How will the dataset effect our Estimation of the normal returns?

As were mentioned in the start of Chapter 6, we know that the Norwegian market has been in a bullish trend during the period 2009-2016. However, when recalling the fact that our dataset contains returns from the Norwegian stock exchange which is highly sensitive to the oil price, where 30% of the stocks are correlated to oil and oil service. In addition as much as 56% of the stock exchange are exposed to Macro factors (ref. hypothesis 8). We therefore expect it to be a causal link to our results especially in the case for insider sales correlated to the oil price which

fell by 60% from June 2014 to 2016. Considering that about 32% of our data contains prices in the same period as the turmoil in the commodity markets, we expect the high volatility to affect the return rates. Consequently bias our results somewhat. It is therefore recommended that the reader understands that this study is only conducted on a narrow time window which incorporates a unique historical timing. Acknowledgment to this fact is therefore necessary.

How can Multicollinearity from confounding events affect our results?

Recall that this study was conducted with the purpose of studying the insider effect on stock prices. Bearing in mind that we used an event study with a respective publication date as time of event with the following time event, 1 day, 1 week, 1 month, 3 months and 6 months. In the events measured with a longer time horizon, that is, longer than 1 week, we know that other external factors as for example, macro related events would affect the return rates. Another important variable to remember is that firm specific events, for example, new contracts, change in future prospects, etc, will be an disturbing factor the longer event window we chose. Knowing this, we expect some biasness in the returns, making us conduct a type 1 error where we might reject the 0 hypothesis.

Survivor bias

Even though we tried to include as many of the firms on the stock exchange regardless if they had gone of the stock exchange we met some occurring issues. As were disused in the earlier chapters, some of our data are incomplete. For example, in the specific case for REC Solar, did we lack some data due to the fact that the company was delisted from the stock exchange. Similar events occur multiple times, where our data includes incomplete data to do longer event studies, especially for the 3 and 6 months. This implies that some of the insider's trades are left out in the longer event windows. With this in mind, we know that this could create survivorship biasness.

9.2 Further studies

Now that we are standing at the end of our thesis we wish to present some recommendations to other papers or thesis that will do similar studies. First of all,

by combining different firm characteristics could give different results. For example, by combining firm industries with momentum, this could give more reliable results. Secondly, this thesis does not study the change in trading activity measured which can be measured in volume. We believe that both volume and the momentum in volume should be studied as a possible predictor of insider effects. Again, if one were to combine momentum in trading volume with both company industry and price momentum this could have been an interesting paper.

Further studies could also focus more of their attention towards shorter event windows, as were mentioned to be weaknesses in both the event study and research critique chapter. Here we recommend studying the price movement during the intraday after the announcement date.

Bearing in mind the weaknesses with the methodology applied in this thesis, a suggestion would be to use different types of methodologies to make the results more robust.

Uniqueness in our dataset is also unfavorable due to macroeconomics coefficients along with clustering effects. Further research should therefore apply a larger data sample from separate stock exchanges both to increase the sample data for each industry along with reducing the risk of clustering effects.

10 Summary Conclusion on thesis

During this thesis we studied whether insider transactions incorporates any valuable signal effect to the market. And thereby studying the possibilities for an outsider to imitate and earn abnormal returns based upon the insider's action. To do so, we studied 1 628 insider trades made on the Norwegian Stock Exchange throughout the period 2010 until 2015. To observe the insider effect we followed in the footsteps of earlier research by applying the same methodology as outlined in MacKinlay (1997). Due to weaknesses in the methodology we applied a supplementary inquiry by replicating an investment strategy, to control the reliability of the results.

A general result after examining all 1 628 insider trades, we do find some indication of abnormal returns close to the event date. Further analysis reveals when dividing the trades into different categories we find somewhat mixed results. For example, when segregating the trades into buy and sale, we find that buy transactions tend to have a positive short time effect. Conversely the sales effects behave very differently, where we don't observe any immediate short term effect. One interpretation might be that the market seems to react slower to insider sales by generating positive abnormal returns in the longer time horizons.

Further analysis, when studying insider positions, we find that managers tend to reveal a stronger informative trade signal than other observed groups. From this we moved on to find that insider trades in small capitalized firms outperformed mid –and large capitalized firms. We also find evidence that growth firms, that is firms with high Price-Book ratio, generates higher abnormal returns than value companies. Meanwhile by studying the multiple Price/Earnings, we find a similar result, which is that value companies tend to underperform its comparable.

Also when summing up the results from the industry hypothesis we observe that trading in Consumption and Tech & Telecom companies generates significant abnormal returns. As a sub-hypothesis to the industry hypothesis we generalizing the industries into micro and macro sensitive firms, where we find an indication that macro firms reacts more quick to the insider trade, earning abnormal returns only in the short term. While on the other hand trades in micro firms shows a slower effect, and hence generates no abnormal returns in the immediate time after the announcement, but that the insider effect gets strong in the longer time horizon.

Then again when we studied the momentum effect through the event study we found that insiders tend to act contrarian to the market. Implying that insiders are selling well performing stocks, and buying poor performing stocks, and hence outperform the market. Indicating that insiders have better prospect to foresee the future stock price. However, when we applied the findings into a trading strategy (ref chapter 8) we observe a conflicting and opposing result, where the outputs from the strategy reveals that the insiders tend to act accordingly to the market.

On the other hand when categorizing the insider trades into trade volume, this seemed to be a poor categorization technique due to few consistent and significant results. However we found some significant positive CARs in the small absolute purchases and small absolute sales, but this might be due to the small size effect as found in hypothesis 4.

As a result from the above findings we constructed 4 different trading strategies, based on the most significant CARs. After adjusting the portfolio returns with various risk-adjusting measurements we found no significant alphas, implying that none of the portfolios outperformed the market.

Based upon the presented results we observe that it is possible from a theoretical perspective to earn cumulative abnormal returns by following insider's transactions. Even so, theory and practice are two very different worlds with very different applications. Having concluded this, we feel confident to believe that from an external investors perspective it would be hard if not impossible to make any significant returns by mimicking the insiders. Reasoning this by referring to the small returns found in our analyses which are too small to generate positive significant returns when including transaction costs. In other words, the CAR will be balanced out by the transaction cost.

All things considered, we therefore conclude in this study that the Norwegian stock market at least behaves accordingly to the semi-strong efficiency hypothesis. Which is a conclusion that distorts Dovres claim to maintain a successful recipe to beat Mr. market. We therefore feel comfortable to state that the possibility to earn excess return by imitating insider trading is inconsistent with the results found in this thesis.

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12 Appendix

12.1 Appendix 1 – Price data with firm characteristics

Date	Ticker	Price	MarketCap	PE	BookValuePShare	PB	Date	Ticker	Price	MarketCap	PE	BookValuePShare	PB	Date	Ticker	Price	MarketCap	PE	BookValuePShare	PB
01/01/10	STL	144.8	461715.9	35.1	69.005	2.098398667	01/01/10	TEL	81.05	134771.8	15.9	53.848	1.505163	01/01/10	DNB	62.75	102207	10	68.269	0.919158
04/01/10	STL	147.7	470963	35.8	69.005	2.140424607	04/01/10	TEL	83.8	138321	16.4	53.848	1.556232	04/01/10	DNB	64.35	104813.1	10.3	68.269	0.942395
05/01/10	STL	148	47193.6	35.8	69.005	2.144772118	05/01/10	TEL	83.4	138267.9	16.3	53.848	1.548804	05/01/10	DNB	63.5	103428.6	10.1	68.269	0.930144
06/01/10	STL	147.9	471600.7	35.8	69.005	2.143322948	06/01/10	TEL	82.55	136858.7	16.2	53.848	1.533019	06/01/10	DNB	63.55	103510	10.1	68.269	0.930876
07/01/10	STL	147.8	471281.8	35.8	69.005	2.141873777	07/01/10	TEL	82.3	136444.2	16.1	53.848	1.528376	07/01/10	DNB	63.7	103754.4	10.1	68.269	0.933074
08/01/10	STL	147.7	470963	35.8	69.005	2.140424607	08/01/10	TEL	81.65	135366.6	16	53.848	1.516305	08/01/10	DNB	66.4	108152.1	10.6	68.269	0.972623
11/01/10	STL	149.2	475746	36.1	69.005	2.162162162	11/01/10	TEL	81.1	134454.8	15.9	53.848	1.508091	11/01/10	DNB	67.85	110513.9	10.8	68.269	0.993863
12/01/10	STL	146.4	466817.8	35.4	69.005	2.121585392	12/01/10	TEL	79.9	132465.3	15.6	53.848	1.483806	12/01/10	DNB	67	109129.4	10.7	68.269	0.981412
13/01/10	STL	145.6	464266.8	35.3	69.005	2.10992203	13/01/10	TEL	78.95	130890.3	15.5	53.848	1.466164	13/01/10	DNB	68.25	111165.4	10.9	68.269	0.999722
14/01/10	STL	146.8	468093.2	35.5	69.005	2.127382074	14/01/10	TEL	79.5	131802.1	15.6	53.848	1.476378	14/01/10	DNB	70.45	114748.8	11.2	68.269	1.031947
15/01/10	STL	147.2	469368.7	35.6	69.005	2.133178755	15/01/10	TEL	77.85	129066.6	15.2	53.848	1.445738	15/01/10	DNB	69.5	113201.4	11.1	68.269	1.018302
18/01/10	STL	145.7	464585.8	35.3	69.005	2.11114412	18/01/10	TEL	81.5	135117.9	15.9	53.848	1.515352	18/01/10	DNB	68.95	112305.6	11	68.269	1.009975
19/01/10	STL	143.7	458208.4	34.8	69.005	2.082457793	19/01/10	TEL	80.8	133957.4	15.8	53.848	1.509252	19/01/10	DNB	69	112387	11	68.269	1.010708
20/01/10	STL	141.2	450236.8	34.2	69.005	2.046228534	20/01/10	TEL	78.45	130061.3	15.4	53.848	1.456879	20/01/10	DNB	68.25	111165.4	10.9	68.269	0.999722
21/01/10	STL	139.5	444816.1	33.8	69.005	2.021592638	21/01/10	TEL	76.6	126994.3	15	53.848	1.422523	21/01/10	DNB	67.45	109862.4	10.7	68.269	0.988003
22/01/10	STL	137.3	437801.1	33.2	69.005	1.989710891	22/01/10	TEL	76.15	126248.2	14.9	53.848	1.414166	22/01/10	DNB	65.5	106686.3	10.4	68.269	0.95944
25/01/10	STL	135.5	432061.6	32.8	69.005	1.963625824	25/01/10	TEL	75.4	125004.8	14.8	53.848	1.400238	25/01/10	DNB	66	107500.6	10.5	68.269	0.966764
26/01/10	STL	134.5	428872.9	32.6	69.005	1.949194121	26/01/10	TEL	76.2	126331.1	14.9	53.848	1.415094	26/01/10	DNB	64.05	104324.4	10.2	68.269	0.9382
27/01/10	STL	134	427278.6	32.4	69.005	1.941888269	27/01/10	TEL	76.7	127160.1	15	53.848	1.42438	27/01/10	DNB	63.1	102777.1	10.1	68.269	0.92485
28/01/10	STL	134.7	429510.6	32.6	69.005	1.952032461	28/01/10	TEL	76.8	127325.8	15	53.848	1.426237	28/01/10	DNB	64.95	105790.4	10.3	68.269	0.951383
29/01/10	STL	134	427278.6	32.4	69.005	1.941888269	29/01/10	TEL	77.5	128486.3	15.2	53.848	1.439236	29/01/10	DNB	67.65	110188.1	10.8	68.269	0.990933
01/02/10	STL	133.8	426640.8	32.4	69.005	1.93899928	01/02/10	TEL	77.45	128403.4	15.2	53.848	1.438308	01/02/10	DNB	68.45	111491.2	10.9	68.269	1.002651
02/02/10	STL	137	43684.5	32.2	69.005	1.99563379	02/02/10	TEL	76.6	126994.3	15	53.848	1.422523	02/02/10	DNB	67.55	11025.3	10.8	68.269	0.989468
03/02/10	STL	135.8	433018.1	32.9	69.005	1.967973335	03/02/10	TEL	78.75	130558.7	15.4	53.848	1.46245	03/02/10	DNB	67.05	109210.8	10.7	68.269	0.982144
04/02/10	STL	132	420901.3	32	69.005	1.912904862	04/02/10	TEL	77.75	128900.8	15.2	53.848	1.443879	04/02/10	DNB	63.55	103510	10.1	68.269	0.930876
05/02/10	STL	128.9	411016.4	31.2	69.005	1.867980581	05/02/10	TEL	76.5	126828.5	15	53.848	1.420666	05/02/10	DNB	63.8	103917.3	10.2	68.269	0.934338
08/02/10	STL	130.5	416118.3	31.6	69.005	1.891167307	08/02/10	TEL	76.8	127325.8	15	53.848	1.426237	08/02/10	DNB	61.7	100496.8	9.8	68.269	0.903778
09/02/10	STL	130	414524	31.5	69.005	1.883921465	09/02/10	TEL	78.05	129398.2	15	53.848	1.440445	09/02/10	DNB	62.75	102207	10	68.269	0.919158
10/02/10	STL	126.9	404639.1	30.7	69.005	1.838997174	10/02/10	TEL	75.15	124590.3	14.4	53.848	1.395595	10/02/10	DNB	62.8	102088.4	9.8	68.269	0.91589
11/02/10	STL	129.8	413886.3	22.6	69.005	1.881023114	11/02/10	TEL	73.6	122020.6	14.1	53.848	1.366891	11/02/10	DNB	67.75	120207.1	9.8	68.269	0.919158
12/02/10	STL	127.5	406552.4	22.2	69.005	1.847692196	12/02/10	TEL	74	122683.8	14.2	53.848	1.374239	12/02/10	DNB	61.8	100659.7	9.6	68.269	0.905242
15/02/10	STL	128.2	408784.4	22.3	69.005	1.857836389	15/02/10	TEL	73	121025.8	14	53.848	1.355668	15/02/10	DNB	62.9	102451.4	9.8	68.269	0.921355

12.2 Appendix 2 – Data obtained from Dovre

Publ.Date	Date	Ticker	Company	Name	short_pos	Shorter.Pos	Action	Price	Shares	Value.In.NOK	Change	Holdings.after.trade
10/08/11	09/08/11	ITE	Itera ASA	Assurance Skuld	Other	Other	BUY	2,6	250000	650000	0,05	5479401
11/08/11	10/08/11	TIDE	Tide ASA	Frode Sjølen	Other	Other	BUY	20	2700	54000	0,01	506082
11/08/11	10/08/11	HEX	Hexagon Composites ASA	Tore Johan Fjell	Exec	Exec	BUY	3,5	30000	105000	0,04	776044
11/08/11	10/08/11	RGT	Rocksource ASA	Mimi K. Berdal	Chairman	Chair	BUY	1,39	100000	139470	0,29	348000
11/08/11	10/08/11	PGS	Petroleum Geo-Services ASA	Per Arild Reksnes	Exec	Exec	BUY	66	25000	165000	0,32	7934
11/08/11	10/08/11	SONG	Songa Offshore SE	Jens Wilhelmsen	Chairman	Chair	BUY	2,2	10000	22000	0,5	20000
11/08/11	10/08/11	WRL	Wentworth Resources Limited	Robert McBean	Chairman	Chair	BUY	3,5	100000	350000	0,01	7183191
11/08/11	10/08/11	SNI	Stolt-Nielsen Limited	Jacob Stolt-Nielsen	Board member	Board member	BUY	113,95	15000	1709250	0,05	289746
12/08/11	11/08/11	PEN	Panoro Energy ASA	Therese Fuglerud	Other	Other	BUY	4,78	10000	47811	1	10000
12/08/11	11/08/11	AVM	Avocet Mining PLC	Richard Gray	Other	Other	SELL	2,35	25000	58750	0,05	521109
12/08/11	11/08/11	NOR	Norwegian Energy Company ASA	Kjetil Bakken	Exec	Exec	BUY	4,6	20000	92000	0,36	55416
12/08/11	11/08/11	PEN	Panoro Energy ASA	Ragnar Sjøgaard	Director	Director	BUY	4,65	20000	93052	0,27	73000
12/08/11	11/08/11	NSG	Norske Skogindustrier ASA	Gaute H. Andreassen	Exec	Exec	BUY	4,63	21600	99926	0,55	39300
12/08/11	11/08/11	NHY	Norsk Hydro ASA	Svein Richard Brandtzzg	CEO	Exec	BUY	91	5000	155000	0,09	57847
12/08/11	11/08/11	NHY	Norsk Hydro ASA	related party to Bente Rathe	Chairman	Chair	BUY	31,42	5000	157100	0,17	29000
12/08/11	11/08/11	NOR	Norwegian Energy Company ASA	Hilde Dr. ne	Board member	Board member	BUY	4,59	40000	183748	1	40000
12/08/11	11/08/11	PEN	Panoro Energy ASA	Nishant Dighe	COO	Exec	BUY	4,6	50000	230000	0,04	1309669
12/08/11	11/08/11	PEN	Panoro Energy ASA	related party of Phil Vingoe	Chairman	Chair	BUY	4,63	100000	463150	0,07	1439669
15/08/11	12/08/11	GJF	Gjensidige Forsikring ASA	Tor Erik Silet	Other	Other	BUY	63,65	1000	63650	0,68	1469
15/08/11	12/08/11	GJF	Gjensidige Forsikring ASA	Erik Ranberg	Director	Director	BUY	63,65	1000	63650	0,23	4353
15/08/11	12/08/11	GJF	Gjensidige Forsikring ASA	Helge Leiro Baastad	CEO	Exec	BUY	63,65	2000	127300	0,12	17213
15/08/11	12/08/11	NOR	Norwegian Energy Company ASA	Rebekka Glasser Herlofson	CFO	Exec	BUY	5,22	30000	156600	0,5	60000
15/08/11	12/08/11	GJF	Gjensidige Forsikring ASA	Randi B. Sjøtershagen	Board member	Board member	BUY	63,65	3000	190950	0,34	8711
15/08/11	12/08/11	NOR	Norwegian Energy Company ASA	John Hogan	Director	Director	BUY	5,23	40000	209200	0,09	461195
17/08/11	16/08/11	WWI	Wilh. Wilhelmsen Holding ASA	Tallyman AS is controlled and	Other	Other	BUY	122	31000	3782000	0	20784730
18/08/11	17/08/11	DOLP	Dolphin Group ASA	Simen Thoresen	Board member	Board member	BUY	3,16	10000	31550	0,33	30000
18/08/11	17/08/11	AKER	Aker ASA	yvind Eriksen	CEO	Exec	BUY	140				

2. Hyp 2: Momentum – Measured

We chose to use the 6 months horizon, and thereby calculated the cumulative average daily return 120 trading days (6 months) for each stock in advance of the trade. Then we split the returns into four quartiles, where the 25% with the highest cumulative average daily return were defined as high-momentum stocks, the 25% poorest performing as low-momentum stocks and the rest as medium momentum stocks. All the results from each of the groups will be presented.

- Low Momentum: (lowest 25% - quartile)
 - All stocks with average daily returns between (-0,0125171 , -0,0012159) 120 days in advance of the trade.
- Medium Momentum: (25% - 75% - quartile)
 - All stocks with average daily returns between (-0,0012159 , 0,0017178) 120 days in advance of the trade.
- High Momentum (Highest 75% - quartile)
 - All stocks with average daily returns higher than: (0,0017272) 120 days in advance of the trade.

3. Hyp 3: Insider Position

- CEO/CFO's; All denoted as CEO or CFO in original dataset
- Managers; All denoted as Managers in original dataset excluded CEO and CFO
- Members of the Board: All denoted as Board Members and Chairmen
- Primary Insiders: Denoted in original dataset
- Others: Denoted in original dataset

4. Hyp 4: Market Value

All market values are captured at the date of publication ($\tau = 0$). And are grouped as followed (in mill NOK)

- Small Cap: (lowest 25% - quartile)
 - All firms with lower market value than 537.
- Mid Cap: (25% - 75% - quartile)
 - All firms with market value between (537 , 7628)
- Large Cap: (Highest 75% - quartile)
 - All firms with market value greater than 7628.

5. Hyp 5: PE

All PE values are captured at the date of publication ($\tau = 0$). And are grouped as followed

- Low PE: (lowest 25% - quartile)
 - All firms with PE less than 8,6
- Mid PE: (25% - 75% - quartile)
 - All firms with PE in between (8.6 , 24.1)
- High PE (Highest 75% - quartile)
 - All firms with PE higher than 24.1

6. Hyp 6: Price – Book

All Price– Book values are captured at the date of publication ($\tau = 0$). And are grouped as followed

- Low PB: (lowest 25% - quartile)
 - All firms with lower PB than 0.72
- Mid PB: (25% - 75% - quartile)
 - All firms with PB between (0.72 , 2.75)
- High PB: (Highest 25% quartile)
 - All firms with PB greater than 2.75

7. Hyp7: Industries

The Industries are classified by SIC codes, but some industries had to be merged together due to few observations. The categorization was done by identifying all companies with the same business model and similar value drivers (sensitivity) into this category. All in all we ended up moving from 16 industries to following 9 industries. Ending up in the following industries:

- Consumption
- Financial & Insurance
- Health Care
- Industry
- Oil & Gas – Exploration and Production
- Oil & Gas – Equipment
- Seafood
- Shipping
- Tech & Telecom

8. Hyp 8: Micro & Macro

The following industries are categorized into Micro and Macro.

- Micro:
 - Consumption
 - Financial & Insurance
 - Health Care
 - Tech & Telecom
- Macro
 - Industry
 - Oil & Gas – Exploration and Production
 - Oil & Gas – Equipment
 - Seafood
 - Shipping

9. Hyp 9: Trade Volume

Divided into Absolute and Relative trade volume.

- *Absolute: Total amount in NOK an insider have invested*
- *Relative: Percent change in amount of stocks the insider holds in a firm.*

All trade values are captured at the date of publication ($\tau = 0$) and divided between purchases and sales. They are grouped as followed (in 1000 NOK)

Absolute purchase:

- *Small absolute purchase: (lowest 25% -quartile)*
 - *All purchases with lower total values than 110.*
- *Medium absolute purchases (25% - 75% - quartile)*
 - *All purchases with total value between (110 , 950)*
- *Big absolute purchases (Highest 25% quartile)*
 - *All purchases with total value more than 950.*

Relative purchase

- *Small relative change purchase(lowest 25% -quartile)*
 - *All relative changes in purchase less than 40%*
- *Medium relative change purchase (25% - 75% - quartile)*
 - *All relative changes in purchase between (40% , 63%)*
- *Big relative change purchase (Highest 25% quartile)*
 - *All relative changes greater than 63%*

Absolute sales

- *Small absolute sales: (lowest 25% -quartile)*
 - *All sales with lower total values than 226.*
- *Medium absolute sales (25% - 75% - quartile)*
 - *All sales with total value between (226 , 5510)*
- *Big absolute purchases (Highest 25% quartile)*
 - *All sales with total value more than 5510.*

Relative sales

- *Small relative change sales (lowest 25% -quartile)*
 - *All relative changes in sales less than 11%*
- *Medium relative change sales (25% - 75% - quartile)*
 - *All relative changes in sales between (11% , 75%)*
- *Big relative change sales (Highest 25% quartile)*
 - *All relative changes greater than 75%*

12.4 Appendix 4 – Construction of HML, SMB, and PRIYR

Briefing on the STATA codes conducted to produce the Fama and French factors.

```

****Creating SMB returns*****
+Sorting firms on size for each year

*2010 – Merk at Xtile er fordeling av MarketCap i kvartiler på 33%
use MergedPrepData, clear

drop if year!=2010
xtile size2010 = MarketCap, n(3)
replace size2010 = 9 if size2010==.
keep date Ticker size2010
sort date Ticker

save workfilesize2010, replace

+Merging data

use MergedPrepData, clear
sort date Ticker
merge date Ticker using workfilesize2010
tab _merge
drop _merge

+Create daily returns
gen small_return = return if size2010==1 | size2011==1 | size2012==1 | size2013==1 | size2014==1 | size2015==1 | size2016==1
egen small_portfolio = mean(small_return), by(date)

gen big_return = return if size2010==3 | size2011==3 | size2012==3 | size2013==3 | size2014==3 | size2015==3 | size2016==3
egen big_portfolio = mean(big_return), by(date)

gen SMB = (small_portfolio - big_portfolio)

* Variabel drop
drop small_return big_return small_portfolio big_portfolio
sort date Ticker

save PreparedData, replace
    
```

12.5 Appendix 5 – Wilcoxon Sign-Rank Test

Market Model									
1 Day	1 Week	1 Month	3 Months	6 Months	1 Year	1 Year	3 Months	6 Months	1 Year
All Trades	Prob > z = 0.1159	All Trades	Prob > z = 0.1579	All Trades	Prob > z = 0.0140	All Trades	Prob > z = 0.0365	All Trades	Prob > z = 0.0147
All Purchases	Prob > z = 0.2807	All Purchases	Prob > z = 0.1415	All Purchases	Prob > z = 0.1919	All Purchases	Prob > z = 0.7796	All Purchases	Prob > z = 0.0889
All Sales	Prob > z = 0.1658	All Sales	Prob > z = 0.7345	All Sales	Prob > z = 0.0036	All Sales	Prob > z = 0.0000	All Sales	Prob > z = 0.0000
Buy Macro	Prob > z = 0.2571	Buy Macro	Prob > z = 0.5699	Buy Macro	Prob > z = 0.3743	Buy Macro	Prob > z = 0.0681	Buy Macro	Prob > z = 0.0001
Sell Macro	Prob > z = 0.6043	Sell Macro	Prob > z = 0.1513	Sell Macro	Prob > z = 0.0111	Sell Macro	Prob > z = 0.0000	Sell Macro	Prob > z = 0.0000
Buy Micro	Prob > z = 0.8004	Buy Micro	Prob > z = 0.0747	Buy Micro	Prob > z = 0.0004	Buy Micro	Prob > z = 0.0372	Buy Micro	Prob > z = 0.0175
Sell Micro	Prob > z = 0.1659	Sell Micro	Prob > z = 0.4558	Sell Micro	Prob > z = 0.0820	Sell Micro	Prob > z = 0.0037	Sell Micro	Prob > z = 0.0025
All Macro	Prob > z = 0.2162	All Macro	Prob > z = 0.2934	All Macro	Prob > z = 0.8910	All Macro	Prob > z = 0.9817	All Macro	Prob > z = 0.0838
All Micro	Prob > z = 0.3400	All Micro	Prob > z = 0.2955	All Micro	Prob > z = 0.0001	All Micro	Prob > z = 0.0009	All Micro	Prob > z = 0.0002
Consumption	Prob > z = 0.0996	Consumption	Prob > z = 0.7379	Consumption	Prob > z = 0.0116	Consumption	Prob > z = 0.0020	Consumption	Prob > z = 0.0041
Financial & Insurance	Prob > z = 0.3136	Financial & Insurance	Prob > z = 0.9472	Financial & Insurance	Prob > z = 0.3181	Financial & Insurance	Prob > z = 0.5065	Financial & Insurance	Prob > z = 0.6197
Health Care	Prob > z = 0.1237	Health Care	Prob > z = 0.8804	Health Care	Prob > z = 0.0856	Health Care	Prob > z = 0.1859	Health Care	Prob > z = 0.2529
Industry	Prob > z = 0.8633	Industry	Prob > z = 0.0189	Industry	Prob > z = 0.3163	Industry	Prob > z = 0.2619	Industry	Prob > z = 0.9576
Oil, gas & Exploration	Prob > z = 0.8268	Oil, gas & Exploration	Prob > z = 0.1233	Oil, gas & Exploration	Prob > z = 0.2365	Oil, gas & Exploration	Prob > z = 0.8036	Oil, gas & Exploration	Prob > z = 0.0772
Oil, gas & Equipment	Prob > z = 0.1319	Oil, gas & Equipment	Prob > z = 0.8033	Oil, gas & Equipment	Prob > z = 0.6014	Oil, gas & Equipment	Prob > z = 0.7837	Oil, gas & Equipment	Prob > z = 0.1971
Seafood	Prob > z = 0.4976	Seafood	Prob > z = 0.6515	Seafood	Prob > z = 0.3687	Seafood	Prob > z = 0.1053	Seafood	Prob > z = 0.0269
Shipping	Prob > z = 0.5584	Shipping	Prob > z = 0.3901	Shipping	Prob > z = 0.7917	Shipping	Prob > z = 0.2570	Shipping	Prob > z = 0.0361
Tech Telecom	Prob > z = 0.9478	Tech Telecom	Prob > z = 0.6336	Tech Telecom	Prob > z = 0.0500	Tech Telecom	Prob > z = 0.0437	Tech Telecom	Prob > z = 0.0001

Carhart four-factor Model									
1 Day	1 Week	1 Month	3 Months	6 Months	1 Year	1 Year	3 Months	6 Months	1 Year
All Trades	Prob > z = 0.0983	All Trades	Prob > z = 0.1734	All Trades	Prob > z = 0.0338	All Trades	Prob > z = 0.0489	All Trades	Prob > z = 0.0275
All Purchases	Prob > z = 0.1512	All Purchases	Prob > z = 0.1853	All Purchases	Prob > z = 0.4044	All Purchases	Prob > z = 0.8374	All Purchases	Prob > z = 0.8963
All Sales	Prob > z = 0.3860	All Sales	Prob > z = 0.5747	All Sales	Prob > z = 0.0022	All Sales	Prob > z = 0.0000	All Sales	Prob > z = 0.0000
Buy Macro	Prob > z = 0.1281	Buy Macro	Prob > z = 0.6069	Buy Macro	Prob > z = 0.3117	Buy Macro	Prob > z = 0.0955	Buy Macro	Prob > z = 0.2754
Sell Macro	Prob > z = 0.9245	Sell Macro	Prob > z = 0.0821	Sell Macro	Prob > z = 0.0071	Sell Macro	Prob > z = 0.0000	Sell Macro	Prob > z = 0.0000
Buy Micro	Prob > z = 0.7038	Buy Micro	Prob > z = 0.1067	Buy Micro	Prob > z = 0.0042	Buy Micro	Prob > z = 0.0435	Buy Micro	Prob > z = 0.1085
Sell Micro	Prob > z = 0.2270	Sell Micro	Prob > z = 0.5071	Sell Micro	Prob > z = 0.0724	Sell Micro	Prob > z = 0.0142	Sell Micro	Prob > z = 0.0253
All Macro	Prob > z = 0.1636	All Macro	Prob > z = 0.2761	All Macro	Prob > z = 0.9283	All Macro	Prob > z = 0.9332	All Macro	Prob > z = 0.4963
All Micro	Prob > z = 0.3329	All Micro	Prob > z = 0.3522	All Micro	Prob > z = 0.0009	All Micro	Prob > z = 0.0020	All Micro	Prob > z = 0.0088
Consumption	Prob > z = 0.1271	Consumption	Prob > z = 0.5761	Consumption	Prob > z = 0.0035	Consumption	Prob > z = 0.0003	Consumption	Prob > z = 0.0000
Financial & Insurance	Prob > z = 0.2854	Financial & Insurance	Prob > z = 0.9638	Financial & Insurance	Prob > z = 0.8212	Financial & Insurance	Prob > z = 0.2775	Financial & Insurance	Prob > z = 0.0087
Health Care	Prob > z = 0.1330	Health Care	Prob > z = 0.9052	Health Care	Prob > z = 0.2826	Health Care	Prob > z = 0.3352	Health Care	Prob > z = 0.5041
Industry	Prob > z = 0.6749	Industry	Prob > z = 0.0120	Industry	Prob > z = 0.1621	Industry	Prob > z = 0.1320	Industry	Prob > z = 0.0953
Oil, gas & Exploration	Prob > z = 0.9347	Oil, gas & Exploration	Prob > z = 0.2357	Oil, gas & Exploration	Prob > z = 0.1765	Oil, gas & Exploration	Prob > z = 0.8036	Oil, gas & Exploration	Prob > z = 0.9045
Oil, gas & Equipment	Prob > z = 0.1450	Oil, gas & Equipment	Prob > z = 0.8518	Oil, gas & Equipment	Prob > z = 0.4600	Oil, gas & Equipment	Prob > z = 0.7438	Oil, gas & Equipment	Prob > z = 0.5325
Seafood	Prob > z = 0.5893	Seafood	Prob > z = 0.9777	Seafood	Prob > z = 0.3265	Seafood	Prob > z = 0.1257	Seafood	Prob > z = 0.0615
Shipping	Prob > z = 0.5406	Shipping	Prob > z = 0.5274	Shipping	Prob > z = 0.5720	Shipping	Prob > z = 0.3142	Shipping	Prob > z = 0.4359
Tech Telecom	Prob > z = 0.9378	Tech Telecom	Prob > z = 0.5677	Tech Telecom	Prob > z = 0.2243	Tech Telecom	Prob > z = 0.0494	Tech Telecom	Prob > z = 0.0251

12.6 Appendix 6 – Results Market Model

Market Model						
	<i>Buy Low MOM</i>	<i>Buy Med MOM</i>	<i>Buy High MOM</i>	<i>Sell Low MOM</i>	<i>Sell Med MOM</i>	<i>Sell High MOM</i>
1 Day	0.00388 ^{**} (0.00171)	0.00113 (0.000929)	-0.00242 (0.00196)	-0.00109 (0.0123)	0.00103 (0.00144)	0.000326 (0.00193)
1 Week	0.00793 ^{**} (0.00319)	0.00457 ^{**} (0.00181)	0.0000207 (0.00416)	-0.0356 [*] (0.0210)	-0.0000386 (0.00294)	0.00540 (0.00335)
1 Month	0.00872 (0.00675)	0.00486 (0.00347)	-0.00349 (0.00834)	-0.0341 (0.0256)	0.00726 (0.00507)	0.0241 ^{***} (0.00674)
3 Months	0.0393 ^{***} (0.0145)	-0.0159 ^{**} (0.00678)	-0.0380 ^{**} (0.0154)	-0.0272 (0.0324)	0.0137 (0.0106)	0.0954 ^{***} (0.0134)
6 Months	0.118 ^{***} (0.0208)	-0.0503 ^{***} (0.0127)	-0.117 ^{***} (0.0229)	-0.116 [*] (0.0673)	0.00588 (0.0159)	0.182 ^{***} (0.0207)
N	370	653	236	51	162	186

Table 21: Standard errors in parentheses * p < 0.10, ** p < 0.05, * p < 0.01**

Market Model					
	<i>Top Managem ent</i>	<i>Board Members</i>	<i>Managers</i>	<i>Primary Insiders</i>	<i>Others</i>
1 Day	-0.0000175 (0.00182)	0.000407 (0.00126)	0.00181 (0.00131)	0.00132 (0.00145)	0.00329 (0.00277)
1 Week	-0.000966 (0.00348)	0.000604 (0.00221)	0.00891 ^{***} (0.00300)	0.00598 ^{**} (0.00289)	0.00341 (0.00450)
1 Month	0.00122 (0.00579)	-0.000783 (0.00447)	0.0210 ^{***} (0.00608)	0.00658 (0.00574)	-0.00174 (0.00763)
3 Months	-0.00586 (0.0131)	-0.00583 (0.00895)	0.0293 ^{***} (0.0110)	0.0217 [*] (0.0121)	0.00643 (0.0170)
6 Months	-0.00607 (0.0226)	-0.0174 (0.0144)	0.0417 ^{**} (0.0178)	0.0317 (0.0196)	-0.00945 (0.0280)
N	295	545	408	214	166

Table 22: Market Model Insider Position. Standard errors in parentheses * p < 0.10, ** p < 0.05, * p < 0.01**

Market Model									
	<i>Consumptio n</i>	<i>Financial Insurance</i>	<i>HealthCare</i>	<i>Industry</i>	<i>OilGasProd Explor</i>	<i>OilGasEqui p</i>	<i>Seafood</i>	<i>Shipping</i>	<i>TechTeleco m</i>
1 Day	0.00359 ^{**} (0.00154)	-0.000348 (0.00167)	-0.00997 ^{**} (0.00486)	0.00279 (0.00242)	-0.0000515 (0.00192)	0.00245 (0.00177)	0.00271 (0.00175)	0.00174 (0.00295)	0.000881 (0.00169)
1 Week	0.00544 [*] (0.00318)	-0.00438 (0.00378)	0.00162 (0.00909)	0.00989 ^{***} (0.00360)	-0.000195 (0.00392)	0.00257 (0.00364)	0.00261 (0.00474)	0.00837 (0.00629)	0.00358 (0.00331)
1 Month	0.0139 ^{**} (0.00568)	0.00106 (0.00482)	0.0147 (0.0176)	0.00690 (0.00737)	0.00170 (0.00931)	0.00671 (0.00669)	-0.0121 (0.00971)	0.00134 (0.00979)	0.0144 ^{**} (0.00558)
3 Months	0.0299 ^{***} (0.00997)	-0.00474 (0.00839)	0.0367 (0.0292)	0.00939 (0.0152)	0.0154 (0.0173)	-0.00476 (0.0146)	-0.0480 ^{**} (0.0240)	-0.0341 (0.0208)	0.0399 ^{***} (0.0129)
6 Months	0.0444 ^{***} (0.0155)	-0.0373 ^{***} (0.0143)	0.0323 (0.0504)	0.0110 (0.0213)	0.000185 (0.0292)	0.0144 (0.0230)	-0.116 ^{**} (0.0462)	-0.0290 (0.0281)	0.0826 ^{***} (0.0228)
N	194	237	75	250	231	261	111	64	205

Table 23: Market Model Industry. Standard errors in parentheses * p < 0.10, ** p < 0.05, * p < 0.01**

Market Model						
	<i>Buy Macro</i>	<i>Sell Macro</i>	<i>Buy Micro</i>	<i>Sell Micro</i>	<i>Buy&Sell Macro Combined</i>	<i>Buy&Sell Micro Combined</i>
1 Day	0.00190 [*] (0.00107)	0.00184 (0.00276)	0.000278 (0.00113)	-0.000398 (0.00202)	0.00189 [*] (0.00100)	0.0000666 (0.00100)
1 Week	0.00381 [*] (0.00208)	0.00733 [*] (0.00413)	0.00621 ^{***} (0.00224)	-0.00666 (0.00405)	0.00437 ^{**} (0.00187)	0.00219 (0.00200)
1 Month	-0.00118 (0.00436)	0.0240 ^{***} (0.00767)	0.0134 ^{***} (0.00403)	0.00232 (0.00582)	0.00285 (0.00387)	0.00991 ^{***} (0.00332)
3 Months	-0.0172 [*] (0.00905)	0.0705 ^{***} (0.0144)	0.0174 ^{**} (0.00761)	0.0322 ^{***} (0.0108)	-0.00312 (0.00801)	0.0220 ^{***} (0.00623)
6 Months	-0.0368 ^{**} (0.0145)	0.137 ^{***} (0.0242)	0.0236 [*] (0.0133)	0.0345 [*] (0.0178)	-0.00894 (0.0129)	0.0270 ^{**} (0.0107)
N	770	147	489	222	917	711

Table 24: Market Model Micro/Macro. Standard errors in parentheses * p < 0.10, ** p < 0.05, * p < 0.01**

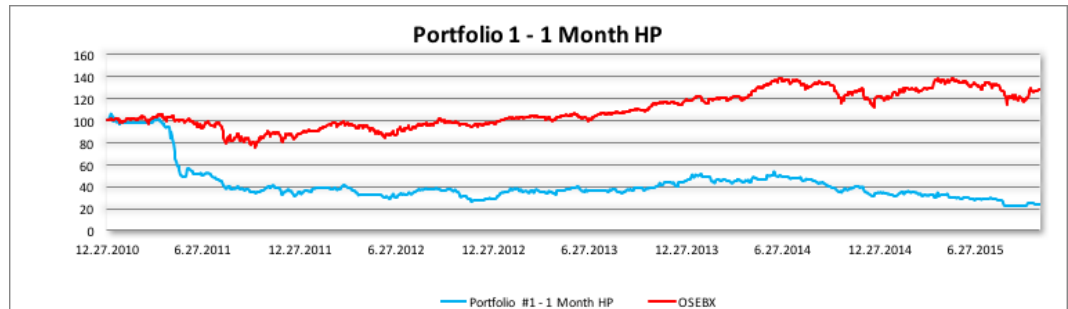
Market Model						
	<i>Small Absolute Purchase</i>	<i>Medium Absolute Purchase</i>	<i>Large Absolute Purchase</i>	<i>Small Absolute Sale</i>	<i>Medium Absolute Sale</i>	<i>Large Absolute Sale</i>
1 Day	-0.000532 (0.00178)	0.00108 (0.00101)	0.00343 ^{**} (0.00168)	0.00198 (0.00212)	0.000452 (0.00264)	-0.000862 (0.00321)
1 Week	0.00688 ^{**} (0.00314)	0.00329 (0.00223)	0.00546 [*] (0.00286)	0.0103 ^{**} (0.00455)	-0.00501 (0.00486)	-0.00421 (0.00476)
1 Month	0.0197 ^{***} (0.00734)	-0.00142 (0.00416)	0.00134 (0.00552)	0.0256 ^{***} (0.00881)	0.00837 (0.00700)	0.00194 (0.00858)
3 Months	0.0132 (0.0141)	-0.0139 (0.00850)	0.0000267 (0.0121)	0.0871 ^{***} (0.0177)	0.0436 ^{***} (0.0116)	0.0169 (0.0185)
6 Months	0.0288 (0.0211)	-0.0217 (0.0144)	-0.0381 [*] (0.0203)	0.106 ^{***} (0.0261)	0.0786 ^{***} (0.0215)	0.0391 (0.0297)
N	308	638	312	90	195	93

Table 25: Market Model Absolute Trade Volume. Standard errors in parentheses * p < 0.10, ** p < 0.05, * p < 0.01**

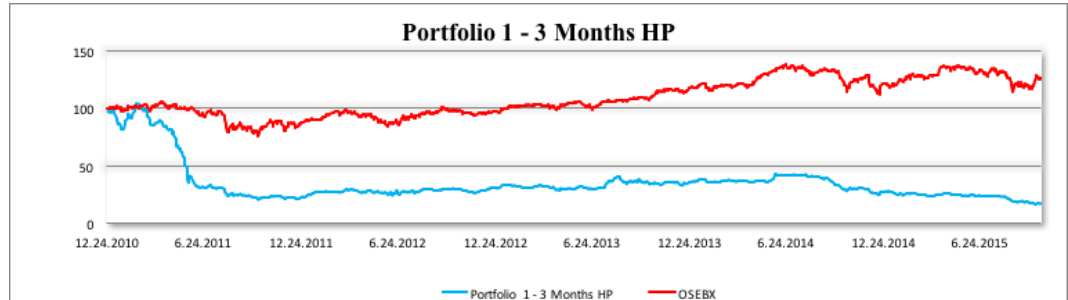
Market Model						
	<i>Small Relative Purchase</i>	<i>Medium Relative Purchase</i>	<i>Large Relative Purchase</i>	<i>Small Relative Sale</i>	<i>Medium Relative Sale</i>	<i>Large Relative Sales</i>
1 Day	0.00166 (0.00161)	0.000574 (0.00112)	0.00210 (0.00157)	-0.00120 (0.00466)	0.00241 (0.00187)	-0.00161 (0.00283)
1 Week	0.00546 [*] (0.00287)	0.00293 (0.00218)	0.00653 [*] (0.00334)	-0.00536 (0.00655)	-0.00264 (0.00449)	0.00598 (0.00421)
1 Month	-0.00157 (0.00540)	0.00486 (0.00480)	0.00955 (0.00599)	-0.00643 (0.0112)	0.0186 ^{***} (0.00674)	0.0126 [*] (0.00660)
3 Months	-0.0158 (0.00989)	-0.00555 (0.00998)	0.0136 (0.0125)	0.0524 ^{***} (0.0193)	0.0413 ^{***} (0.0118)	0.0549 ^{***} (0.0171)
6 Months	-0.0505 ^{***} (0.0181)	-0.00515 (0.0153)	0.00889 (0.0213)	0.0533 [*] (0.0280)	0.0669 ^{***} (0.0212)	0.113 ^{***} (0.0290)
N	338	601	312	90	184	95

Table 26: Market Model Relative Trade Volume. Standard errors in parentheses * p < 0.10, ** p < 0.05, * p < 0.01**

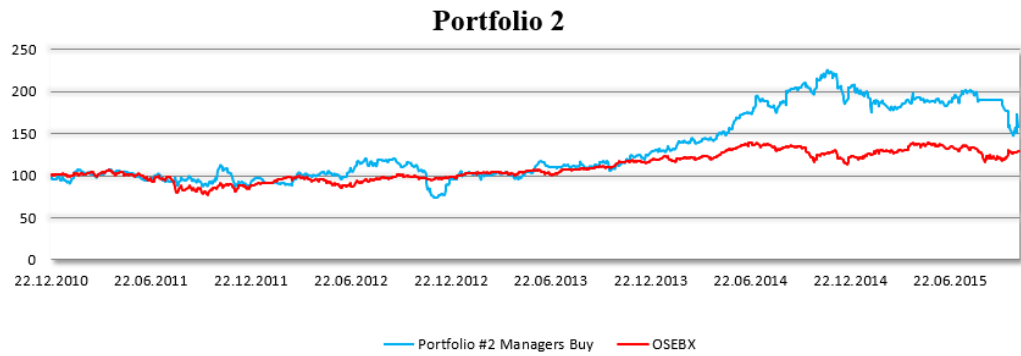
12.7 Appendix 7 – Graphs Strategy



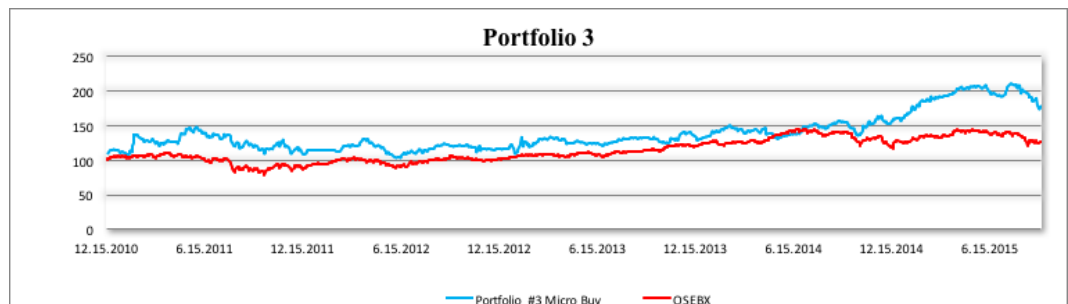
Graph 16: Portfolio 1 – 1 Month Holding Period



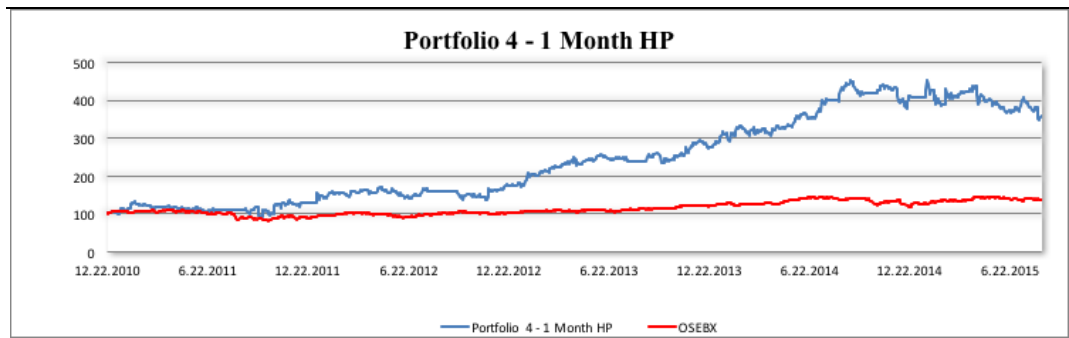
Graph 17: Portfolio 1 – 3 Months Holding Period



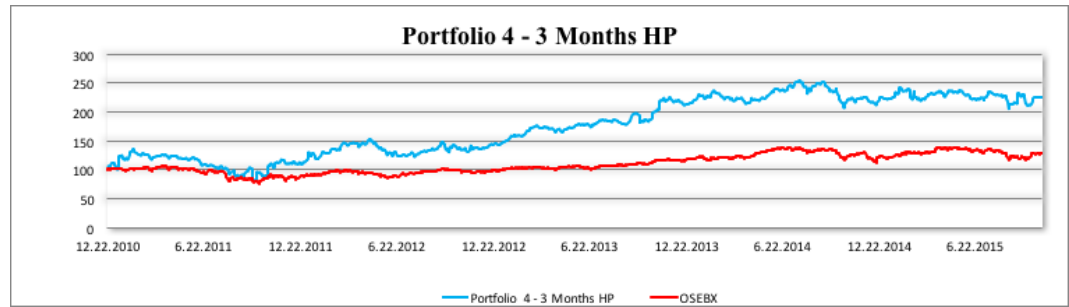
Graph 18: Portfolio 2



Graph 19: Portfolio 3



Graph 20: Portfolio 4 – 1 Month Holding Period



Graph 21: Portfolio 4 – 3 Month Holding Period

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Preliminary Thesis

Is it possible to earn abnormal returns by following Insiders on OSEX

Eksamenskode og navn:

GRA 19003 – Preliminary Thesis

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Supervisor:
Kjell Jørgensen

Campus:
BI Oslo

Programme:
Master of Science in Business and Economics, Major in Finance

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13 Preliminary

Over the history both researchers and investors have tried to challenge the market efficiency hypothesis. Insider trading has always been a popular topic for discussions both within the financial industry, the media and academic environment. The attraction to the topic must be seen in line with the fact that we are constantly faced with speculations whether CEO's, CFO's or other primary insiders uses their superior information to gain advantage over non-informed investors, and hence creating profits.

In this preliminary we wish to introduce our thoughts and approach to study whether there is possible to obtain abnormal returns by following the transactions made by insiders trading. To do this we have formulated the following hypothesis that we will test on Oslo Stock Exchange:

*H₀: Following an insiders trades **does not** give any abnormal returns*

*H₁: Following an insiders trades **does** give abnormal returns*

The first chapter will present our motivation and pre- knowledge on the topic. Following chapters will then present literature review and methodology. Considering that the theoretical framework presented in this paper is based upon research made nearly half a decade ago, the reader should keep in mind that some of the assumptions made then might have changed due to changes in the market or regulations. For example, it is natural to believe that markets today might be more efficient when considering the high sequence of trading due to major technological advances. Nonetheless, the presented literature is considered to be important arguments to why we seek out to test both our main and sub hypotheses. All together we are trying to cover the most important parts of our thesis in this preliminary, minor changes might occur at later stages.

Motivation:

Through our thesis we wish to apply knowledge gained over our two year-long master degree. We therefore felt comfortable to choose a subject that would challenge our prior knowledge from both financial and quantitative courses. As both of us have a high interest to the financial market, we early on decided to select a thesis concentrating on market principals and arbitrage. Another important feature to our motivation was that we got in contact with the investment fund Dovre Forvaltning. Dovre is a Norwegian fund managed by the acknowledged stock strategist Stig Myrseth who is both founder and CEO of Dovre. Mr. Myrseth has done research on insider trading, claiming to have found a successful recipe to use insider information to create abnormal returns. *“The cornerstone of the investment strategy of Dovre Inside Nordic is investing in Nordic listed shares where there has been significant insider purchases”*. Subsequently, insiders have an information advantage, it is therefore reasonable to assume that they over time will do better than the average investor. Dovre are not alone in their beliefs for a success recipe to gain abnormal returns. Trygve Hegnar’s *Finansavisen* with its “Innsideportefølje” claims to have found an investment strategy that beats the market. Since its startup, back in 1996 *Finansavisen* claim to have gained excess return 17 out of 18 years. An impressive result, that are in conflicting with some of the most accepted financial theories.

Dovre’s success and business concept combined with our beliefs in the market efficiency theory made us curious whether it will be possible to beat the market by taking advantage of insider trading. We therefore felt very lucky when Stig Myrseth promised to supervise and contribute to our thesis granting us access to their database.

Literature review

Keeping in mind that our research paper will be formed out of an academic point of view, we wish to apply some of the key findings made in earlier research into our paper. To secure a good and strong intuition, all the theories presented in this paper have been carefully studied and selected accordingly to their relevance to our hypothesis. Implying that all our sources of

information will be provided and supported by a scientific study. Important subjects will be price drift, market equilibrium, and efficient market hypothesis.

Our sources of information are provided mostly from academic studies and were found in academic journals regarding topics on market efficiency and insider trading. The main source of empirical research were articles found in academic journals such as Journal of Finance and Journal of Financial Economics. These articles among others include Henry G. Manne's research on insider trading and Eugene F. Fama's research on the Efficient Market Hypothesis (EMH). Both are to be considered a cornerstone in our theoretical approach. When it comes to the methodology, literature on research finance and statistics has been closely reviewed to maintain valid statistical conclusions.

Market efficiency

Market efficiency is one of the most famous and probably the most significant proven theory ever made to explain the financial markets. The theory was put forward by Eugene Fama in 1970, and is a theoretical description of how stock prices tend to develop over time. From the creation of the theory and to this day, many have tried to challenge Fama's result, although, the theory still stands as a valid explanation to the behavior of the stock prices.

The EMH claims that we expect stock prices to reflect all information at all time. This infers that we would not gain any risk adjusted excess returns over the market, therefore, eliminating the possibility to systematically beat the market over time. Since all prices will be reflected by the available information to each asset. Prices are then believed to move randomly and only change significantly if new information are published, for instance due to a profit warning. The variation in the stock price is thus reflected in the expected returns, as returns and risk are correlated. Implying that all public information will be interpreted into the company's stock price, where price fluctuations are believed to be a result of random walk. However, abnormalities within the returns tend to occur on a frequent basis as new information is released. This is often referred to as price drift, which are believed to be a result of market inefficiency. One explanation according to Damoduran (2002) could be that price drifts can be a result of information leakage prior to trade announcements, which may be an indication of insider trading.

Semi-strong and Strong form efficiency

Our paper will mainly focus on semi strong-and strong form efficiencies, which is an important explanation to market behavior. The semi-strong form hypothesis states that; all publicly available information regarding the firm and its prospects must already be reflected in the stock price. This makes it impossible to gain abnormal returns by applying fundamental analysis based on public information. The strong-form version of the efficient market hypothesis states that; stock prices reflect all information related to the firm, even information that is only available to company insiders. Making it impossible to earn abnormal profit by any information of the firm (Fama 1970). The strong form of the EMH is quite extreme and has weaker scientific support compared to the semi strong form.

Why is the efficient market hypothesis so important? Why do we need to control the insiders?

In this paragraph we will discuss and present an important backside to why we need market regulation on insider trading and its relevance to the market efficiency hypothesis. This will be an important framework and needs to be fully understood by the reader before we continue arguing on the theories made on insider trading.

Although, markets are built upon assumptions and rules there is a general assumption that insider trading is something that must be prohibited in order to protect the general public's confidence in the stock market (Hetzler, 2001). This means that investors need a regulated and transparent market. If there were to be any disbelief about the market regulation, this could bring along market hysteria where the investors refuse to invest in the market. Lack of faith could damage the market, and in the long run destroy the liquidity.

Laffont and Maskin (1990) stated that abnormal returns made by insider trading creates imperfect competition which adds a new complication to the efficient market question. Arguing that when some traders are large, the amount of information conveyed by prices is to some degree a matter of their strategic choice. Oslo Stock Exchange explain in their statement that: The issues that arises with insiders trades is that they typically has greater knowledge of what is happening in the future and is therefore better suited to evaluate the future direction of the company's stock price. Transactions made by such insiders might therefore be of highly interest for the non-informed market, and the investor's decisions around their investments.

The Norwegian Securities Trading Act, along with the European commission states that trading on inside information is more likely to have a significant effect on the stock price, is illegal by law. Despite the support for market regulation, Finnerty 1976 and Haddock & Macey (1987) argues that non-regulated markets could improve market efficiency, believing that transactions made by insiders would reveal the real value of the company. On the other hand it's well known that in order to have a regulated an efficient market some regulation will be needed to have a sustainable economy.

What is the relationship between Fama and insider regulation?

According to the strong form market efficiency, illegal trading would not have earned insiders abnormal returns. When studying the semi-strong form, it is possible to earn abnormal returns for an insider, but not for an outsider to follow these signals, as they already are reflected in the price. If the trade is done illegally, i.e. if someone were trading on non-public information, or if the market expects insiders to have better knowledge as a whole, and thereby trading on this, there could be a possibility to earn abnormal returns. Having this in mind and the short time interval on Oslo Stock Exchange from the trade to the announcement, makes it interesting to study if we can find some anomalies in the stock market relating to insider trading. Hence also violating the semi-strong form efficiency.

Literature on insider trading

Some of the first acknowledged research ever made on insider trading was presented by Glass and Rogoff (1966). Their study examined the possibility to earn abnormal profits using insider information, where they studied the performance of a portfolio containing insider stocks which they compared to the market. Lorie and Niederhoffer (1968) used the same approach and found similar results; this was the start of closer research on this topic as it gave abnormal returns in both studies.

As more knowledge about statistical testing and better market data were collected, Jaffe (1974) and Finnerty (1976) made an improved effort to study the significance on insider trading. Jaffe approached his studies by focusing on larger sample sizes and vibrant adjustments on market risk. Finnerty combined Jaffe's results with an event-based methodology to separate between buy and sale trades made by insiders. His results were in line with Jaffe's; both confirming that insider trading could lead to abnormal returns. They

also concluded that even uninformed investors, so called outsiders could earn abnormal profits by imitating the insiders. The result breaks with the validity semi-strong –and strong efficiency theory in EMH.

Baesel and Stein (1979) studied if insiders and bank insiders could use this superior information to earn positive abnormal returns by trading on this information. They found evidence for their hypothesis, but also concluded that outsiders could not react to insider trading as a signal about the change in the stock price.

The now wide supporting literature on insider's significance, inspired new research to focus on the characteristics behind the insider transactions. New literatures were focused towards relationship between insider's returns in relation to firm specific events, size, price, growth and multiples. Basu (1977) et.al. found that stocks with high E/P ratios had higher risk-adjusted returns than low E/P stocks. Banz (1981) studied the size effect and found that shares in smaller firms earned a higher risk adjusted return than shares in larger firms, biasing the CAPM when measuring the expected returns to the securities, as this does not adjust for firm size anomalies. Suggesting that using CAPM as a model when studying insider trading should be used with caution.

Later Elliot, Morse and Richardson (1984) and Givoly and Palmo (1985) studied the relationship between insider trading on events and announcements. The study cited evidence on the possibility to profit on insider trading, although they also stated that a lot of the insiders' trading's were not related to information events.

Further studies were also conducted by Seyhun (1986) who studied the correlation on buy and sell signals provided by insiders. Seyhun used data with a five-year horizon to conclude that insiders can predict abnormal future stock prices. He also came to the interesting conclusion that there were differences in the quality of the information. For example insiders that were expected to have more knowledge about the firm, such as chairmen of the boards, were more successful predictors of abnormal returns than lower positioned executives. In short, the idea behind the research is that higher positioned insiders would have access to more information and hence providing higher returns. He also found that the abnormal returns could disappear

both for insiders and outsiders if the bid-ask spread is taken into account as an additional cost of the trading. Thus making the EMH valid.

Metrick, Jeng and Zeckhauser (2003) contributed with their research supporting that a higher positioned insider tends to provide higher abnormal returns. They also claimed that a larger fraction of abnormal returns came from smaller firms. Their research results were found by using Carhart (1997) four factor model, a model that adjusts for size, momentum and value factors. Finding evidence that to have greater explanatory power than the CAPM.

Heinkel and Krauss (1987) continued the research by focusing on the relationship between smaller companies, where insiders owned the majority of the shares. Believing the insiders to have more valuable information than outsiders. Their conclusion was that insider's performed well but was not significantly greater than the outsider's performance.

The supporting literature on how different insider could affect abnormal returns, inspired researchers to wonder if some markets were more affected by insiders trading then others. Fidermuc, Georgen and Renneboog (2006) published studies on cross country differences between abnormal returns, claiming to find evidence that proves national differences. The study were made by comparing the market in UK towards the US, believing national laws on insider trading to be the reason for the differences. Fidermuc and Korxzak published new literature studying the differences in abnormal returns for countries in Europe. Their results emphasized that different shareholder protection were the reason to the abnormal returns, arguing that countries with a higher degree of shareholder protection had lower abnormal return then those with less protection.

As can be concluded from the literature presented above, much research have been made since Glass and Rogoff confirmed the significance behind insider trading. However, most of the methodology that has been applied on insider trading has been provided by using an unconditional model. Due to this fact, Eckbo and Smith decided in 1998 to present their studies, which were made using a conditional model. In a brief view, Smith and Eckbo used a model that frequently updated its weights as insiders bought and sold stocks. Giving them a more accurate measure on the realized returns. Although, the data that were used in the

studies came from Oslo Stock Exchange, the authors didn't find any proof of abnormal return. A deviating result compared to earlier research made by Finnerty and Glass.

In sum, the research presented in this preliminary indicates that insiders tend to outperform the market. Studies made by different researchers support how different characteristics of insider trades can have an effect on abnormal returns. If we assume that the presented research and their conclusions are correct, this would imply a violation of Famas strong market efficiency theory. The rest of our paper will therefore be based upon the violation on the semi- strong form efficiency.

Methodology

Introduction

The following paragraph will discuss methods to detect excessive returns made from insider trading. Bearing in mind that there are multiples ways to test our hypothesis, our approach will therefore be similar to earlier studies, using an event study technique. The method has though been shown to have its weaknesses, for example it holds the level of risk constant, which could bias the long run testing and therefore affect the measure of risk adjusted abnormal returns (Kothari and Warner 1997 et. al). However, Eckbo and Smith (1998) used a different approach to avoid this long run bias. By using different weighting algorithms in addition to equally weighting, they constructed monthly portfolios that could adjust the risk in order to provide a more reliable result. Another approach that also could be used to measure long run returns is the portfolio mimicking approach (Zeckhauser et. al. 2003). Consisting of replicating a portfolio where the more active traded firms have a greater weighting than single traded firms. In other words the insider portfolio will act like a tracking portfolio.

Despite the challenges to constantly adjust weights and risk, and in the light of our main goal with this assignment, which is to measure the short-term effects of the abnormal returns. We find it applicable to conduct an event study approach in order to measure the abnormal returns.

Event studies

An event study is defined as a statistical method to measure the impact of an event by studying the change made by the event itself. For the changes to be notable it will be necessary to assume rational and efficient markets (McWilliams & Siegel, 1997). Nonetheless, event study has been a frequently used method and is a robust measurement to study abnormal stock returns MacKinlay(1997).

In order to do a proper event study we need to define when the event occurred, and the period of which the stock price has developed MacKinlay(1997). There are several ways to do this, however, we have chosen the same approach as described by MacKinlay (1997), calculating the normal-, abnormal-, and cumulative returns using daily data. The rationale behind our choice to study daily data are justified by MacKinlay, stating that shorter data are better to detect abnormal returns compared to weekly or monthly observations. Further, our study will be conducted on insiders publication of the trades as the event window. Sample characteristics will then be tested according to our hypothesis, company size, insider positions, industry effects, momentum, and quarterly-and yearly reports effects. With the event of interest as the publication of the insiders trade.

Models and statistical framework

The purpose of the test is to find abnormal returns caused by an event, which we can define as the difference between the actual and expected return given by the equation:

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

MacKinlay (1997) suggests the use of specific economic performance models in order to obtain the expected returns; we will therefore use a simple market model known as the Capital Asset Pricing Model (CAPM), as well as multifactor models (Rolls 1976) to obtain this. The CAPM is the most applied model when simulating event studies. The model is simple in structure and explains the market returns through an equation containing alpha, beta and market return. Although the CAPM is widely used the market model contains restriction by using only one parameter to explain the returns. Hence, contain some weaknesses in its

simple structure. We have therefore chosen to include a multifactor model, namely Fama and French's three factor model.

$$R_{it} = \alpha_i + \beta_{it}R_{mt} + u_{it}$$

The distinct difference between the CAPM and the three factor model is the usage of three explanatory variables compared to one in the CAPM. The three-factor model uses two more variables than the CAPM, measuring the relationship between small and big firms, and the price/book ratio. The model has been scientifically proven to be an efficient and correct proxy to measure returns. If insiders were to trade in small firms we would need to use the multifactor model to adjust the returns to avoid biasness. To do this we will use Fama and French's 3 factor model. We have chosen to divide the SMB and HML factors into equally sized groups in order to always have a significant number of observations in each group. The groupings will therefore be as following: SMB effects by dividing up the firms in the groups, 33% biggest-, 33% medium-, and 33% smallest firms. And do the same to the HML factor, where we will have the 33% high value-, 33% medium value-, and 33% lowest value firms, through $\frac{Price}{Bookvalue}$.

$$R_{it} = \alpha_i + \beta_{it}R_{mt} + \delta_{it}SMB_t + \gamma_{it}HML_t + u_{it}$$

A key assumption to the statistical framework will be that the standard errors are independently distributed, where the error term are the difference between the actual return and the normal return in the estimation window, and:

$$E(u_{it} = 0)$$

$$var(u_{it} = \sigma_{u_i}^2)$$

We will then run an ordinary least squares regression (OLS) to obtain the estimates of the parameters α_i , β_{it} , γ_{it} , and δ_{it} .

In order to obtain inference from our study it is more interesting to aggregate the stocks and take the averages of the abnormal returns, and thereby cumulate the average returns.

$$AR_t = \frac{1}{N} \sum_{i=1}^N AR_{it}$$

$$CAR_t(\tau_1, \tau_2) = \sum_{t=\tau_1}^{\tau_2} AR_t$$

Under the null hypothesis there will be no abnormal performance on the traded stocks at day t during the event window. We can therefore construct test statistics that we assume are asymptotically normally distributed, where we can use the following test statistics to obtain the average return on day t given these formulas:

$$AR_{it} \sim N(0, \sigma^2(AR_{it}))$$

$$\tau = \frac{CAR_t}{SE(CAR_t)}$$

$$SE(CAR_t(\tau_1, \tau_2)) = \sqrt{\frac{1}{N^2} \sum_{i=1}^N \widehat{\sigma}^2(CAR_i(\tau_1, \tau_2))}$$

In order to pick the length of the estimation window it is important to choose one that is long enough to picture all the volatility of the stock. Providing consistent estimators is important to avoid noisy information, like shocks and crisis, that could lead to structural breaks in the estimation. Hence, affecting the reliability of the normal returns in the period. Armitage (1995) argues that the estimation window should be somewhere between 100 to 300 trading days prior to the event window, while MacKinlay (1997) argues that it should be between 180 to 250 trading days. In this thesis we will therefore use an estimation window of 200 trading days.

As this paper is written in cooperation with Dovre Forvaltning we have chosen to use the same post-event window as them; 1, 3, and 6 months, but also include the immediate short term effect occurring right after the trade. This gives the following event window in trading days within their respective periods in trading days: (0,1] (0,20] (0,60] and (0,120] .

Measuring returns

Our approach to study the effect will therefore be done by measuring the price from both the day the transaction were made and the days after. By doing so we wish to quantify the effect made by the insider trade. This will allow us to measure the effects as far as 6months and we are also hoping on see any immediate effects already the day after the announcement. Longer terms effects will also give us a better idea about how the size of the information asymmetry measured by abnormal returns develops over time, and thereby makes it easier to implement trading strategies based on holding stocks for these amount of times, which will lead to a less intensive trading.

The returns are calculated logarithmically of two reasons. The first reason is that they are calculated as continuously compounded returns (geometric). This makes it easier to aggregate the returns across time periods, in other words we can say that they are time-additive. The second reason is that we need the normality assumption to hold in order to test our models, and the fact that geometric returns have been proven to give stronger normality returns (Henderson 1990), we use the following equation in order to do the calculation:

$$R_{it} = \ln\left(\frac{p_{it}}{P_{it-1}}\right)$$

13.1 Selections Criteria

Event studies has some specifications when it comes to choosing the right proxies for their testing's. Our choice and reasons for this will be presented in our final thesis. We also have to be sure that our testing period is within a normal period. Meaning that we test within a period where the market were stable and did not contain a high volatility with extraordinary returns.

Data

In the scope to limit this thesis to its extent, we have chosen to only focus on the Norwegian stock market. We obtained a dataset from Dovre Forvaltning that contains of 3700 insider trades on OSEX from 10.11.2008 to today, our time horizon will therefore be between these two dates. In line with previous studies (Gregory 1997, and Ravina and Spienza 2009), we choose to exclude actions which is associated with other corporate actions, like options, bonus shares etc. as they are not initiated by insiders and hence generally not driven by private

information. Daily stock prices will be downloaded through databases such as DataStream, and matched with the dataset that we already have obtained by Dovre Forvaltning in order to create a test-able dataset. In the insider dataset we have information about date of publication, company, name of buy/seller, position in the firm of the trader, price, shares, and holdings after trade. Having all this information available simplifies the procedure to test for all hypotheses.

Progression plan

Plan	Deadline
Clean insider trades dataset	February 2016
Collect price data	February 2016
Structure and test hypotheses	March 2016
Interpret and comment results	March – April 2016
Hand in first draft	Early May 2016
Review, add, finish thesis	May – September 2016
Deadline	September 2016

Literature:

*Armitage Seth(1995), Event Study Methods and Evidence on Their Performance [Journal of Economic Surveys](#), 1995, vol. 9, issue 1, pages 25-52**Date: 1995**References: [Add references at CitEc](#) Citations [View citations in EconPapers](#) (24) [Track citations by RSS feed](#)*

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Appendix

These are some of the suggested hypothesis:

1. Is it possible to make profit by following insiders on Oslo stock exchange
2. It is possible to earn abnormal returns on average on Oslo Stock Exchange 1, 20, 60, 120 trading days after an insiders purchase announcement.

3. Is there a difference in abnormal return between firms with high and low price/book ratio
4. Is there a difference in abnormal returns between different industries.
5. Is there a difference in insiders abnormal return between firms with high low market cap
6. Is there a difference between insider performance before and after quarterly/yearly reports
7. Do Insiders in different positions in the firm earn different abnormal returns.
8. Insider trades in companies with momentum earn a significant higher abnormal return following the trade than insider trades in companies without momentum