Is there a relationship between export reliance and stock performance on Oslo Stock Exchange after an interest rate change?

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An event study

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Master Thesis in Financial Economics

Preface

This thesis was written as a part of the master profile Financial Economics at the Norwegian School of Economics.

Since both of us have taken a master in finance together with several macroeconomic courses, it was natural for us to choose a problem where we could combine the two topics. We chose to write about interest and exchange rate effect on the market after the course *International Financial Markets and Financial Stability* spurred our interest for the topic.

We chose to work together on the thesis because we wanted a more nuanced and thoroughly thesis. Our main difficulty was to collect enough, and correct data for our sample, and later present it in an appropriate matter. This has led to more difficulties than we expected, but in the end we learned a lot and managed to deliver a thesis we are satisfied with.

Throughout the whole process of writing a master thesis we have learned a lot about stock behaviour, interest and exchange rate effects on the market. Working on the master thesis has been different compared to our previous semesters at NHH. We have had to work more independently, which in a way was demanding, but also interesting and educational. All in all we have learned a lot, and matured in many ways through this semester, which we hope is reflected in our thesis.

Finally, we would also like to thank our supervisor through the whole process, Tyler Hull, who has been very helpful with constructive feedback in time of need.

Norwegian School of Economics, December 2013

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Abstract

In this thesis we have conducted an event study to investigate if stocks of companies which are reliant on export are more sensitive to interest rate changes compared to companies which mainly get their revenue from the domestic market.

The main findings in the thesis are that there does not seem to be any significant difference in stock behaviour after interest rate changes. We do find some significant results, and quite a few trends, indicating that export reliant stocks benefit slightly more from an interest rate reduction compared to non-export firms, but the results are not consistent.

It also seems like non-exporting firms in general perform worse than exporting firm, both when it comes to an interest rate increase and decrease as they often show a negative trend compared to the sector indices. However, we cannot draw any firm conclusions as the results are not statistically significant.

Introduction

This paper analyses if export reliant stocks are more sensitive to interest rate changes compared to stocks with lower export reliance, focusing on four sectors of the Norwegian economy. We introduce the market model to establish the normal returns of the different stocks we analyse, and try to look at their performance in an event window around interest rate changes.

The Norwegian central bank changes the interest rate to fit the current economic situation in the country. An interest rate change will in theory affect the currency value and thus the exchange rate. This effect works through the uncovered interest parity which in theory adjusts the exchange rate to exactly countervail interest rate differentials. We think that exporting firms are more affected than non-exporting firms in the time horizon around the interest rate change. This would in turn imply that the efficient market hypothesis (EMH) is rejected and we would have inefficient markets. The EMH implies that new information is implemented in the stock prices straight away after becoming available, but we want to check a period of five days before and after to see if we can observe any effects around the event.

We chose to look at four different sectors on Oslo Bors; the Industrials- , Consumer Staples-, Materials- and the Information Technology sector. Within these sectors, we have categorized firms as either exporters or non-exporters based on export share over overall revenue, which has been retrieved from the firms' annual reports. By categorizing within each sector, we are able to check if we can find any significant difference in returns within each sector. We also analysed all sectors together to see if there was any results supporting the fact that exporters experience a different return than non-exporters in the event of interest rate changes.

We use the market model in order to compute the normal return for each individual stock by comparing their performance to the performance of the sector index 250 days prior to the event. Using this expected return, we are able to calculate the *abnormal return* in the event window and thus check our hypothesis. This is done for all of the firms in our sample and the results are then averaged and added up to form the A*verage Abnormal Return*

(AAR) and *Cumulative Average Abnormal Return (CAAR)* to check if there are any effects cumulating throughout the event window. We also compute t-tests to check if there is any significant difference between two samples, where we use exporters/non-exporters and interest rate increase/decrease to check this.

The results we get are not particularly remarkable. Few observations are significant, even at a 10 % level of significance. We cannot say for sure that the results we get are due to pure chance or if there in fact is an effect. However, we get some interesting trends that we describe and try to interpret. Throughout our analysis it seems that exporting firms perform better than those which do not export after an interest reduction. As mentioned, the proofs are not overwhelming, but there seems to be a pretty clear trend towards it. This might be because there is an effect apparent that we suspected, or it can be due to the fact that exporting firms tend to perform better than those which do not export in general. This is stated by Bernard and Jensen (1997), who say that exporters may be well-performing because well-performing firms become exporters, or because exporting is good for firms, or both.

Problem definition

In this thesis we want to examine if stocks of firms which have a great deal of exports are more sensitive to interest rate change than stocks of firms with less export reliance. In order to figure this out, we offer an explanation for which firms that are considered to be exporters with data retrieved from their respective companies' annual reports. We have categorized firms into two categories: either exporting or non-exporting.

We want to do this by looking at Norwegian firms' historical stock prices representing different sectors on Oslo Bors. That way we can analyse different industries to see if we can observe a relationship between stock performance and export reliance. We will also analyse the difference between sectors, between interest rate increase and decrease and also do an analysis on individual stocks within the same industry.

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Literature review

Campa (2004) argues that currency depreciation increases the export volume of exporting firms. In addition, Bernard and Jensen (2004) find that more favourable exchange rates shifts increase export intensity. There is plenty of research that supports our claims that favourable exchange rates affect export volume in a positive way. There is, however, uncertainty in regards to what effect the interest rate has on the exchange rate, according to Smith (2004).

There has been a lot research on how changes in interest rates influence firm value. A lot of this research has been concentrated on the banking industry due to the interest rate sensitive reliance of the industry (Staikouras, 2006). Nevertheless, there has been research that argues that interest rate fluctuations also offers a significant influence of nonfinancial companies, especially those which are highly leveraged, thus reducing cash flows in the future (Bartram, 2002).

Several papers have empirically examined the connection between exporting and economic performance. It has been documented that exporting firms are larger, more productive and more R&D intensive (Bernard & Jensen, 1997). One weakness with these studies is that it is very hard to distinguish between the effects of exporting and other unobservable differences between exporting and non-exporting firms (Park & Yang, 2010).

We think that this study contributes to the extant literature in three ways. First, to our knowledge, this is the first report that examines the difference in returns for exporters and non-exporters after interest rate changes in the Norwegian market. Further, we also look at different sectors in order to test if we can find sector specific factors that can describe the potential relationship between export reliance and stock performance. In addition, we try to link export reliance to different variables in a panel data regression to examine if there are any significant relationships that combines the performance of exporters to other economics variables.

Theory

Monetary policy

Norges Bank communicates its policy intentions more openly than most central banks. Only the Reserve Bank of New Zealand started to publish an interest rate forecast prior to Norges Bank's introduction in November 2005 (NorgesBank, 2006). In addition, key variables like inflation and the output gap are also published. Monetary policy works mainly through expectation, as Woodford (2005) puts it: «*For not only do expectations about policy matter, (...) very little else matters».* The interest rate set by the central bank is usually a short-term interest rate and has, independently, little effect on economic policy decisions. What matters are expectations about future rates that affect the market interest rates and thereby economic decisions (Holmsen, Qvigstad, Røisland, & Solberg-Johansen, 2008).

Why change the interest rate?

Central banks around the world use the interest rate as a tool to form a monetary policy that they see fit the current economic situation in their country. The goal is to promote a healthy economic growth and at the same time create a stable economy. The interest rate helps regulate the total supply of money in the economy because it sets the price of using money. A higher interest rate will increase the cost of using money and thus reduce the money supply in the market. The opposite is true for a low interest rate. The monetary policy can either be expansionary or contractionary, where the latter reduces the total money supply by increasing cost of money, and an expansionary policy increases total money supply by reducing cost of money. A reduction in the interest rate, an expansionary policy, is an instrument to recover a slowing economy by trying to spur investment and consumption. A contractionary is an instrument to cool down a heated economy by reducing access to funds (Gartner, 2006).

Another important task central banks use monetary policy for, is to control the inflation rate. When the interest rate is lowered, the cost of money is reduced and it may create excess supply of money, which will raise prices. Central banks always have to weigh the necessity of economic growth against the danger of high inflation (Duff, 2013). The Norwegian government has an inflation target for the monetary policy, oriented towards low and stable inflation (NorgesBank, 2006). The interest rate is the most important monetary policy instrument for the central bank. The rate, which is the rate on banks'

deposits in the central bank, can be changed four times every year, or stay the same, based on the central banks' evaluation of the economic conditions in the country.

Interest and exchange rates

To better understand how the central banks' interest rate is affecting the operations of exporting firms, we must look into how the companies are creating income and where their costs come from. In our report we are including export relating firms from several different sectors, thus will their financials look different. We will focus on the cost and the funding in the companies that can be directly or indirectly be related to changes in interest rate or exchange rate.

A currency will change as a result of changes in the interest rate in a country, which we will explain by the theory of uncovered interest parity. To put it simple, a weaker home currency will make export relating firms' products relatively cheaper. As their products become relatively cheaper, the demand for their products abroad increases, thus revenue is expected to increase. When the domestic exchange rate becomes weaker, importing becomes more expensive for domestic firms and consumers, demand gets skewed against domestic products contra imported products. The opposite will be a fact when the domestic interest rate appreciates.

How is export affected?

Finding what effect the interest rate changes have on the stock prices of export reliant companies is a complicated matter. Our idea on how the interest rate changes will affect stock value is a process consisting of mainly two different parts. First, the interest rate decreases (increases), which will have many effects on the economy and on the financing cost for firms. Second, our idea is that the exchange rate is going to depreciate (appreciate) and increase (decrease) export reliant companies' competitiveness.

It will involve many difficulties to actually identify the effect the interest rate change has on the resulting exchange rate. An exchange rate is affected by all kinds of economic movements. It is also very exposed to speculation, thus is it difficult to identify the effect the exchange rate will have on the stock market (Smith, 2004).

The unstable and highly volatile export market creates problems trying to fully capture the effect of the exchange rate. In other words, when a shock hits, it is difficult to detect the

variation in export volumes that is due to the exchange rate. In *figure 1* we can see all the factors that may affect the final export volumes. It could also be doubts about how accurate the volumes and profits from exports are. The possibilities for error in the measurement may prevent us from identify changes in the export volume, and thus revenue, accurately (Smith, 2004).

Factors affecting export volumes

Export volumes				
Supply influences		**Demand influences**		
Capacity	**Alternative uses**	**Foreign demand**	**Trade barriers**	**Competitiveness**
Inputs	Domestic market	Market size	Tariffs	Input costs
Productivity		Foreign income	Quotas	Productivity
Weather		Population	Regulatory constraints	Exchange rate
Stocks		Preferences		Transport costs
Expected profitability		World export prices		
World export rates		Exchange rate		
Exchange rate				

Figure 1: Factors affecting export volumes (Smith, 2004)

The effect of the interest rate

The interest rate is a tool for controlling the heat in the economy, and a change in this interest rate will affect all firms within a country, not only exporting firms. As mentioned earlier, the interest rate can be seen as the price of money, and we can use this to explain the basic relationship between interest rate and stock value.

The interest rate is the opportunity cost for investments and consumption for companies and people. A low interest rate means that the opportunity cost is low as the return of saving money in the bank or lending out the excess money in the market also is low. For companies, this means that there will be more projects available that will return more than their current cost, which will spur more investments. The low cost of borrowing also makes it more attractive to borrow money. This means that the demand for good investments increases. For people, the low interest rate means that it will not be as attractive to save

their money in the bank, so they will increase their consumption (Krishnamurthy, 2013). The higher investment demand and increased consumption will be reflected in the net income of companies. Low interest rates will also often decrease the cost of debt for companies, and thus help reduce cost. Low interest rates are thus in general good for the value of stocks (Andreassen & Helte, 2004). When the opposite is true and the interest rate is relatively high, it will be more attractive to save and there will be fewer investment opportunities in the market that seem attractive. The general consumption will decrease and the demand for money and investment will also decrease. This will affect the operations and result of companies. High interest rates are thus in general negative for stock values.

Uncovered interest rate parity

Export related firms differ from companies which solely do business in the domestic market when it comes to how changes in the interest rate may affect their firm. This is because companies that get a major part of their business from abroad also have to take the interest rate effect on the exchange rate into consideration, and not just what it does to demand and supply of money in the domestic market.

An important point in our research is how theory suggests that changes in the interest rate are affecting the demand for a currency, and thus the value of a currency. When there are differences in the interest rate between two countries with different currencies, investors should be rewarded (Bekaert & Wei, 2007).

Interest rate parity is a theory that tries to explain how the interest rate differentials between countries are expected to affect the future exchange rate between two currencies. The theory states that a risk neutral investor would always be indifferent between holding different currencies because the investor is compensated for the interest rate differentials by a currency change that exactly countervail interest rate differentials on average (McCurdy, 1991).

If the hypothesis is correct, the exchange rate of the currency with the higher interest rate will depreciate relatively to the compared currency with the exact differential interest return on holding one currency over the other. To put it simple, an increased interest rate will lead to an immediate appreciation of the home currency which will depreciate over time, and vice versa (McCurdy, 1991).

$$(1 + i_\$) = \frac{E_t(S_{t+k})}{S_t}(1 + i_c)$$

Figure 2: Uncovered interest rate parity

We think this change in exchange rates resulting from an interest cut or raise will have an impact on how the stock value of different companies will behave after the central bank has decided on a monetary policy. We expect that the monetary policy will have a larger impact on firms that are highly export reliant compared to those which generate most of their revenue in the domestic market, because the exchange rate has a large impact on the competitiveness of an exporting firm. When a currency depreciates, a country's export will increase because it is now cheaper for foreigners to invest in the domestic market and buy domestic products, hence increasing aggregate demand for domestic products. When a currency appreciates, the opposite happens (Gartner, Macroeconomics, 2009). Naturally, companies where a major part of their revenue comes from exports will benefit or suffer most from this effect, and it will in turn affect their results. Since stock prices in theory are priced based on the value of future cash flows, a change in a firms future cash flow expectations will in turn affect their stock price (Damodaran, 2002).

What defines an export company?

First we want to elaborate how we define an export/non-export stock as it is an important aspect of the analysis to be able to distinguish between the two. We have developed an understanding of what we think should be defined as an export stock. First of all, it has to have a large share of its operational revenue from foreign sales, i.e. export. This information has been retrieved from the various companies' annual reports when available. In some cases, the reports did not give such information, and we had to use other characteristics in order to consider their share of exports relatively to others. Exporters are larger, more productive, relatively more capital – and technology-intensive and pay higher wages than non-exporters (Bernard & Jensen, 1997). In cases where the foreign sales numbers were unavailable, we have looked at various criteria in order to classify them as exporters or non-exporters.

The background for this approach is that various researchers have found several firm characteristics that are correlated with the amount of export. R&D expenditure, productivity

and size have been labelled as drivers for export. A more detailed description and the numbers we found for each company in question is attached in the appendix of the thesis.

External market characteristics

Since the breakdown of the Bretton Woods system, exchange rates between countries have fluctuated widely. These changes have led to an interest in what way they affect countries' export and import behaviour, with export being the focus in the following.

Previous research has shown that the decision to export is affected by a sunk-cost hypothesis. There are certain fixed costs associated with entering export activity, which cannot be recovered (Baldwin & Krugman, 1989). Non-exporters that want to enter export markets must therefore incur an entry cost which is sunk. As a result of this, they argue, firms will enter the market if the expected profit is higher than the entry cost. Firms that are exporting, however, will not look to exit the market before the exchange rates fluctuate to a point where expected gross profit of remaining in the market is negative.

Companies that operate internationally are exposed to foreign exchange risks that arise from various currency expenditures. The exchange rate, however, offers a more direct effect on export, given that the firm already is exporting. Campa (2004) finds that exporting firms adjust their output quantities due to exchange rates changes. These changes are occurring via the interest rate changes by the central bank as we have discussed earlier. We think we can observe these effects reflected in the companies' performances in the event window tied to an interest rate change.

Firm characteristics

Firms that export have usually certain characteristics that make them more likely to export than non-exporters. Exporting companies are usually well-performing. Researchers have not been able to fully explain *why.* Exporters may be well-performing because well-performing firms become exporters, or because exporting is good for firms, or both (Bernard & Jensen, 1997).

There has been found proof that certain firm characteristics can be used in order to explain what kind of companies that choose to become exporters. Technological intensity, measured as R&D expenditure, has successfully been linked with the decision to export by many researchers (Salomon, 2005).

Size

There are usually high costs tied to internationalization and the literature suggests that firm size is a key factor for the ability to export. As we have discussed above, the sunk-cost hypothesis means high costs tied to market knowledge, networking with customers and establishing distribution channels. Large firms can divide these costs on higher volumes which makes it relatively cheaper for large firms to engage in export. This is one explanation for the positive correlation between firm size and export ratio. The research literature also shows a clear picture that supports size as a key factor for the ability to export (Bernard & Jensen, 1997).

The causality can also go the other way. Exports are a source of growth, which is reason to expect that firms that have a large export ratio will grow faster than other firms. Aitken, Hanson and Harrison (1997) show that the causality runs primarily from size to export, but exporters also seem to grow faster than non-exporters.

R&D expenditure

There have been examples of previous studies that link technological intensity (i.e. R&D expenditure) with the decision to export (Cavusgil, 1984). The implications from their studies are that technologically endowed firms are exporters. Rodriguez and Rodriguez (2005) argue that the more R&D intensive firms are, the more export intense will it be. We will therefore evaluate the companies' expenditures on R&D as one criterion when we consider the export degree of firms. We will measure it as a percentage of a company's total sales.

Productivity

International operations are usually more demanding than operating purely in domestic markets, even though there are exceptions. Productivity depends on the firm's R&D and its participation in export markets. There is thus a relationship that is empirically supported, between the three variables export, R&D expenditure and productivity (Harris, 2011). Firm's productivity goes hand in hand with either lower costs or higher income, which in both cases will give high productivity. Research literature provides strong evidence for this pattern, which often has been given the term "export selection bias". Bernard, Eaton, Jenson and Kortum (2000) show that this effect in fact is very strong, and that firms with

high export share have higher productivity than firms with low export ratio. We will consider productivity as value added per employee.

Exchange rate and competition

Norwegian industrial firms get a large share of their revenue from export sales (Kvinge, 2003). Exchange rate fluctuations are therefore a vital factor that affects the revenue positively or negatively. Internationally, there has been developed different financial instruments to reduce the risk tied to the exchange rate, but it is not possible to hedge the entire risk. Usually the hedging period is a lot shorter than the optimal horizon of planning, which means that too big uncertainty around the Norwegian exchange rate affects the risk of investing (Kvinge, 2003).

Firms that operate in international markets will to some extent buy semi-finished products and sell finished products in the same currency (for example dollar or euro). However, there will always be expenses denominated in Norwegian kroner, salaries, taxes and so on, if the production and/or administration take place in Norway. The Norwegian exchange rate will thus affect the firms operating result (Kvinge, 2003).

Currency hedging

It varies a lot whether the management perceives an exchange rate appreciation as a problem or not. FAFO, a research foundation in Norway, conducted interviews with leaders of 47 large enterprises in Norway where they tried to identify the behaviour of companies when they faced exchange rate fluctuations. Some said that it does not need to be a problem with currency hedging, but most of the interviewees claim that it is impossible to completely hedge against this risk. The margins in the competitive sector are around 5-10 %, according to one leader a few years back, and last year the currency changes amounted for 20 % (Kvinge, 2003).

This obviously has implications for our sample. As we have tried to categorize our stocks into export and non-export, the exporting firms are engaged in substantial international activities and are exposed to changes in the currency exchange rates. One of our seafood firms, Marine Harvest, which exports almost all of their revenue, says in their financial report that "fluctuations in the currency exchange rates will continuously influence Marine Harvest's financial statements and cash flows" (MarineHarvest, 2005-2012). Firms in that

category obviously have risks tied to exchange rate fluctuations, and will be exposed to interest rate changes. On the other hand, firms in the non-export category are not especially exposed to such risk and will therefore not use hedging strategies. One of the companies that we categorized as non-export, Tide, says that they have a low exposure and that they thus do not see the need for hedging (Tide, 2005-2012).

Efficient Market Hypothesis

What expectations the market has towards the interest rate changes plays an important role for our study. The changes can already be implemented in the price or it can be seen as a surprise in the market and thus cause a correction in the price. We would therefore give an overview of the term market efficiency.

Whether the financial markets are efficient or not has been widely discussed in academic literature the past decades. The efficient market hypothesis (EMH) was introduced by Eugene Fama in his article *«Efficient Capital Markets: A Review of Theory and Empirical Work»* (Fama, 1969). It states that capital markets are, indeed, efficient, because the investors are intelligent and rational. Stock information is public information and cheap to get ahold of, and thus implemented in the stock price.

Fama defines the market efficiency hypothesis as a "(…) simple statement that security prices fully reflect all available information." Investors are rational, and they use the available information to value stocks as the present value of all future cash flows. However, all investors might not be rational, but that does not necessarily mean the theory will not hold as smart investors will take advantage of the less rational investors exploiting arbitrage.

There are three forms of market efficiency, according to Fama, and these will be defined in the following.

Weak form

Weak form efficiency implies that all information from historic data is reflected in the price. Thus, all future movement in the stock price will be random as one does not know when future information will occur. One is not able to predict any movement in the stock price whatsoever, and changes in future prices is simple decided by «random walk».

Semi-strong form

Semi-strong form market efficiency tests whether current prices «fully reflect» all publicly available information (Fama, 1969). The historical data is implemented in the price, weak form efficiency, in addition to all public information. Such information can for example be financial statement or quarterly reports that have impact on the value of a company. As soon as such information is publicly available it immediately will be reflected in the stock price. Only those with access to information publicly unavailable to the market will be able to make excess return compared to the market.

Strong form

The last form for market efficiency is strong form efficiency, a model which is very theoretical and not an exact description of reality (Fama, 1969). It implies that no investor has a higher chance of making excess return than others because of monopolistic information.

Our thesis will focus on breaches on the semi-strong form of market efficiency. We will look at effects in the days leading up to the interest change and a few days after to see if the information is, indeed, known to the market sooner than the time of the event.

Methodological approach

What is an event study?

An event study is used when one want to explore what effect an economic event has on the market. The economic event can basically be everything that happens in a market which may or may not affect the value of a firm, from interest and exchange rate changes, to news announcement and mergers and acquisitions. The event can be in or outside the control of the companies involved in the study. When one has researched economic theory and found reasons why this event may affect your firm, event studies are a tool to test and analyse if your hypothesis is in fact a reality (MacKinlay, 1997).

This methodology for event studies is built on three crucial assumptions that have to be taken into consideration when analysing the results. The first assumption says that there cannot be any overlap in calendar time between the event windows of the included securities. Second, the methodology assumes an efficient and rational market where the event will be reflected in the stock price. The last assumption states that the event cannot be expected, which means that the event is seen as a shock in the market (MacKinlay, 1997).

Central in an event study is to find out to which degree the event in question is affecting the security to move away from its "normal" return level. To analyse this, a measurement of abnormal stock returns is needed. By applying historical stock prices in the time prior to the event to compare stock price changes during the event, one can create a model for finding abnormal return, which can indicate the effect of the event. How to define and calculate abnormal return is a complicated matter which we will present later in the thesis. We have developed our models according to the procedures presented in the articles of (MacKinlay, 1997) and (Kothari & Warner, 2006).

Definition of the event

The first thing to do in the event study is to define what event we are looking into. In our case, as mentioned before, we want to look at what effect interest rate changes set by the central banks have on the stock prices of export related companies. This could for example be how an interest rate change done by Norges Bank will affect the stock price of companies

like Marine Harvest and Hydro. The economic theory behind our reasoning for why we think an interest change can have a significant effect on export related stock prices are presented in the theory part of this thesis.

Before starting the analysis we have to decide how frequent observation data we are going to use. As stated in MacKinlay's (1997) article we can increase the strength of the analysis by increasing the frequency of observations used. We have therefore decided to use daily data to increase the validity of our analysis.

The event window

The next step in the event study is to decide and define the event window we want to use in our model. This means deciding estimation window, event day, event window and post-window.

Here are terms for defining time in the methodology

τ	Index for time
$\tau = 0$	Event
$T_0 + 1 \leq \tau \leq T_1$	Estimation window
$T_1 + 1 \leq \tau \leq T_2$	Event window
$T_2 + 1 \leq \tau \leq T_3$	Post- event window
$L_1 = T_1 - T_0$	Length of estimation window
$L_2 = T_2 - T_1$	Length of event window
$L_3 = T_3 - T_2$	Length of post-event window
AR_{it}	Abnormal returns for days in event window.

$$\tau = T_1 + 1, T_1 + 2, \ldots, T_2 \text{ and events } i = 1, 2, \ldots, N$$

When we have defined these terms, we can use them to present the event window we have chosen for our analysis.
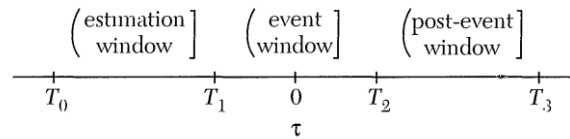
Figure 1. Time line for an event study.

Figure 3: Time line for an event study (MacKinlay, 1997)

The event

The identification of the event is a key step in relation to an event study. This is the platform from which the analysis is built upon. It is important to be as accurate as possible when identifying when the new information is known in the market, as it is *how* the event is reflected in the market that is interesting. If not, it can lead to misleading results and conclusions. Even though we assume an efficient market, delays can occur before the market becomes aware of the incident and that one may not be able to observe any reaction straight after the event. In other cases, the information might be available to the market at an earlier time than expected, due to e.g. information leakage or good predictive skills.

In our thesis, we have used the day where the interest change is implemented as the event date. However, there is uncertainty whether this is the actual time when the information is known in the market. There could be consensus in the market that the interest change was likely and that the market already adjusted to the new information (the interest rate change) at the event date. We still think that this is a good approximation as the event date.

Event window

An event window consists of the event day in addition to a number of days before and after the event. This is the window where we analyse whether there exists some form of abnormal returns in relation to the event. In general, a shorter event window leads to increased statistically reliability, assuming that the abnormal return is concentrated in the event window (Kothari & Warner, 2006). There is a balance as we want to capture all the effects of the event and at the same time making the window as small as possible.

Our event window consists of 11 days. This includes five days before and after the event date, in addition to the event day. We think that most of the potential effects are included using this approach, without losing any statistical significance.

Estimation window

To be able to create a model that can calculate the expected return for the securities in our study, we need to define an estimation window. By deciding a period of time of actual "normal" returns, we can create the parameters needed in the market model to measure expected returns. When deciding estimation window it is very important that the estimation window does not overlap with the event window because we do not want the expected return to be influenced by the event.

When deciding on estimation window we have to value the importance of economic relevance against the value of statistical significance. A shorter estimation window will increase the economic relevance of the observations in the estimation. On the other hand, a longer estimation window will increase the statistical significance of the observations due to the fact that the extra variance from the estimation errors is reduced with an increased number of observations.

We chose an estimation window in the time period prior to the event window as that is the most common approach in event studies (MacKinlay, 1997). We have chosen an estimation window of 250 days. This should be a sufficient period of time to reduce the variance in the error term. With an estimation period of this size, a company's variance is a good estimation of its true variance.

Estimation Procedure

In an event study, the central data to measure and collect is the abnormal returns from the stocks. To calculate what the abnormal return of stocks is, we first need to decide how we are going to calculate the normal (expected) return. As mentioned earlier, abnormal return is the difference between normal return and actual registered return, which means that we can define abnormal return for stock *i* in time *t* like the equation below.

$$e_{it} = R_{it} - K_{it} \hspace{4cm} \text{Equation (1)}$$

Where e_{it} , R_{it} and K_{it} is abnormal, measured and normal returns (Kothari & Warner, 2006). MacKinlay (1997) suggests different models for calculating normal returns for a given security. He separates the models into two different groups, the economic models and the statistical models. In the statistical group two different models are mentioned; constant mean return model and the market model. These models do not depend on any economic arguments, but are based on statistical assumption concerning the behaviour of asset return (MacKinlay, 1997). These models assume a constant linear relationship between return on a security and the return on the market. Further, they also assume that the return of both the market and the securities are normally distributed, independent and identically distributed through time (MacKinlay, 1997). The constant mean return model is the simplest to implement of the two, but it also have some weaknesses compared to the market model. The market model may be seen as an improvement of the constant mean return model because it removes the portion of the return that is related to the markets return variations. This in turn means that the variance of the abnormal returns is reduced. By reducing the variance there is an increased possibility to detect event effects.

When it comes to the economic models the two most used are the Capital Asset Pricing model (CAPM) and Arbitrage Pricing Theory (APT). These models are supposed to reflect the market based on economic theory, and may increase the structure of the model as it provides more constrained normal return models. The CAPM was used a lot in event studies before 1970's, but the use have almost ceased because the validity of the restriction posed by CAPM on the market is questionable, and by using the market model instead one can avoid these problems (MacKinlay, 1997).

Picking a model comes down to the balance between the benefits one gains by implementing more structure into the models, contra the statistical "correctness" of the model. We have decided to use the market model to estimate expected return as it seems like the most robust model.

Estimation of the market model

We can define the equation for the market model for each security like this:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \hspace{4cm} \text{Equation (2)}$$

$$E(\varepsilon_{it} = 0) \qquad var(\varepsilon_{it}) = \sigma_{\varepsilon_i}^2 \qquad\qquad\qquad \text{Equation (3)}$$

where ε_{it} is the zero mean disturbance term, with the expected value of zero. R_{it} and R_{mt} are the time t returns on portfolio i and market m, respectively. The term β_i measures the sensitivity of security i relative to the market portfolio, and α_i is the constant term. In our thesis we have used various sector indices as a substitute to the market portfolio.

In our analysis we are using ordinary least square method (OLS) for each company in the estimation window to estimate the parameters of the market model. Under the assumptions mentioned earlier the best linear unbiased estimator (BLUE) is given by the ordinary least squares estimator. The parameters for security i can be estimated as shown in the equations below.

$$\hat{\beta}_i = \frac{\sum_{t=T_0+1}^{T_1}(R_{it}-\hat{\mu}_i)(R_{mt}-\hat{\mu}_m)}{\sum_{t=T_0+1}^{T_1}(R_{mt}-\hat{\mu}_m)^2} \qquad\qquad \text{Equation (4)}$$

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\beta}_i\hat{\mu}_m \qquad\qquad\qquad \text{Equation (5)}$$

$$\hat{\sigma}_{ei}^2 = \frac{1}{L_1-2}\sum_{t=T_0+1}^{T_1}\left(R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt}\right)^2 \qquad\qquad \text{Equation (6)}$$

$$\hat{\mu}_i = \frac{1}{L_1}\sum_{t=T_0+1}^{T_1} R_{it} \qquad\qquad\qquad \text{Equation (7)}$$

$$\hat{\mu}_m = \frac{1}{L_1}\sum_{t=T_0+1}^{T_1} R_{mt}. \qquad\qquad\qquad \text{Equation (8)}$$

Normal return and *abnormal* return (AR)

Now that we have a method for finding the normal return, we can begin measuring and analysing the abnormal returns. We can find the abnormal return for security i by subtracting the normal return from the measured actual return at time $t = T_0 + 1, T_0 + 2, \dots, T_2$.

Abnormal return (AR) is the disturbance term one calculates *Out of Sample:*

$$AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt} \qquad\qquad\qquad \text{Equation (9)}$$

Under the null hypothesis, restricted by market return in the event window, the abnormal return is normally distributed, with a zero conditional mean and conditional variance similar to the one presented in equation (10) below. From the equation we see that the conditional variance consists of two components. The first component comes from the variance in the error term from equation (3), and the second component is additional variance due to estimation errors of α_i and β_i. As we can see, the second term moves towards zero as the number of observations in the estimation window, L_1, increases. This means that we can choose an estimation window that is large enough for it to reasonable to assume that the contribution of the second term to the total variance in abnormal return is zero.

$$\sigma^2(AR_{it}) = \sigma_{ei}^2 + \frac{1}{L_1} * \left[1 + \frac{(R_{mt} - \hat{\mu}_m)^2}{\hat{\sigma}_m^2}\right] \quad \underset{L_1 \to \infty}{\Longrightarrow} \quad \sigma^2(AR_{it}) \approx \sigma_{ei}^2 \qquad \text{Equation (10)}$$

The distribution of the abnormal return, given the null hypothesis of zero interference on neither the mean nor the variance, will be approximately equal to the distribution of equation (11). Assuming this, we can examine if there are any violations on this distribution based on the aggregate abnormal returns in the event window.

$$AR_{it} \sim N\big(0, \sigma^2(AR_{it})\big) \qquad\qquad \text{Equation (11)}$$

Aggregated abnormal return (AAR)

In order to be able to test the sample and enable overall inference for the event of interest, we have to aggregate the abnormal returns. The aggregation is calculated through both the time dimension and across the stocks in the sample. It is crucial that an event study goes over several time periods in order to apply the concept of cumulative abnormal return (CAR). The cumulated abnormal return, from period τ_1 to τ_2, where $T_1 < \tau_1 \leq \tau_2 \leq T_2$, is defined as the sum of the included abnormal return.

$$CAR_i(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{i\tau} \qquad\qquad \text{Equation (12)}$$

The variance of CAR, given in equation (13) below, is true if the assumption made in equation (10) holds. However, if we have small values of L_1, so that the second term in

equation (8) cannot be neglected, we have to adjust the variance for the effect of estimation errors in the model.

$$\sigma_i^2(\tau_1, \tau_2) = (\tau_1 - \tau_2 + 1)\sigma_{\varepsilon_i}^2 \qquad\qquad \text{Equation (13)}$$

Under the null hypothesis, the distribution of the cumulative abnormal return is as shown in equation (14).

$$CAR_i(\tau_1, \tau_2) \sim N(0, \sigma_i^2(\tau_1, \tau_2)) \qquad\qquad \text{Equation (14)}$$

With this distribution of AR and CAR in Equation (11) and (14) respectively, we are now able to test the null hypothesis for a sample. As we have to aggregate the abnormal return observations, it is assumed that there is not any form for clustering in the data. In brief, clustering is present if there is any form for overlap in the event window of the securities. This will be explained thoroughly later in the thesis.

However, for now we will assume that the returns are independent, so that we can aggregate the abnormal return, $AR_{i\tau}$, from equation (9) for every period $\tau = T_1 + 1, \dots, T_2$. With N events, the sample's average abnormal returns for period τ are given in equation (15).

$$\overline{AR}_\tau = \frac{1}{N}\sum_{i=1}^{N} AR_{i\tau} \qquad\qquad \text{Equation (15)}$$

The variance, assuming a large number of observations L_1, is

$$var(\overline{AR}_\tau) = \frac{1}{N^2}\sum_{i=1}^{N} \sigma_{\varepsilon_i}^2 \qquad\qquad \text{Equation (16)}$$

These estimates presented above can be used to analyze the abnormal returns for any event period. Using the same approach as we did to find the cumulative aggregated return for each security earlier, we can now find the average abnormal return aggregated over the event window. Thus, for any interval we have,

$$\overline{CAR}(\tau_1, \tau_2) = \sum_{\tau=\tau_1}^{\tau_2} \overline{AR}_\tau \qquad\qquad \text{Equation (17)}$$

And the variance presented in equation (18),

$$var\left(\overline{CAR}(\tau_1, \tau_2)\right) = \sum_{\tau=\tau_1}^{\tau_2} var(\overline{AR}_\tau) \qquad\qquad \text{Equation (18)}$$

Alternatively, one can find the CAR for each security and aggregate through time, as shown in Equation (19) and (20).

$$\overline{CAR}(\tau_1, \tau_2) = \frac{1}{N} \sum_{i=1}^{N} CAR_i(\tau_1, \tau_2)$$ Equation (19)

$$var\left(\overline{CAR}(\tau_1, \tau_2)\right) = \frac{1}{N^2} \sum_{i=1}^{N} \sigma_i^2(\tau_1, \tau_2)$$ Equation (20)

Test procedures

We have decided to use a two sided t-test to test out the null hypothesis that the abnormal return is significantly different to zero. We assume that;

$$\overline{CAR}(\tau_1, \tau_2) \sim N\left[0, var\left(\overline{CAR}(\tau_1, \tau_2)\right)\right]$$ Equation (21)

Again, because of the same reason as described earlier, we use the $\sigma_{\varepsilon_i}^2$ from the market model as an estimate of the true variance of the abnormal returns. Then, we can use the test observer presented in equation (22) to test the null hypothesis. The test assumes zero correlation between the abnormal returns, which is underestimated with the presence of *clustering.* The problem could lead to that we reject the null too often and inaccurate inference. However, this will be discussed later in the thesis.

$$\theta_i = \frac{\overline{CAR}(\tau_1, \tau_2)}{\sqrt{var\left(\overline{CAR}(\tau_1, \tau_2)\right)}}$$ Equation (22)

$$cov\left(AR_{it}, AR_{jt}\right) = 0, i \neq j$$ Equation (23)

When we perform the tests, we will use t-values to evaluate the validity of the results.

T-test for two independent samples

In order to compare whether there is a significant difference between two samples, one can use a *t*-test for two independent samples. This is done by comparing the average expected value of the samples.

The *t*-statistic is calculated as presented in equation (24) below. The standard error of the difference can be estimated by using Equation (25), where S_{X_i} is the standard error of the respective sample. By capitalizing on this, we are able to compare samples of different sizes.

The number of degrees of freedom is calculated by subtraction *one* from every sample's population size, n_i, according to equation (26).

$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{S_{x_1 x_2}\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$$ Equation (24)

$$S_{x_1 x_2} = \sqrt{\frac{(n_1-1)S_{x_1}^2+(n_2-1)S_{x_2}^2}{n_1+n_2-2}}$$ Equation (25)

$$Df = (N_1 + N_2 - 2)$$ Equation (26)

This test can be used to perform hypotheses tests where:

H_0: There is no significant difference between the samples.

H_1: There is significant difference.

The corresponding t-value to the test will then tell us if we can accept H_0.

The power of the study

In order to get an estimate for how well we can trust the results we obtain, we will use the figure below by MacKinlay (1997) to discuss the validity of our tests. It shows how the power of the analysis is affected by the number of stocks and the size of the abnormal return we observe.
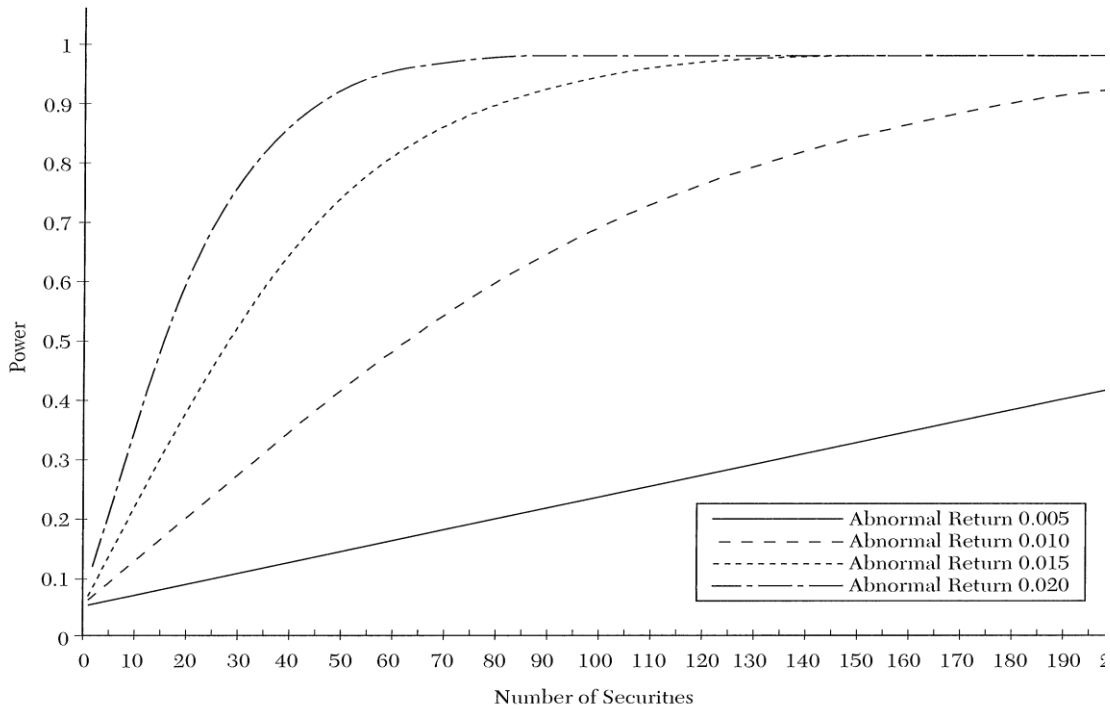
Figure 3b. Power of event study test statistic θ_1 to reject the null hypothesis that the abnormal return is zero, when the square root of the average variance of the abnormal return across firms is 4 percent.

Figure 4: Power of event study

The graph shows the combinations of securities and the power of the test statistic, θ_i, for different levels of abnormal returns, in order to obtain statistically robust data. This means that one should be careful not to draw any firm conclusions at low, abnormal returns, and that we should be aware of the fact that a large number of stocks are necessary to strengthen the validity further.

Clustering

Clustering is a bias, a method error, which is very common in event studies. So far we have assumed that the event windows of the securities included in our report does not overlap in time when it comes to analysing aggregate abnormal returns. The most common form of clustering can be found when looking into securities reaction to events made by external factors which affect the securities in the market simultaneously. Clustering may also occur if the sample is chosen from the same time period. Clustering cannot be ignored because it may cause our results to be misinterpreted and show wrong test results (Bernard V. L., 1987).

In our analysis, the central bank will be an external factor which will likely affect all the stocks in a country at the same time, thus could be a cause of clustering. This means that one of the assumption of our preferred event study methodology is not satisfied since there may exist dependence in the error terms. This can create problems in our report because the error term does not take into account co-variation and may underestimate the true variance, thus may clustering cause the null hypothesis to be rejected too often. Knowing this one have to be careful interpreting the result from the analysis because it is an imminent danger one may end up with a wrong conclusion (Bernard & Jensen, 1997).

To get the most reliable results, we want to reduce clustering as much as possible. In Bernard's article he suggests some measures that can be taken to reduce the impact of clustering. Some of the things he suggests are to increase frequency of the observations or include more industries into the analysis. Our use of daily observation will not decrease the problem because every stock in the market will be affected simultaneously by an interest rate change from the central bank. Since we are only analysing Norwegian companies, adding companies from other countries is not really an option. As a result we have to be very careful about clustering in our analysis, since the only possible way to reduce it is by adding more industries.

As we have presented earlier in our report, we are including exporting companies from several different industries. We think that this may slightly reduce the clustering effect in our dataset. The interest rates will still affect all stocks at the same time and may thus lead to clustering.

Panel data regression

Panel data is used when you want to do a regression on a dataset that contains data observations of individuals (entities) where these entities are observed in more than one point in time. Using panel data instead of regular ordinary least square regression have the main advantages that we can control for factors that are constant over time, which in our thesis would be very beneficial as the very important potential explanatory variable "export or not" would not vary over time (Stock & Watson, 2012).

Fixed effect method

Fixed effect transformation is a method to control for unobserved effects, a_i. The method removes the unobserved effect before estimation by using transformation, but also time-constant variables will be removed in the process (Wooldridge, 2008).The idea behind this is to eliminate the possibility of correlation between a_i and an explanatory variable. We can define the equation for the fixed effect method like this:

$$Y_{it} = B_1 X_{1,it} + \ldots + B_k X_{k,it} + a_i + u_{it}$$

Where i = 1,......n ; t=1.......T and $X_{1,it}$ is the value of the first explanatory variable for entity *i* in time period *t*, and so on. If we want to include dummy variables, the fixed effect regression model can be identified like this:

$$Y_{it} = B_0 + B_1 X_{1,it} + \ldots + B_k X_{k,it} + y_2 D2_i + y_3 D3_i + u_{it}$$

The fixed effect method has n-1 binary variables to avoid the dummy variable trap (Stock & Watson, 2012).

Random effect method

Random effect regression method is a panel data model which controls for the unobserved individual specific effects, a_i, yet still allows us to estimate the effect of time constant explanatory variables (Wooldridge, 2008). We can define the equation for the random effect method like this:

$$Y_{it} = B_1 X_{1,it} + \ldots + B_k X_{k,it} + a_i + u_{it}$$

The random effect model differ from fixed effect method by assuming that the explanatory variables are uncorrelated with the unobserved individual specific effects a_i, and will in turn return biased results if correlation do exist (Wooldridge, 2008).

Hausman test

To test if there are significant differences between any of the coefficients in the fixed effect and the random effect models, we use a Hausman test. The test is testing if both methods, fixed effect and random effect, give consistent results when used on a dataset. It is testing this by checking if the error term is uncorrelated with the regressors of the model, H_0. Since random effect assumes that there exist no correlations problems, a rejection of the null hypothesis means that some correlation problems do exist, and the random effect estimators will be inconsistent, while the fixed effects estimators will be unaffected. This result will be reflected in the difference between the estimates of the coefficients using the two different methods. A significant difference results in a large Hausman statistic. Since we would like our estimators to be consistent, we should rely on the estimators from the fixed effects when the null hypothesis is rejected (Fløgstad, Olsen, & Skyrud, 2012). When it is not rejected both models are OK, but random effect is often preferred as it consumes less degrees of freedom and is therefore more effective (Nilsen, 2012).

Data sample

In this part, we will present the data sample we have used in the thesis. We have retrieved all data through the database service called Thomas Reuters' Datastream. We have used a 10 year period, from November 1. 2003 to November 1. 2013. In the following we will present our chosen companies and the criteria we looked at for choosing them.

Sectors

We have included firms from a total of four different sectors on Oslo Stock Exchange, where we have chosen stocks with a large share of export and stocks with a low export share. In the following part, we will describe the sectors we have chosen.

Consumer Staples

The consumer staples sector on Oslo Stock Exchange mainly consists of seafood companies, an industry which is a big part of the Norwegian economy. The government's goal is to "develop Norway as the world's leading seafood nation" (Regjeringen, 2013). In addition, almost everything is sold abroad. In fact, according to Menon Business Economics, 95 % of all seafood produced in Norway is exported (Menon Business Economics, 2013).

The industry is exposed to risks in a number of areas, one of which is changes in interest and exchange rates (Grieg Seafood, 2012). Even though the companies in question in this industry aim to hedge the exchange rate risk as far as possible, they are not able to eliminate all the risk, according to annual reports of the companies we looked at in the seafood industry. The industry is thus one that we think is affected by interest rate fluctuations.

After going through the different companies within the seafood industry listed at Oslo Stock Exchange, we came up with a sample of seven stocks we want to include in our analysis.

Stocks in the Consumer Staples sector		
Company	**Ticker**	**Classification**
Lerøy Seafood Group	LSG	Exporter
Marine Harvest	MHG	Exporter
Austevoll Seafood	AUSS	Exporter
Grieg Seafood	GSF	Exporter
Havfisk	HFISK	Non-exporter
Orkla	ORK	Non-exporter
Cermaq	CEQ	Non-exporter

Table 1: Stocks in the Consumer Staples sector

We chose to look at Lerøy Seafood Group, Grieg Seafood, Austevoll Seafood, and Marine Harvest as exporters. These are big companies within the industry and also big exporters. From their annual reports we retrieved information to classify them as exporters (see appendix). Orkla, Cermaq and Havfisk, on the other hand, are classified as non-exporters. These companies do not export to the same degree and/or do not operate from the Norwegian shelf and therefore not affected to the same degree by exchange rate fluctuations on the Norwegian krone.

Information Technology

The information technology sector on Oslo Stock Exchange includes technology, software and services, information technology consulting, in addition to technology hardware and equipment (OSE45 Information Technology, 2013).

Having looked into the different companies listed on the OSE 45 Information Technology index, we found quite varying data in regards to their degree of export. For example, Eltek, a global leader in telecom power, has 97 % of their sales revenue come from abroad (Eltek, 2005-2012). On the other end of the scale, Bouvet, an IT consultant firm, only has 3 % of their operating income from abroad (Bouvet, 2005-2012).

There is also risk involved in the IT industry, first and foremost in regards to the market development. Exchange rate fluctuation will be more of a risk to those with a large share of sales in a foreign currency.

Stocks in the Information Technology sector

Company	Ticker	Classification
Eltek	ELT	Exporter
PSI Group	PSI	Exporter
Atea	ATEA	Exporter
Evry	EVRY	Non-exporter
Bouvet	BOUVET	Non-exporter
Itera	ITE	Non-exporter

Table 2: Stocks in the Information Technology sector

Industrials

The industrial sector on Oslo Stock Exchange includes companies within businesses such as manufacturing and distribution of capital goods, provision of commercial services and of transportation services (OSE20 Industrials, 2013).

Stocks in the Industrials sector

Company	Ticker	Classification
Tomra Systems	TOM	Exporter
Norwegian Air Shuttle	NAS	Exporter
Kongsberg Gruppen	KOG	Exporter
Repant	REPANT	Exporter
TTS Group	TTS	Non-exporter
AKVA Group	AKVA	Non-exporter
Tide	TIDE	Non-exporter
Infratek	INFRA	Non-exporter

Table 3: Stocks in the Industrials sector

The sample from the industrials sector includes large, international companies such as Norwegian Air Shuttle and Kongsberg Gruppen, which we classified as exporters, and we also find more domestic companies with no or little export.

Materials

The OSE15 materials sector encompasses a broad variety of commodity-related manufacturing industries, including construction materials, glass, paper and forest products (OSE15, 2013).

Stocks in the Information Technology sector		
Company	**Ticker**	**Classification**
Norske Skog	NSG	Exporter
Scana Industrier	SCI	Exporter
Hydro	NHY	Exporter
IGE Resources	IGE	Non-exporter
Byggma	BMA	Non-exporter
Yara	YAR	Non-exporter

Table 4: Stock in the Materials sector

Some of the largest companies listed on Oslo Stock Exchange, Hydro and Yara, are listed on the materials sector index. We included six stocks, three exports and three non-exporters.

Empirical results

In the following part we will present the results of the analysis we performed. We have tried to link together the analysis against the presented theory in part 1.

First, we will describe the results on an overall aggregated level for the entire event study. We then want to examine the results on a more sector specific level. Further, as we have categorised the companies as export or non-export, we have analysed the impact interest rate changes have on each category.

As we have described earlier, clustering could not only have an effect on the estimation of the standard deviation, but also on the estimation of the average abnormal return (AAR) and the cumulative average abnormal return (CAAR), respectively. This could have an effect on the interpretation of the results, and we have therefore chosen to treat even clearly significant observation with caution.

The way we present our results is as follows; we will quote the values from our analysis in the tables beneath. We have presented an overview of the day specific abnormal returns for the sector, which is divided into three categories; export, non-export and the whole sector. This categorization within the different sectors is described in the section about data sample where tables show the stocks in the sectors in question. We added the category called *sector* to verify that our samples is representative for each of their associated sectors. This category contains the summed average abnormal returns from every stock in the sample for each respective sector. If the sector category would show significant returns, we would know that our sample not would be representative for the sector.

The results have different levels of significance due to different *t-values.* For each observation we have conducted a *t test* and we have used (*) as notation to describe the significance level. The level of significance we have used is shown in the table below with the notation to each level of significance.

	Level of confidence		
	Not significant	90% confidence level	95% confidence level	99% confidence level
Indicator		*	**	***

Overall level – all stocks

The first thing we did was to compute all the observation together in one pool and look at the results that would give us. The pool consists of all the observations from each day from every sector. For example, CAAR at *t=5* for export will be the average CAAR at *t=5* of every exporting firm in the dataset. As it contains four different sectors it is pretty well diversified. Further, we have also divided the sample into export and non-export stocks and we will thus be able to explore whether there is a trend present when interest rate changes are occurring. The overall findings are listed in the tables below; the first one is for interest increases and the second one looks at interest decreases.

ALL SECTORS INTEREST INCREASE						
	AAR			CAAR		
T	Pooled	Export	Non-export	Pooled	Export	Non-export
5	0.12 %	0.25 %	(0.07 %)	(0.57 %)	(0.09 %)	(1.05 %)
4	(0.25 %)	(0.49 %)	0.09 %	(0.69 %)	(0.34 %)	(0.98 %)
3	0.12 %	0.17 %	0.15 %	(0.44 %)	0.15 %	(1.07 %)
2	(0.01 %)	0.19 %	(0.24 %)	(0.57 %)	(0.02 %)	(1.22 %)
1	(0.32 %)	(0.20 %)	(0.50 %)	(0.56 %)	(0.21 %)	(0.99 %)
0	(0.13 %)	(0.13 %)	(0.24 %)	(0.23 %)	(0.01 %)	(0.49 %)
-1	(0.03 %)	(0.15 %)	0.18 %	(0.10 %)	0.12 %	(0.25 %)
.2	0.04 %	0.07 %	(0.04 %)	(0.07 %)	0.27 %	(0.43 %)
-3	(0.24 %)	(0.08 %)	(0.40 %)	(0.11 %)	0.19 %	(0.39 %)
-4	0.07 %	0.25 %	(0.04 %)	0.12 %	0.27 %	0.01 %
-5	0.05 %	0.02 %	0.05 %	0.05 %	0.02 %	0.05 %

Table 5: All sectors - interest increase

As we can observe in the table above, there are no significant observations, not even on a 10 % level. Since there are no significant results, the test is not very informative. We can though see that a major part of the observations are negative in the interest increase table. The effect is clearer for non-export stocks, as they in general have larger negative returns.

ALL SECTORS INTEREST DECREASE						
	AAR			CAAR		
T	Pooled	Export	Non-export	Pooled	Export	Non-export
5	(0.07 %)	(0.38 %)	0.15 %	1.28 %	2.82 %	(0.05 %)
4	0.15 %	0.07 %	0.30 %	1.35 %	3.20 %	(0.20 %)
3	0.07 %	(0.40 %)	0.58 %	1.20 %	3.13 %	(0.50 %)

2	0.06 %	0.40 %	(0.34 %)	1.14 %	3.53 %	(1.09 %)
1	0.23 %	0.37 %	0.20 %	1.08 %	3.12 %	(0.75 %)
0	(0.11 %)	0.31 %	(0.46 %)	0.85 %	2.75 %	(0.95 %)
-1	0.40 %	0.40 %	0.51 %	0.96 %	2.44 %	(0.49 %)
.2	0.00 %	0.09 %	(0.01 %)	0.56 %	2.04 %	(1.00 %)
-3	0.05 %	0.14 %	(0.29 %)	0.56 %	1.95 %	(0.99 %)
-4	0.68 %	1.24 %	0.14 %	0.50 %	1.82 %	(0.70 %)
-5	(0.18 %)	0.58 %	(0.84 %)	(0.18 %)	0.58 %	(0.84 %)

Table 6: All sectors - interest decrease

For interest decrease we find an opposite trend, which is what we would expect. We find a majority of positive observations, though none that are significant. We observe some minor trends from the two tables; however, we cannot draw any conclusions on the base of insignificant results.

These trends are according to what we would expect. As we have argued in the theory part, an interest decrease would be favourable for export stocks and this seems to be the case. We think these results indicate that an interest decrease is more an advantage to exporters than non-exporters.

Interest rate reduction

When we look at the two categories, exporters and non-exporters, we look at the performance over the course of the event window for the two. When the interest rate falls, exporters seem to perform better than non-exporters.

As the graph shows, the performance of exporters is better than non-exporters all the way through the event window. It is steadily rising and reaches its peak two days after the announcement before it falls a little towards the end of the event window. The returns are not significant, but there is a clear trend indicating that exporters do well when the interest falls.

The non-exporters seem to do worse. As the green graph shows, their cumulated average abnormal return is negative through the whole event window. The line is moving a bit up and down, which means the returns go from positive to negative between every day. As we

can see from the table, none of the returns are significant for non-exporting stocks either, which means that we cannot draw any firm conclusion.
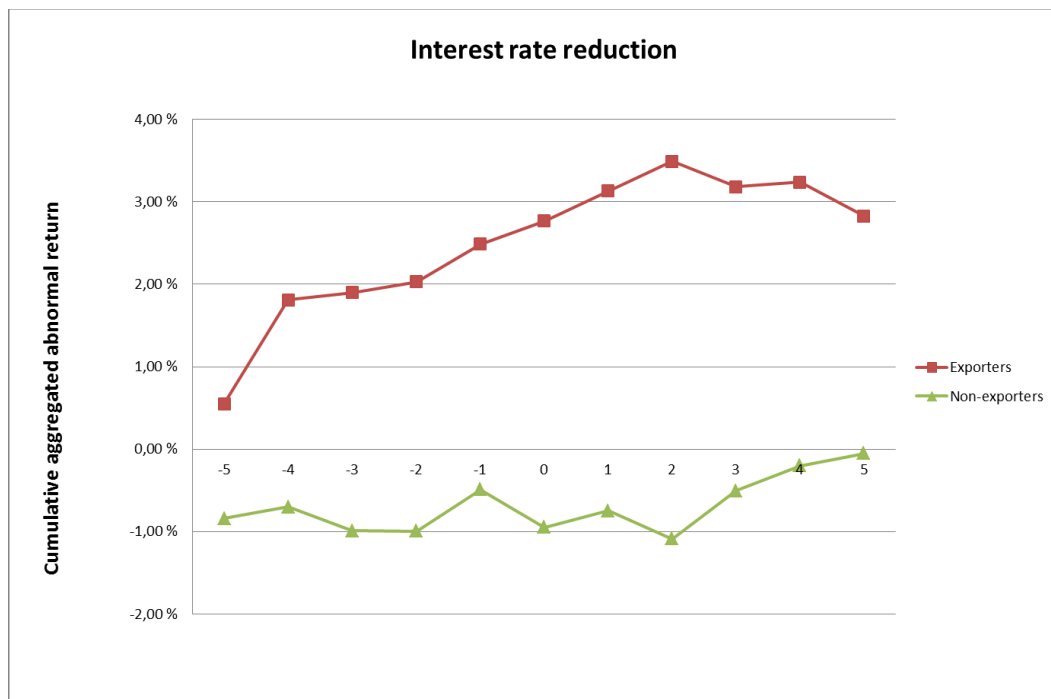
Figure 5: Interest rate reduction for exporters and non-exporters

Interest rate increase

The graph below shows how the firms react to interest rate increases. We observe that non-exporters perform worse than exporters. The green line decreases all through the event window, with the exception of a little upswing the last couple of days. Cumulated over the event window, non-exporters fall 1.05 %. However, there are not any significant results, so we cannot draw any certain conclusions from it.
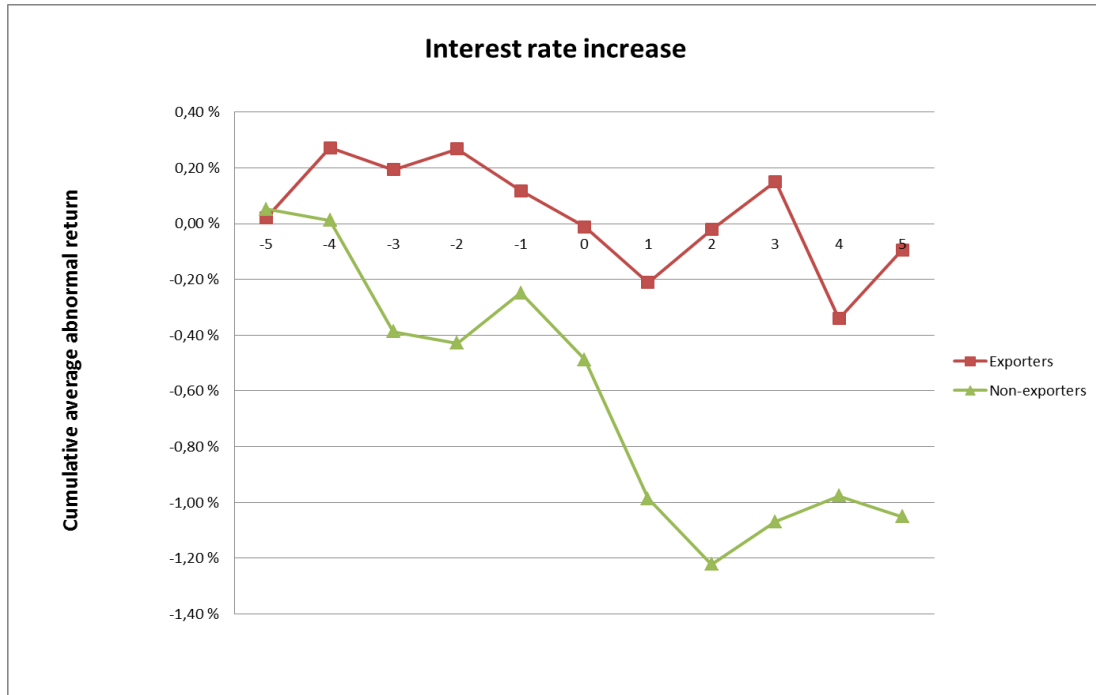
Figure 6: Interest rate increase

Test for difference between export and non-export stocks

Finally, we want to compare the results we observe for exporting and non-exporting firms against each other and see if there exists a significant difference in how their stocks behave after an interest rate change. This is the central question in our thesis; whether or not stocks of exporting firms react differently to interest changes compared to stock of non-exporting firms.

Below we have presented the result of our test in two different tables. The first one for interest increase and the second one for interest decrease.

T-test for two independent samples – Interest increase			
Parameter	Exporters	Non-exporters	Difference
CAAR	(0.09 %)	(1.05 %)	0.96 %
STD	0.0271	0.0222	0.0248
T-test	(0.03)	(0.47)	1.22
N	20	20	

Table 7: t-test, exporters against non-exporters, interest increase

From the tables we cannot observe any significant difference in stock behaviour between export and non-export stocks after an interest increase. This is contradicting to the theory we have presented earlier as we would expect that export firms would be more sensitive to interest changes, and thus suffer more after an interest increase.

T-test for two independent samples – Interest decrease			
Parameter	Exporters	Non-exporters	Difference
CAAR	2.83 %	(0.05 %)	2.88 %
STD	4.32 %	4.07 %	4.20 %
T-test	0.65	(0.01)	1.46
N	9	9	

Table 8: t-test, exporters against non-exporters - interest decrease

We did not find any significant results when we looked at the effect of interest reduction either, though do we observe some promising trends that could support our hypothesis.

The results we have found so far is discouraging considering our proposed hypothesis and bring us closer to a conclusion that export-reliant firms are in general not more sensitive to interest rate changes than non-export firms. In the next few sections we will look into the main issue on a lower level and test if our proposed stock behaviour is more apparent when we look at each sector separately.

OSE20 – Industrials sector

We now are going to perform the same tests as we did in the previous section, only now we look solely at the industrials sector. To create normal and abnormal returns, we use the OSE20 Industrials index instead of the market index as a benchmark.

OSE20 Industrials sector - INTEREST DECREASE						
	AAR			CAAR		
T	Sector	Export	Non-export	Sector	Export	Non-export
5	0.32%	0.09%	0.28%	4.28%	7.84%*	1.47%
4	0.58%	0.62%	0.59%	3.97%	7.75%*	1.19%
3	(0.30%)	(1.29%)	0.70%	3.38%	7.13%*	0.60%
2	0.37%	1.40%	(0.66%)	3.68%	8.42%**	(0.10%)
1	0.19%	0.41%	(0.12%)	3.31%	7.00%**	0.55%

	AAR			CAAR		
0	(0.23%)	0.10%	(0.14%)	3.12%	6.61%**	0.67%
-1	0.70%	0.77%	0.83%	3.45%	6.50%**	0.53%
.2	(0.27%)	(0.65%)	(0.46%)	2.65%	5.74%**	(0.29%)
-3	0.34%	0.45%	0.41%	2.92%	6.40%***	0.16%
-4	2.26%**	5.00%***	(0.25%)	2.58%	5.94%***	(0.25%)
-5	0.32%	0.93%	0.00%	0.32%	0.93%	(0.00%)

Table 7: Industrials sector - interest decrease

First of all we observe that there are no significant results in the sector category neither for interest cut nor for interest raise, which indicates that our sample is representative for the Industrial sector as a whole.

Second, we observe several significant results for exporting firms after an interest reduction. The trend is also very strong as all cumulative aggregate abnormal return observation shows significant results, except one, some as high as on a 99% level. We do not find the same trend in the day to day observations. This may indicate that the market are pricing in the positive effect from the interest cut over time and not just the day right after an interest rate change. It may also indicate that there exist some special circumstances that are difficult to catch up on, but could also be a sign of noise that have not been eliminated because of clustering. The results are though very robust and the test values high enough to support our proposed hypothesis.

OSE20 Industrials sector - INTEREST INCREASE						
AAR			**CAAR**			
T	Sector	Export	Non-export	Sector	Export	Non-export
5	0.22%	0.54%	0.13%	(0.32%)	0.49%	(0.46%)
4	(0.72%)	(0.98)%	(0.72%)	(0.54%)	(0.05%)	(0.59%)
3	0.54%	0.69%	0.37%	0.18%	0.93%	0.12%
2	0.37%	1.17%	(0.38%)	(0.36%)	0.25%	(0.25%)
1	(0.35%)	(0.55%)	0.03%	(0.72%)	(0.92%)	(0.14%)
0	(0.22%)	(0.34%)	(0.31%)	(0.38%)	(0.37%)	(0.10%)
-1	(0.08%)	0.09%	(0.02%)	(0.16%)	(0.03%)	(0.41%)
.2	0.29%	0.31%	0.36%	(0.09%)	(0.12%)	(0.44%)
-3	(0.17%)	(0.23%)	(0.02%)	(0.38%)	(0.43%)	(0.07%)
-4	0.19%	0.51%	(0.14%)	(0.21%)	(0.20%)	(0.09%)
-5	(0.40%)	(0.71%)	0.23%	(0.40%)	(0.71%)	(0.23%)

Table 8: Industrials sector - interest increase

As for interest rate increase we again fail to find any significant observations. In this sample we cannot see a particular trend either. The test shows positive and negative returns almost at random without any particular pattern. Again, it looks like interest rate increase does not affect stock behaviour for neither exporting nor non-exporting companies.

Looking separately at the observations for non-exporting and exporting firms, the results indicates that there might be a difference between how stocks with high export reliance reacts to interest decrease, compared to how stocks with lower export reliance reacts to the same event.

Below we have performed a test to see if there is a significant difference between exporters and non-exporters stock behaviour after and interest increase and decrease.

T-test interest reduction Exporters against non-exporters			
Parameter	Exporters	Non Exporters	Difference
CAAR	7.84 %	1.47 %	6.37%
STD	4.33%	3.41%	3.47%
T-test	1.81	0.43	3.47***
N	9	9	

Table 9: t-test for difference with interest decrease

T-test interest increase Exporters against non-exporters			
Parameter	Exporters	Non Exporters	Difference
CAAR	0.49 %	(0.46%)	0.95%
STD	4.15%	3.28%	3.74%
T-test	0.12	(0.14)	0.54
N	20	20	

Table 10: t-test for difference with interest increase

As we would expect the difference between exporting and non-exporting stock behaviour is not significant for interest rate increase. As for interest reduction, we observe that there is a significant difference between how exporters and non-exporters in the industrials sector reacts to an interest reduction.

Interest increase has little effect

As earlier mentioned, and as we can see from the tables, an interest increase by the Norwegian central bank has little to non-effect on the development of the stock prices of companies in the Industrial sector in our sample. Based on the theory we have presented

earlier in the thesis, an interest increase should lead to a negative abnormal return in the event window. This does not seem to be the case for our sample as we do not find any significant observations for interest increase.

As we can see in several of the annual reports we have looked into, a majority of the companies have hedged themselves from interest and exchange risk to reduce risk and get more consistent results. These contracts contribute to contain their revenue level stable when the currency is working against them. Despite of this we do observe a relatively large effect on stock prices as a consequence to an interest reduction which should not be the case if the firms are totally hedged against risk. If the effect of hedging would be able to diminish the negative effect of an interest increase, it should also reduce the positive effect of an interest reduction, which we do not observe happening in our results. Theory also states that it is really difficult to hedge against all risk, thus these results do seem plausible (Kvinge, 2003).

Another possible cause may be that interest rate increases are not as shocking as an interest reduction. An interest increase is often a sign that things are going well in the economy, that the economy is, or on its way to become, booming. In a booming economy the demand for the exporting companies' products are high both domestically and internationally. The price increase that may result from an interest increase may not be enough to lower demand, as actors in the economy are less price elastic when they are facing a high demand themselves (Gartner, 2009). Another reason could be that the central bank to a larger extent follows its interest rate path, and is thus more predictable, when the economy is in good shape. This is supported by the fact that the standard deviation for observations resulting from an interest increase is typically lower than for a reduction.

Finally, the industrial sector is typically export heavy in general. This in turn means that the companies in the sample are not only exposed to Norwegian interest rate levels, but also macro factors outside Norwegian control. There may be countercyclical factors working against the Norwegian monetary policy intentions, which may neutralize the possible negative effect of an interest increase.

Interest rate cuts give positive returns

We observe that interest rate cuts results in significant positive cumulative aggregated abnormal returns. This is what we would expect according to theory presented in our thesis stating that a lower interest rate should spur revenue and improve todays and future results, hence increasing stock value.

A major part of the revenue and the cost for the companies in our sample is denoted in Norwegian kroner. This means that not only the demand for their products will increase, but their cost will also be reduced as a result of a depreciating currency. Expectations of improved results in the future will increase the price investors are willing to pay for a certain stock, thus will stock price increase.

We argued in the previous section that interest reductions come more as a shock than interest increases. This effect may also explain why interest reductions seem to affect stock prices more than an increase. On the other hand, we cannot observe that the positive effect from an interest reduction does typically occur right after the interest change, but rather slowly over the whole time of the event window. It may seem like the market uses a few days to implement the whole effect of an interest reduction. It is also important to remember that these firms use substantial amount of resources on macroeconomic analysis and predictions, thus will an interest reduction rarely be a totally shocking event and can hence partly explain why we do not see the whole effect of the interest reduction right after the event day.

An interest rate reduction is the result of quite the opposite economic situation than an interest rate increase. During an economic downturn firms and other investors typically move their assets to low risk investments like bank deposits and government bonds, which hit firms with high export reliance particularly hard as they feed on demand for good investments. An interest rate cut will for many investors mark a change against more investments in the economy, which in turn will lead to higher expectations for export related firms. Combining this with the fact that the standard deviations for interest reductions are typically higher than for interest increase, it indicates that an interest

reduction comes more as a shock than an interest increase. This may be a reason why we do not see any significant results for interest rate increases, but several for reductions.
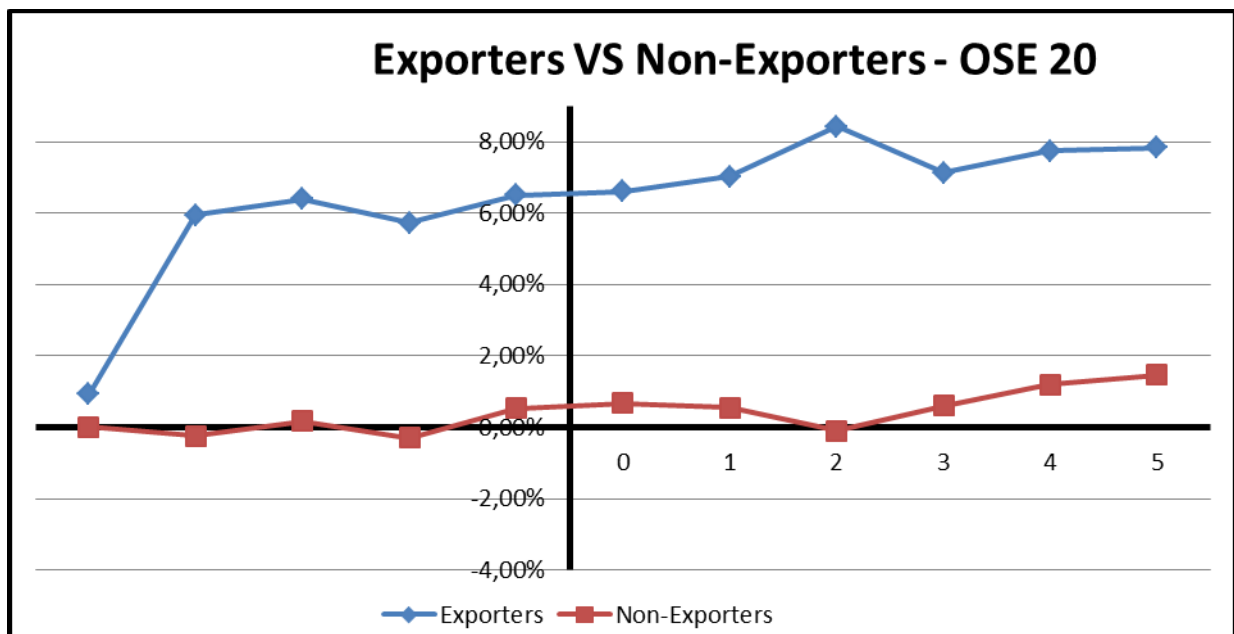
Figure 7: Exporters vs non-exporters – interest cuts in the Industrials sector

As we can see from the graph above, our test displays a relatively large difference between how exporting stocks react to an interest reduction compared to stocks with a lower share of export. The graph also shows that exporters seem to react positively to interest rate reductions. These results support our hypothesis. What is particular special about the Industrials sector at Oslo Bors is that most of the firms in our sample actually are relatively export heavy and would probably benefit from an interest reduction, but since we are comparing their return to the Industrials sector index return, companies with lower export reliance do not appear to be significantly affected by the interest reduction. This may further prove that it is not only a difference between exporting companies and zero-exporting companies, but also that the more export reliant the firm is, the more it is affected by interest rate reduction in general.

OSE30 – Consumer Staples sector

Looking into OSE30, the Consumer Staples sector, which mainly consists of seafood related companies, we do not find any significant results. There are certain trends one can extract from the results, but we have to be careful with drawing any firm conclusion when we analyse our findings here.

Interest decrease

First, if we look at the interest rate decreases, the table is listed below with the corresponding results. As mentioned, none of them are significant. However, we do observe a minor trend. For export stocks, the CAAR is positive with the exception of the first day of the event window. The non-export stocks, on the other hand, do not show such performance. They have a negative CAAR until one day after the announcement day, where it turns positive.

OSE30 Consumer Staples sector - INTEREST DECREASE					
AAR			**CAAR**		
T	Sector	Export	Non-export	Sector	Export	Non-export
5	(0.57%)	(0.88%)	(0.17%)	0.97%	1.14%	0.76%
4	0.10%	0.44%	(0.34%)	1.55%	2.01%	0.92%
3	(0.01%)	(0.67%)	0.89%	1.44%	1.57%	1.27%
2	0.23%	0.18%	0.32%	1.45%	2.25%	0.38%
1	(0.03%)	(0.28%)	0.30%	1.21%	2.07%	0.06%
0	0.06%	0.27%	(0.23%)	1.24%	2.35%	(0.24%)
-1	0.82%	0.68%	1.01%	1.19%	2.08%	(0.00%)
.2	0.47%	1.22%	(0.54%)	0.36%	1.39%	(1.01%)
-3	0.16%	0.10%	0.24%	(0.11%)	0.17%	(0.47%)
-4	0.02%	0.13%	(0.13%)	(0.26%)	0.07%	(0.72%)
-5	(0.28%)	(0.5%)	(0.58%)	(0.28%)	(0.05%)	(0.58%)

Table 11: Consumer staples sector - interest decrease

For the AAR, there is not a similar trend. If any, one can say that export companies perform well in the days leading up to the announcement day, but it is difficult to argue that there is a clear pattern. The magnitude of the returns is low, with the exception of two days prior to the announcement. However, since the results are not significant for the AAR either, there are not any clear conclusions to be drawn for the interest rate decreases in this sector. Below we present comparison of cumulative aggregated return after an interest reduction.
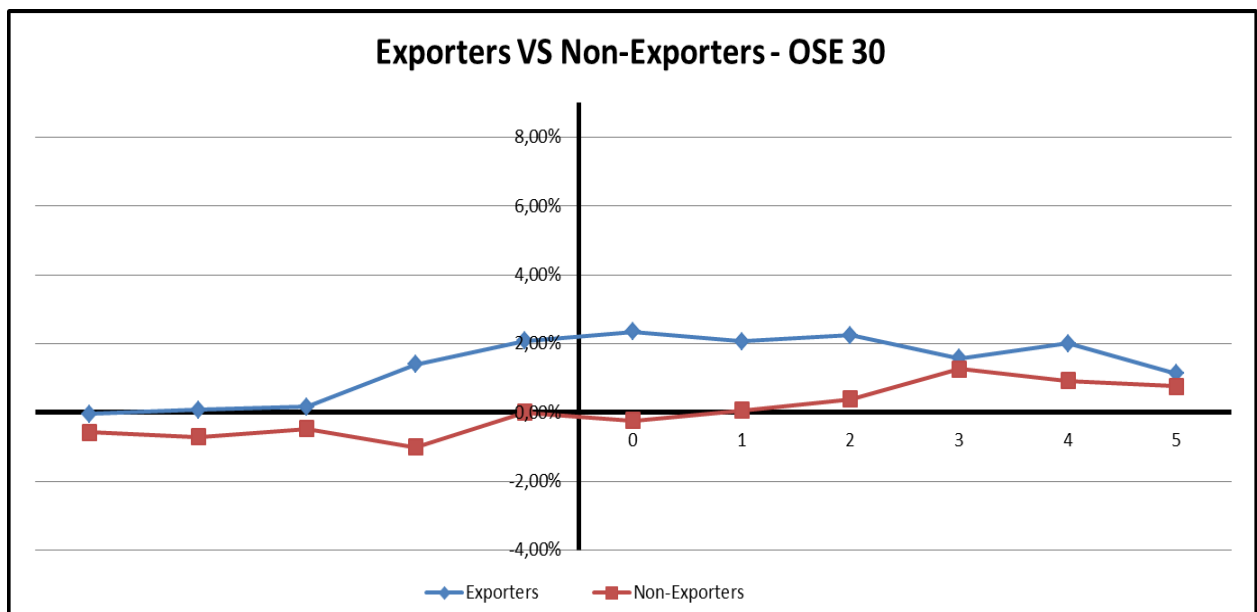
Figure 8: Exporters vs non-exporters, OSE30

Interest increase

The results of the interest increases in the consumer staples sector are listed in the table below. As it shows, there are not any significant results here either. However, like the previous discussion, we can see some patterns here too and draw some conclusion on the basis of that.

OSE30 Consumer Staples sector - INTEREST INCREASE					
	AAR			CAAR	
T	Sector	Export	Non-export	Sector	Export	Non-export
5	0.11%	0.01%	0.24%	(0.96%)	(1.00%)	(0.89%)
4	(0.35%)	(0.57%)	(0.05%)	(1.07%)	(1.02%)	(1.14%)
3	0.08%	0.17%	(0.05%)	(0.72%)	(0.45%)	(1.08%)
2	(0.43%)	(0.21%)	(0.73%)	(0.79%)	(0.62%)	(1.04%)

1	(0.15%)	(0.19%)	(0.09%)	(0.36%)	(0.40%)	(0.31%)
0	(0.11%)	0.31%	(0.68%)	(0.22%)	(2.14%)	(0.22%)
-1	(0.08%)	(0.39%)	0.03%	(0.10%)	(0.53%)	0.46%
.2	(0.08%)	(0.28%)	0.19%	(0.03%)	(0.14%)	0.12%
-3	(0.27%)	(0.43%)	(0.05%)	0.05%	(0.14%)	(0.07%)
-4	0.22%	0.49%	(0.15%)	0.32%	(0.57%)	(0.03%)
-5	0.10%	0.08%	0.12%	0.10%	(0.08%)	0.12%

Table 12: Consumer staples sector - interest increase

For the CAAR, we observe negative results for the exporters when there are interest increases. The non-exporting firms do not perform as badly, but it turns negative for them too throughout the event window. The negative results we observe for the exporters are what we would expect according to theory. On the other hand, the results we observe for non-exporters are the opposite of what we would expect. This is because we expect that the non-exporters would perform better than the sector index as, according to our hypothesis, they should be less sensitive to an interest increase compared to the sector average.

Finally we perform two tests to see if there is a significant difference between how the stocks of exporting firms behave compared to non-exporters. The results are presented below.

T-test interest reduction Exporters VS non-exporters			
Parameter	Exporters	Non Exporters	Difference
CAAR	1.34 %	0.76%	0.38%
STD	3.45%	3.60%	3.53%
T-test	0.33	0.21	0.23
N	9	9	

Table 13: t-test exporters vs non-exporters, interest decrease

T-test interest increase Exporters VS non-exporters			
Parameter	Exporters	Non Exporters	Difference
CAAR	(1.00%)	(0.89%)	(0.11%)
STD	2.77%	1.64%	2.28%
T-test	(0.36)	(0.54)	(0.10)
N	20	20	

Table 14: t-test, exporters vs non-exporters, interest increase

As expected there is no significant difference in stock behaviour between the two types of stocks. It is a little bit surprising that none of the results in this sector is significant. Our sample in this sector contains firms with a very clear classification of exporters and non-exporters. The exporting firms count their exporting revenue for over 90 % of their operating revenue on average, while the non-exporters' numbers are significantly lower. In spite of this, there are not any clear results to support our hypothesis. No firm conclusions can be drawn from these results.

OSE45 – Information Technology sector

Below we have presented the observation from an interest decrease. Again we do not seem to find many significant observations in our test results. We only find one significant observation, on the third day in the event window in the observation of average abnormal returns for non-exporters. This observation seems rather random, and we coin it as a coincidence instead of trying to interpret it. There does not seem to be any particular pattern in the stock behaviour for interest decrease in the information technology sector, contrary to what we observed for the other sectors.

OSE45 Information Technology sector - INTEREST DECREASE					
	AAR			CAAR	
T	Sector	Export	Non-export	Sector	Export	Non-export
5	(0.38%)	(1.42%)	0.18%	(0.61%)	(0.67%)	0.31%
4	(0.58%)	(1.21%)	0.42%	(0.23%)	0.75%	0.12%
3	0.91%	1.21%	0.70%	0.35%	1.96%	(0.30%)
2	(1.05%)	(1.94%)	(0.48%)	(0.56%)	0.75%	(1.00%)
1	1.07%	1.98%	0.54%	0.49%	2.69%	(0.52%)
0	(0.98%)	(0.58%)	(1.05%)	(0.57%)	0.71%	(1.06%)
-1	0.51%	0.70%	0.75%	0.41%	1.28%	(0.01%)
.2	(0.05%)	(0.36%)	0.88%	(0.10%)	0.59%	(0.76%)
-3	(0.28%)	(0.03)%	(1.64%)*	0.06%	0.95%	(1.63%)
-4	(0.17%)	0.28%	(0.51%)	0.23%	0.99%	0.01%
-5	0.39%	0.71%	0.52%	0.39%	0.71%	0.52%

Table 15: Information Technology - interest decrease

In the table below we can see the results after an interest increase. Contrary to the previous observations, we can observe a minor trend in the results. Non-exporting firms show an increasingly negative trend throughout the event window, while the exporters show no apparent trend. This is the opposite of our expectations. Since we proposed that non-exporting stocks are less sensitive to interest rate changes, they should experience positive return compared to the sector index after an interest increase.

OSE45 Information Technology sector - INTEREST INCREASE					
AAR			**CAAR**		
T	Sector	Export	Non-export	Sector	Export	Non-export
5	0.11%	0.33%	(0.42%)	(0.62%)	0.66%	(1.93%)
4	0.03%	0.07%	0.29%	(0.73%)	0.33%	(1.51%)
3	(0.41%)	(0.42%)	(0.05%)	(0.76%)	0.25%	(1.81%)
2	0.03%	0.20%	(0.19%)	(0.36%)	0.68%	(1.76%)
1	(0.07%)	0.26%	(0.61%)	(0.38%)	0.47%	(1.57%)
0	(0.08%)	(0.43%)	(0.02%)	(0.31%)	0.22%	(0.96%)
-1	0.07%	0.27%	0.12%	(0.23%)	0.65%	(0.94%)
.2	(0.02%)	(0.13%)	(0.17%)	(0.30%)	0.38%	(1.06%)
-3	(0.41%)	(0.22%)	(0.67%)	(0.27%)	0.51%	(0.89%)
-4	(0.26%)	0.13%	(0.31%)	0.14%	0.73%	(0.22%)
-5	0.40%	0.60%	0.10%	0.40%	0.60%	0.10%

Table 16: Information Technology - interest increase

The test above indicates that there may exist differences between the two types of stocks. We though cannot be sure and want to test it formally with a t-test, as we did for the other sectors.

Below we have performed a test to see if the observed abnormal returns are significantly different between exporters and non- exporters.

T-test interest increase Exporters vs non-exporters			
Parameter	Exporters	Non Exporters	Difference
CAAR	0,66 %	(1.93 %)	2.59%
STD	2.07%	2.04%	2.06%
T-test	0,32	(0.95)	2.68
N	20	20	

Table 17: t-test exporters vs non-exporters, interest increase

Even though we did not get any significant results in the first test, we see that there exists a significant difference between how exporters and non-exporters react to interest increases in the Information Technology sector. As we suspected, the test above indicates that non-exporters are more sensitive to interest changes compared to exporters. These results weaken the proposed conclusion that export-reliant firms are more sensitive to interest changes than non-exports.

T-test interest reduction Exporters vs non-exporters			
Parameter	Exporters	Non Exporters	Difference
CAAR	(0,67 %)	0,31 %	(0,98%)
STD	4.65%	3.43%	4.08%
T-test	(0,15)	0,09	(0,51)
N	9	9	

Table 18: t-test exporters vs non-exporters, interest reduction

Contrary to previous sectors, an interest decrease did not show any signs or trend of different stock behaviour between exporters and non-exporters.

Interest rate cuts have little effect, interest increases do

As earlier mentioned, and as we can see from the graph below, after an interest reduction we do not observe a trend of significant positive returns. This is against what we would expect according to theory we have presented earlier where we argue that an interest cut should spur stock value for export-reliant firms. Theory cannot explain why we observe a trend indicating that an interest increase reduces stock value for companies with low export reliance.
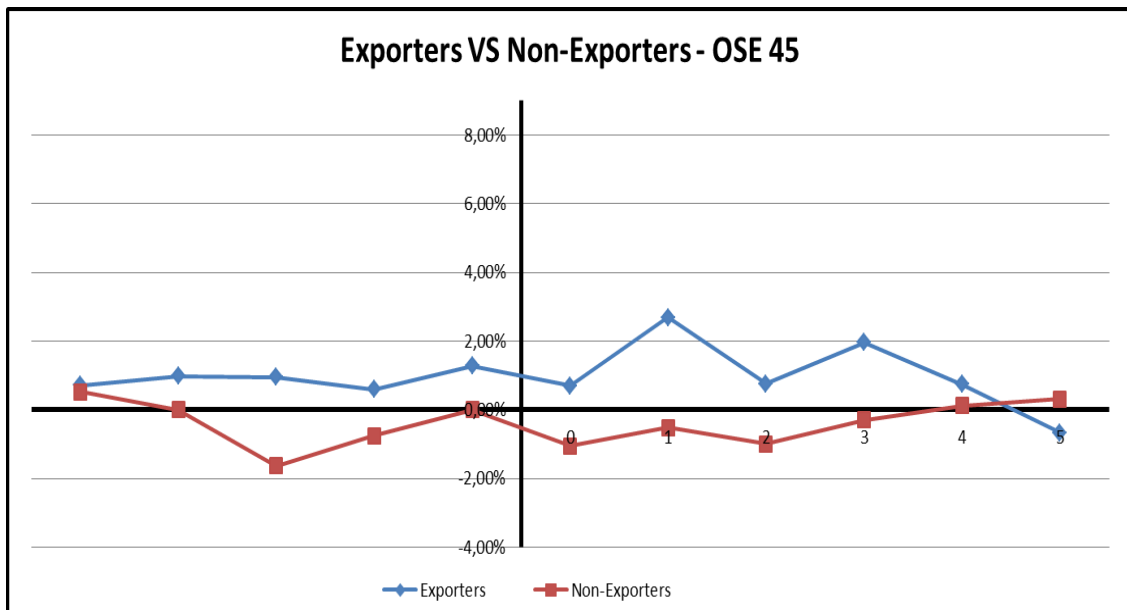
The Information Technology sector differs from previous sectors in how the companies in the sector acquire their revenues and in the end creates their results. While firms in our sample from the previous sectors get a major part of their revenue from selling processed products or resources, firms in the Information Technology sector create a large part of their revenue from different kind of services. When the business model relies heavily on selling services instead of produced products or processed resources, it may not have the same flexibility to adapt to increasing demand. When demand for their services increase, the firms first need to increase their own supply to be able to fully take advantage of the improving economic situation. To increase their supply of services the companies have to hire more personnel to handle the growing order book. Since hiring new employees is time consuming and very costly, companies often restrain themselves from hiring before they are absolute sure that the demand for their services is growing steadily (Abowd & Kramarz, 2003).

The fact that the labour market has a tendency to lag behind changes in economic output support this argument (Gartner, 2009). As a result, companies where a large part of their revenue come from services, often need more time to adapt to economic changes hence will not show as quick improvement in results after an interest rate reduction. If we add to the fact that new employees in firms that sell services need thorough training and usually do

not create positive results before after a year or so in the firm, the effect becomes even more apparent (Markit Economic Reseach, 2010).

As mentioned, the non-exporting observations shows that an interest increase tends to reduce stock value in the event window. In general terms, for the whole market, this makes sense as an interest increase tends to be negative for the stock market (Andreassen & Helte, 2004). In our experiment on the other hand, we are comparing the abnormal returns from the non-exporting firms with their associated sector. Since they are categorized as non-exporting the average of the sector should be more export reliant than these companies, thus should the non-exporting firms be less sensitive to interest rate change than the exporting firms, not more. The observations may be caused by noise that was not removed because of clustering, but in the end we have to admit that the results weaken our proposed hypothesis.

OSE15 – Materials sector

When it comes to the materials sector, we yet again fail to find many significant results. We also register that the sector returns are not significant, thus confirming that our sample is representative for the OSE 15 materials sector.

Interest decrease

For an interest decrease, we do not observe many large returns and find few significant observations. When the interest decreases, we do not see that much effect on the materials sector. As the table below shows, the interest rate decrease seems to affect export stocks accumulated some days after the announcement. Here we have quite strong returns compared to the index, but none of the observations are significant.

OSE15 Materials sector – INTEREST DECREASE					
AAR			**CAAR**		
T	Sector	Export	Non-export	Sector	Export	Non-export
5	0.31%	0.58%	0.04%	0.51%	3.01%	(1.99%)
4	0.47%	0.37%	0.58%	0.20%	2.44%	(2.04%)
3	(0.20%)	(0.47%)	0.07%	(0.27%)	2.07%	(2.62%)
2	0.63%	1.80%	(0.55%)	(0.07%)	2.54%	(2.68%)
1	(0.32%)	(0.66%)	0.01%	(0.70%)	0.74%	(2.14%)
0	0.65%	1.31%	0.00%	(0.37%)	1.40%	(2.14%)
-1	(0.33%)	(0.30%)	(0.36%)	(1.03%)	0.09%	(2.14%)
-2	(0.09%)	0.30%	(0.48%)	(0.70%)	0.39%	(1.79%)
-3	(0.07%)	(0.15%)	0.01%	(0.61%)	0.09%	(1.30%)
-4	0.65%	(0.38%)	1.68%	(0.54%)	0.24%	(1.31%)
-5	(1.19%)	0.61%	(2.99%)*	(1.19%)	0.61%	(2.99%)*

Table 19: Materials sector, interest decrease

For the AAR, there is only one significant result, five days prior the announcement day for non-export stocks. This seems a bit strange, as there is a decrease of 3 %, which is significant on a 90 % level. If we look closely on the data, there is a 34 % fall in IGE Resources in December 2011, and that particular event would influence the results so much that we should be careful in putting too much weight into that result.

When we look at the cumulative results on the right hand side of the table, there seems to be a clear trend. Export stocks react positively on interest rate decreases while non-export stocks react negatively. However, very few of these results are significant, even at 90 %. We cannot draw any conclusions based on insignificant results, but we recognize the trend being present.
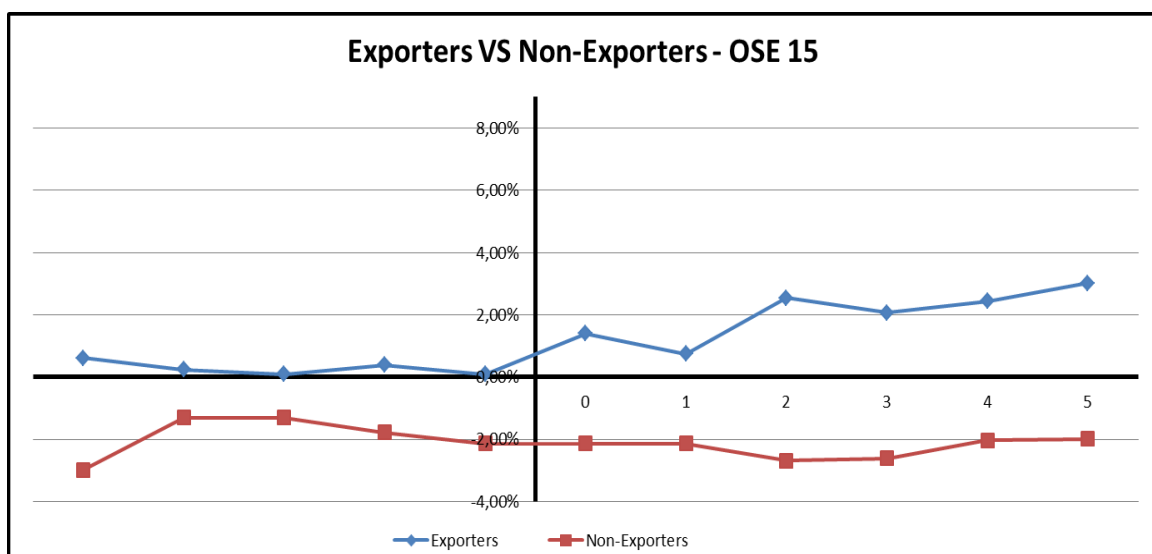
Figure 10: Exporters vs non-exporters, materials sector

There were few significant results when we looked at exporters and non-exporters separately. However, we did observe a trend indicating that there might exist a difference between how they reacted to interest reduction, as we can see in the graph above. This suspicion is confirmed in the test below where we can observe that there is a significant difference between stock behaviour for exporters and non-exporters on a 95% level. These results support our hypothesis and bring us closer to a conclusion that export reliant firms are more sensitive to interest rate reductions compared to non-exporting firms.

T-test interest reduction Exporters vs non-exporters			
Parameter	Exporters	Non Exporters	Difference
CAAR	3.02 %	(1.99%)	5.01%
STD	4.85%	6.00%	5.45%
T-test	0.62	(0.33)	1.97**
N	9	9	

Table 20: t-test, exporters vs non-exporters, materials sector

Interest increase

OSE15 Materials sector – INTEREST INCREASE						
	AAR			CAAR		
T	Sector	Export	Non-export	Sector	Export	Non-export
5	0.03%	0.09%	(0.03%)	(0.39%)	(0.53%)	(0.26%)
4	0.05%	(0.49%)	0.58%	(0.42%)	(0.62%)	(0.23%)
3	0.29%	0.26%	0.33%	(0.47%)	(0.13%)	(0.81%)
2	0.01%	(0.39%)	0.40%	(0.76%)	(0.39%)	(1.14%)
1	(0.74%)	(0.31%)	(1.17%)*	(0.77%)	0.01%	(1.54%)
0	(0.11%)	(0.06%)	(0.15%)	(0.03%)	0.31%	(0.37%)
-1	(0.04%)	(0.57%)	0.50%	0.08%	0.38%	(0.22%)
.2	(0.03%)	0.40%	(0.47%)	0.11%	0.95%	(0.72%)
-3	(0.10%)	0.57%	(0.77%)	0.15%	0.55%	(0.26%)
-4	0.14%	(0.13%)	0.42%	0.25%	(0.02%)	0.51%
-5	0.10%	0.12%	0.09%	0.10%	0.12%	0.09%

Table 21: Materials sector, interest increase

Observing the results from the table we do not find any particular trend, and the observations seem rather random. There is therefore no surprise when we do not find any significant difference between how exporters and non-exporters reacts to interest increase in the test below.

T-test interest increase Exporters VS non-exporters			
Parameter	Exporters	Non Exporters	Difference
CAAR	(0.53%)	(0.26%)	(0.27%)
STD	1.85%	2.18%	2.02%
T-test	(0.28)	(0.12)	(0.28)
N	20	20	

Table 22: t-test, exporters vs non-exporters, interest increase

Aggregating on individual firms: Leroy Seafood

Because the Consumer Staples sector turned out to be one of the sectors it would be very interesting to investigate further, we also wanted to look into if there were any individual companies which especially reflected our expectations for stock behaviour. After considering size, market position and ownership it became clear that Leroy Seafood is a stock we wanted to take a closer look at.

Leroy Seafood is the second largest trout and salmon farming company in the world, and is one of the largest exporting companies in Norway as a whole (Leroy Seafood, 2012). In 2012 they sold almost 85% of their production internationally which make them perfect for further investigation (Leroy Seafood, 2012). First, we want to investigate how Leroy's stock reacts to an interest reduction compared to an interest increase. We have chosen to perform the same tests as described earlier, and the results of these are shown below.

T-Test for the difference between interest increase and decrease			
Parameters	Interest reduction	Interest increase	Difference
CAAR	4.60 %	(0.60%)	5.21%
STD	3.16%	1.27%	2.02%
T-Test	1.46	(0.47)	6.42
N	9	20	

Table 23: t-test for difference between interest increase and decrease

Again, we cannot find any significant results after an interest rate increase. For interest rate cut we get a positive cumulative abnormal return. We can also see that the standard deviation for the observations is lower for interest increases cuts than for interest rate cuts. The most important result we find in this test is the different reactions to interest rate cuts and increase, which yet again is significant. Below we have performed another test to look at the significance of the cumulative abnormal returns observed each day in the event window.

Leroy Seafood- Cumulative return and T-test			
T	CAAR	STD	T-Test
5	4.60 %	0.032	1.46
4	4.85 %	0.030	1.61
3	5.57 %	0.029	1.95
2	6.99 %	0.027	2.60
1	6.62 %	0.025	2.63
0	7.20 %	0.023	3.09
-1	7.70 %	0.021	3.62
-2	3.14 %	0.019	1.65
-3	2.50 %	0.016	1.51
-4	2.40 %	0.013	1.79
-5	2.05 %	0.010	2.15

Table 24: Leroy Seafood, CAAR and t-test

In this test we observe several significant results as a consequence of an interest rate cut. It is particular significant around the event day which may indicate that we chose event day correctly. We can again observe that interest rate increase does not show any significant results, which is quite interesting as we have observed this trend over and over again throughout our thesis. This observation brings us closer to the conclusion that interest rate increase does not affect stock behaviour for exporting firms. We have illustrated cumulative abnormal returns for Leroy Seafood for interest rate decrease and increase in the graph below.
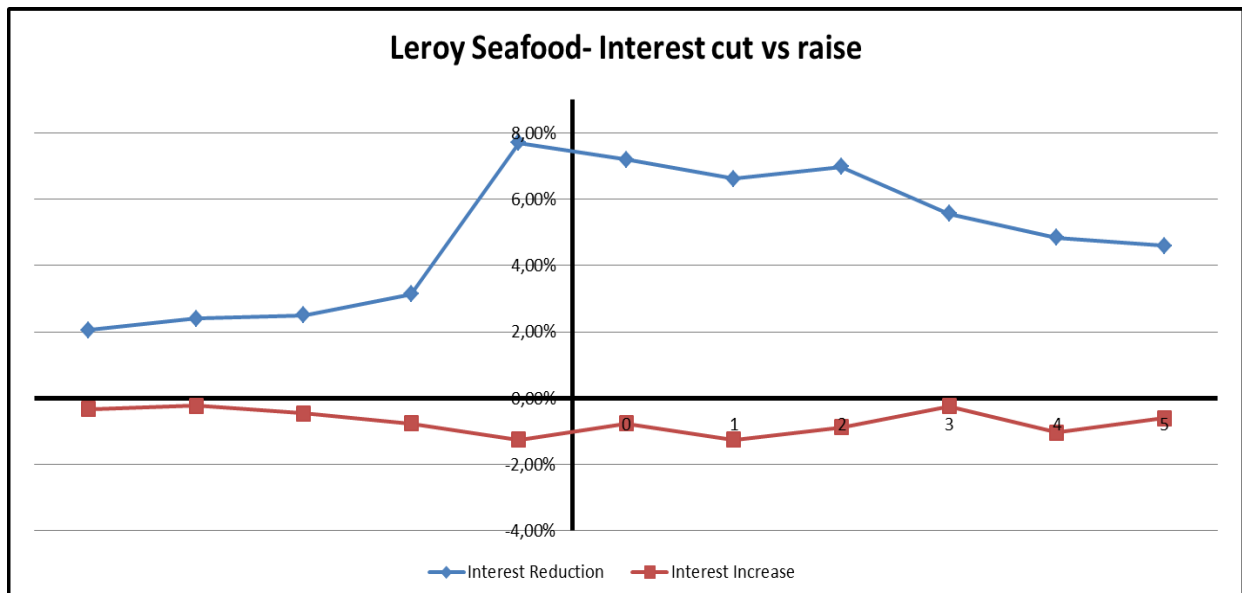
Figure 11: Leroy Seafood, interest rate increase vs decrease

Leroy Seafood is a large exporter in Norway, and export most of their production, but yet they seem to be unaffected by an increased interest rate. Looking into their financials, they have had relatively high equity ratio which in turn may reduce the risk and cost of increased interest rates (Leroy Seafood, 2012). On the other hand, their long term liabilities are mainly based on a floating interest rate which leave them open to credit risk. In addition, their debt is mainly in Norwegian Kroner. This means that their debt would relatively increase (denote in foreign currency) when an interest rate increase appreciate the value of the NOK (Leroy Seafood, 2012).

So, why does Leroy Seafood seem rather unaffected by interest increase? The floating interest rate argument could also be turned around. The fact that they do not want to use a fixed interest rate could be a sign that they are not afraid of an interest increase and assume that it would not affect their business substantially. The relatively high equity ratio supports this argument as a high equity ratio reduces the debt risk and cost in case of interest raise (Krishnamurthy, 2013). Leroy Seafood has also chosen to minimize currency risk with use of different financial instrument, which in turn reduce impact of currency movement. They also have a rather large amount of cash and cash equivalents, which could be used for unexpected expenses (Leroy Seafood, 2012).

Overall Leroy Seafood seems like a relatively robust company financially, which could be one of the reason investors do not react to interest increases. We cannot discard that the test result may be a coincidence and should be careful with drawing any conclusions, yet do these observations bring us closer to the conclusion that an interest raise does not significantly affect stock behaviour in highly export reliant firms.

Comparing on individual level: Marine Harvest vs. Leroy

As mentioned before, we found Leroy Seafood's stock interesting to investigate further because of several factors. We think it also would be interesting to compare this stock against another exporting stock with relatively differing results. Marine Harvest showed quite different results than Leroy Seafood when we observed CAAR for interest rate cut and is though very interesting to compare with Leroy Seafood. Marine Harvest is the world's largest company in the salmon and trout market, and is one of Norway's largest exporting companies (Marine Harvest, 2012). Below we will first perform a test on Marin Harvest to see if their stock significantly reacts differently to interest cuts and raises.

T-Test for the difference between interest increase and decrease: Marine Harvest			
Parameters	**Interest reduction**	**Interest increase**	**Difference**
CAAR	(4.48 %)	(1.96%)	(2.53%)
STD	2.73%	2.06%	2.28%
T-Test	(1.63)	(0.95)	(2.76)
N	9	20	

Table 25: t-test for difference between interest increase and decrease: Marine Harvest

As for Leroy Seafood, we find a significant difference between how Marine Harvest reacts to interest raises and cuts. However, their cumulative average abnormal return is not significant for either of them.

Marine Harvest- Cumulative return and T-test			
Parameters	CAAR	STD	T-Test
5	-4,48 %	0,03	-1,64
4	-2,67 %	0,03	-1,02
3	-2,43 %	0,02	-0,98
2	-1,03 %	0,02	-0,44
1	-1,42 %	0,02	-0,65
0	-0,04 %	0,02	-0,02
-1	-0,29 %	0,02	-0,16
-2	1,29 %	0,016	0,78
-3	-0,57 %	0,01	-0,39
-4	0,01 %	0,01	0,01
-5	-0,61 %	0,01	-0,73

Table 26: Marine Havest - CAAR and t-test

As with Leroy Seafood, we do not find any significant observation for interest increase. For Marine Harvest we do not find any significant observations for interest reduction either which differ from what we found for Leroy Seafood and thus do we want to investigate further what lies behind the different reactions to interest rate reductions.

T-Test for the difference between interest reduction: Marine Harvest VS Leroy Seafood			
Parameters	Leroy S	Marine H	Difference
CAAR	4.60 %	(4.48%)	9.08%
STD	3.16%	2.73%	2.95%
T-Test	1.46	(1.64)	6.52***
N	9	20	

Table 27: t-test for difference between Leroy Seafood and Marine Harvest

As shown by the key figures, there exists a statistical significant difference between how the two export-reliant companies react to interest reduction. The test results are also relatively strong with a t-test value of 6.52. Below we have presented both companies reaction to interest reduction in a graph.
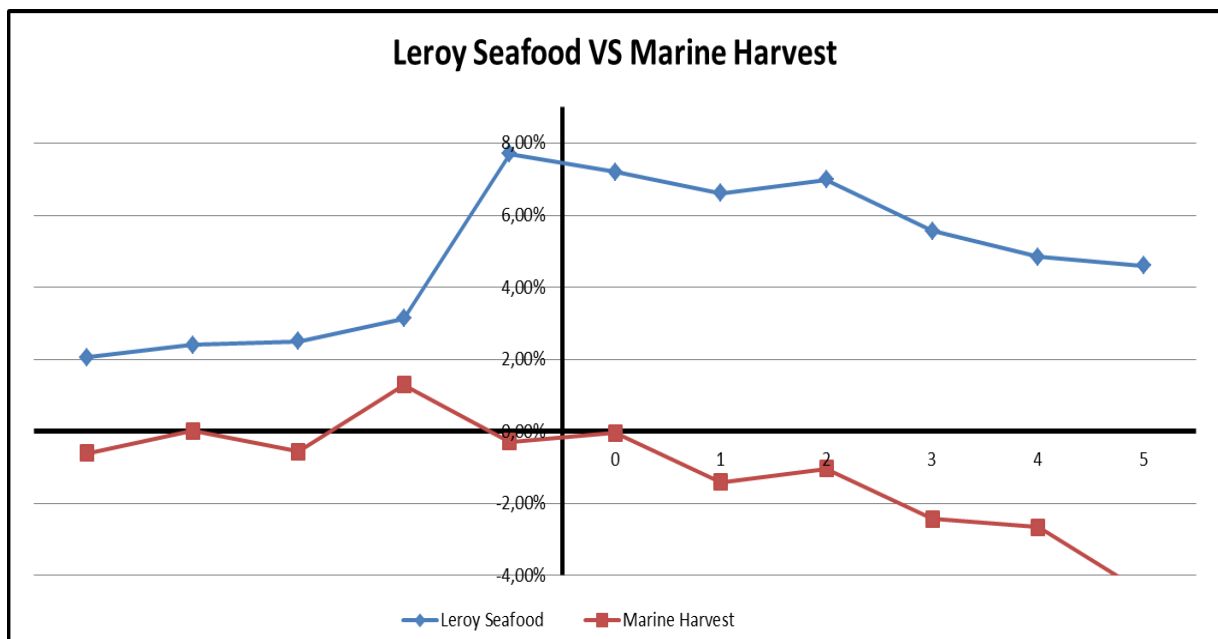
Figure 12: Leroy Seafood vs Marine Harvest

As we observe from the graph, Marine Harvest and Leroy Seafood react rather differently to interest reduction. Leroy Seafood act as we would expect after an interest cut, while Marine Harvest act rather in the opposite way.

At first glance the two companies seem rather similar and we should expect more or less similar behaviour from their stock values. As we can observe from the graph, this is far from the truth. It would be natural to suspect that Marine Harvest got hit harder by the financial crisis than Leroy hence showing negative results associated with an interest reduction. Though after looking into it, there is no sign that Marine Harvest did worse than Leroy Seafood during the financial crisis and we have to discard that argument. Looking into their financial statements they also share most of the same risk. Both are exposed to supplier price risk, currency risk and interest rate risk to mention some, and they also adopt many of the same policies to cope with them. Like long term price contracts with suppliers, extensive hedging policy against currency risk and letting the interest on their debt float freely. All in all they seem relatively similar and there are no obvious differences between them that can explain their different reactions to interest rate reduction (MarineHarvest, 2005-2012) & (LerøySeafood, 2005-2012).

The result we observe could be a coincidence or not, but either way it weakens the probability that there actually exist a relationship between interest reduction and stock value increase in export reliant firms. We also have to consider that the high t-test results when comparing the two companies may be a consequence of clustering boosting test value, bringing further uncertainty and doubt to our proposed relationship.

Panel Data Regression

The final test we are going to perform in this thesis is a test using panel data where *cumulative average abnormal returns* (CAR) is the dependent variable. The explanatory variables we are using are listed in the table below.

Variables Panel data regression		
Variable name	**Description**	**Value**
interestred	Interest reduction	(0,1)
export	Exporter	(0,1)
marketcap	Equity Value	Millions
industrials	Industrials sector	(0,1)
consumerstaples	Consumer staples	(0,1)
it	IT sector	(0,1)
materials	Materials sector	(0,1)
y2005	Year 2005	(0,1)
y2006	Year 2006	(0,1)
y2007	Year 2007	(0,1)
y2008	Year 2008	(0,1)
y2009	Year 2009	(0,1)
y2010	Year 2010	(0,1)
y2011	Year 2011	(0,1)
y2012	Year 2012	(0,1)
constant	Constant value	Numeric

Table 28: Variables in the Panel Data Regression

The variables that can have the value (0,1) are dummy variable, which have the value 1 if true and the value 0 if not. That means that each observation can represent only one sector

and one year, and the effect on the CAR of the variable in question must be looked upon as an addition to the constant value which is the value of CAR if all other variables are equal to zero. Some of the variables have numeric value. The 'marketcap' variable is how large the market capitalization of each firm is, in million kroner, and the constant would say something about the CAR to an observation without being characterized by something.

However, before we could conduct a panel data regression, we had to run a Hausman test to decide if we should use the random effect or the fixed effect model, as described in the method section of the thesis.

The Hausman test was performed in Stata, and the value of the test is listed below.

Hausman test		
Critical value, 95 %	**Test statistic**	**p value**
15,51	3,48	0,9010

Table 29: Hausman test statistics

The critical value for a chi-squared distribution on a 5 % significant level, with k = 8 degrees of freedom, is 15.51. As the test statistics show a value of 3,48, we can with confidence say that H_0 is accepted and we therefore realize that the error term is uncorrelated with the regressors of the model. The random effect model is therefore used in the following panel data regression.

CAAR over the event window

The first regression we ran in Stata was a panel data regression of cumulative average abnormal return for the entire event window. That means that we included and ran 687 observations from the interest rate changes of all firms in the panel regression.

The Stata output is given in the table below. As the table shows, there is only one significant variable, the 'interestred' variable, which tells us how the CAR is affected if the interest change is in fact a reduction. The value of the t-test is 1.98, which means it is significant on a 5 % level. We have to remember that this is a dummy variable, which has the value 0 if there is an interest increase. The model predicts that the CAR will be 2.45 % higher if there

is an interest reduction contra an interest increase. This is quite remarkable, but it supports our previous findings where we saw quite clear that the firms performed better after interest reductions, even though this was not always statistically significant.

The 'export' variable has a t value of 1.29, which means it is not statistically significant, even at 10 %. However, the t value is quite high, and it is worth looking at the coefficient. It has a value of 0,012, which says that if the company is classified as an exporter it would obtain a 1.2 % higher CAR than a non-exporter. Even though we cannot say this for sure, we observe that there looks to be a higher CAR for exporters compared to non-exporters.

The last coefficient that is worth looking at in this regression is the 'industrials' variable. Here the t value is 1.53, which means it is close to be accepted on a 10 % level, but not quite high enough to be statistically significant. The coefficient value is 0.0208, which implies that if the entity is in the industrials sector, it would be expected to have a CAR 2.1 % higher than those in the materials sector. The value of the materials dummy is omitted; the constant is the true value of the materials effect.

However, since the value of the constant is – 2 %, it implies that if the entity is from the industrials sector it would obtain 0.1 % higher CAR. We have to be careful in drawing any firm conclusions since the t value of the other variables are so low, but clearly being in the industry sector looks like being positive on the performance of the firms.

The year-dummies we included do not seem to have any particular effect. All t test values are low and there is any reasonable information to pick up on.

Panel regression CAR		
Variable	Coefficient	t-test
interestred	0,0245**	1,98
export	0,0120	1,29
marketcap	5,48 e-08	0,20
industrials	0,0208	1,53
consumerstaples	(0,0013)	(0,10)
it	1,7e-04	0,01
o.materials	0	.
y2005	0,0149	0,49
y2006	0,0073	0,27
y2007	0,0101	0,38
y2008	5,3e-04	0,02
y2009	0,0068	0,29
y2010	(0,0261)	(0,80)
y2011	(0,0162)	(0,60)
o.y2012	0	.
constant	(0,0200)	(0,74)
N		687

Table 30: Panel data regression, all sample

Modifications

Even though we have yet to find consistent results confirming our hypothesis, we suspect that there may exists a relationship between an interest reduction, and positive abnormal returns for export heavy stocks.

The first alteration we have made is to convert our export dummy variable to an explanatory variable containing share of export for each firm instead of the value 1 or 0. We have also substituted the variable 'marketcap' with the variable 'assets', which contains the total assets of the firm at the respective time of the observation instead of just the equity. Since we wanted to look specifically at interest reduction observations, we made a dataset

leaving out all the observations for interest increases to see if our regression would now find the significant relationship we were looking for. The result is presented in the table below. To the left we use the 'shareex' explanatory variable, and to the right we use the 'export' dummy variable.

Variable	Coefficient	t-test	Coefficient	t-test
Shareex/export	0,0453*	1.68*	0.0292	1.51
assets	(2,9e-07)	(0.78)	(2,05e-07)	(0.55)
industrials	0.0445	1.52	0.0523	1.64
consumerstamples	0.0038	0.14	0.0139	0.48
it	0.0067	0.22	0.0071	0.22
o.materials	0	.	0	.
o.y2005	0	.	0	.
o.y2006	0	.	0	.
o.y2007	0	.	0	.
y2008	0.0072	0.21	0.0062	0.21
y2009	0.0067	0.21	0.0061	0.21
o.y2010	0	.	0	.
y2011	(0.033)	(0,83)	(0.033)	(0.83)
o.y2012	0	.	0	.
o.y2012	0	.	0	.
constant	(0.0262)	(0.68)	(0.019)	(0.50)
N		242		242

Table 31: Modified panel data regression, interest reductions

Looking at the results, we see that our suspicions are more or less confirmed. The variable 'shareex' shows a significant positive effect, though only on a 90% level. If we also look at the same test, just with the export variable kept as a dummy, we get similar results though not significant. This may indicate that share of export does a better job explaining stock behaviour than just a dummy separating between export and non-export. About the new variable, 'assets', it seems to not be able to explain much of the development in CAR. Worth mentioning is also that were no interest rate decrease observations in the omitted years. Even though this test gives us promising results, the dataset is small and we would need

more data to draw a firm conclusion. Below we have performed the same test, just for interest increase.

Panel regression CAR		
Variable	**Coefficient**	**t-test**
shareex	0.00013	0.009
assets	(3.6e-07)**	(2.53)
industrials	0.01	1.34
consumerstamples	(0.0032)	(0.10)
it	0.0134	1.05
o.materials	0	.
y2005	0.0131	0.64
y2006	0.0074	0.40
y2007	0.0081	0.48
y2008	(0.0102)	(0.52)
y2009	0.0066	0.29
y2010	(0.0273)	(1.15)
o.y2011	0	.
o.y2012	0	.
constant	(0,0763)	(0.36)
N		447

Table 32: Modified panel data regression, interest increases

We can again observe the same trend that we have been observing through the whole thesis, that stocks of exporting firms are not more sensitive to interest increase compared to non-exporting firms. With this test, we feel like we have enough information to conclude that there exist no significant relationship between stock behaviour after interest increase and share of export in firms.

Another interesting variable is the 'assets' variable. It has a large t-value of -2.53 and is thus significant on a 5 % level. The coefficient value is rather low, however, but it tells us that the firm's CAR will decrease with (3,6e-07) multiplied with the number of millions the respective firm's assets is worth. Some firms in our sample are large, such as Orkla with a total asset value of nearly 58 000 millions in 2012. That would mean that, with an interest increase, Orkla's CAR would decrease with roughly 2 %.

After promising results in the test which examined the interest reductions, we wanted to make some additional modifications to our test to see if we could improve the model. First we do a test with the full dataset where we have changed the old variables 'marketcap' and 'export', with 'assets' and 'shareex' respectively. The results are presented below.

Panel regression CAR		
Variable	**Coefficient**	**t-test**
Shareex	0.018	1.39
assets	0.000035	0.78
industrials	0.023*	1.67
consumerstamples	(0.0006)	(0.07)
it	0.003	0.25
o.materials	0	.
y2005	0.015	0.51
y2006	0.008	0.29
y2007	0.010	0.40
y2008	0.001	0.02
y2009	0.007	0.30
y2010	(0.026)	(0.80)
y2011	(0.016)	(0.61)
o.y2012	0	.
Interestred	0.0245**	1.98
constant	(0.027)	(0.97)
N		687

Table 33: Modified panel data regression, all sample

Now that we include all observation, and not just interest reduction, we again observe that the 'shareex' explanatory variable is not significant, and it shows about the same result as when we used a dummy export variable though again with a little bit higher t-test values.

Finally, we wanted to make a modification where we added two interaction variables to our dataset. We decided to combine the 'export' dummy variable with the 'interestreduction' variable to get the interaction variable 'exportReduction'. This explanatory variable tells us what the effect on CAR is after an interest reduction given that the firm is export reliant. We also wanted to add an interaction variable which could pick up the added effect of being a small exporter versus being a large one, and created the explanatory variable 'exportAssets', where we combined the export dummy with the assets variable.

Panel regression CAR		
Variable	Coefficient	t-test
export	0.0004	0.03
assets	1,7e-07	0.77
industrials	0.024*	1.90
consumerstaples	(0,00119)	(0.10)
it	0.004	0.30
o.materials	0	.
y2005	0.015	0.48
y2006	0.007	0.26
y2007	0.010	0.37
y2008	0.0001997	0.01
y2009	0.007	0.30
y2010	(0.026)	(0.80)
y2011	(0.016)	(0.61)
o.y2012	0	.
Interestred	0.008	0.51
exportAssets	(2,69e-08)	(0.10)
exportReduction	0.0315*	1.77
Constant	(0.016)	(0.60
N		687

Table 34: Panel data regression with interaction variables, all sample

As we would expect, our new interaction variables is largely picking up the effect that earlier was associated with 'interestreduction' and 'export' individually. If we first look at the 'exportAssets' variable, we can see that it is not even close to be significant. Interpreting this result, it seems like the size of the exporter does not impact stock behaviour after an interest change. The other interaction variable, 'exportReduction', has a t value of 1.77 and is significant on a 10 % level. The interaction variable shows us again that there exists a difference between exporters and non-exporters reaction to interest rate reduction. If the event is an interest reduction, the effect on CAR is significantly larger if the firm also is a heavy exporter compared to if it is a non-exporter. This further enhances our suspicions that exporters show significantly positive abnormal returns in the aftermath of an interest reduction, while the same is not the case for non-exporters.

Summarize

We have through ordinary least square and panel data regression investigated if stocks of export reliant firms are more sensitive to interest rate changes compared to non-exporters. We have observed some varying results from both our panel data regression and our regular regression yet have we observed some of the same trends several times indicating that there just might something to our hypothesis.

Overall we have not found any indication that an interest increase affects stock behaviour of neither exporters nor non-exporters, so we have basically rejected that possibility. We have observed more interesting results when it comes to the effect of an interest reduction. We identified both significant and non-significant results, leaving us a little bit torn. Our most promising results did we get from the panel data regression when adding interaction variables and when looking at a sample of only interest reductions. We will be careful giving a firm conclusion based on our results, as the results vary a lot and they are not strongly significant and the R^2 is relatively low indicating that the included variables do not do a very good job explaining the variance in CAR.

Include Financial crisis or not?

As earlier mentioned in the theory part of our thesis, an interest reduction is a monetary policy decision which is supposed to stimulate a country's economy. When the economy is

in *normal* condition monetary policies are supposed to achieve minor correction in the economy for the respective country, like achieving the inflation goal or reduce unemployment rate etc.

During the financial crisis this monetary policy was not enough to have the theoretically intended effect on the economy, because the intended effect was dominated by other macroeconomic events like credit crisis, real estate market collapse, bankruptcy, and in general a drastic economic turmoil. This means that during more "normal" circumstances we may have experienced different movement in the stock prices than what we have observed in our thesis. One possible consequence could be that we would get unreasonable negative abnormal returns despite interest cuts since the macroeconomic factors would "drag" stock value down despite monetary stimulation, thus disturbing our results.

A solution to this problem would be to add another test where we only use data from before the financial crisis hit. This would though lead to losses of a significant share of our observations, and we would not be able to compare the observation in the same matter as before because of the lack of sufficient observation necessary to produce statistically significant results. (McKinley) Taking a closer look at our data and test results we do not observe any unreasonable values due to the financial crisis which would heavily affect our results and disturb our conclusion. We have thus decided that another regression analysis of the period before the financial crisis would not be necessary, or give us a better picture of stock behaviour under normal conditions.

Conclusion

In this thesis we have completed an event study on Oslo Bors to investigate if stocks of companies which are very reliant on export are more sensitive to interest rate changes compared to companies which mainly get their revenue from the domestic market.

The main findings in our thesis are that there does not seem to be a significant difference in stock behaviour after an interest increase. For interest rate reductions, we do find some significant results and some trends, indicating that export-reliant stocks benefit slightly more from an interest reduction compared to non-exporting stocks. Especially the panel data regressions give us some convincing results. It also seems like non-exporting firms in general perform worse than exporting stocks for both interest raises and cuts as they often show a negative trend in stock value compared to the sector indexes independently, whether the change is an interest increase or decrease. This rather seems to confirm what Bernard and Jensen (1997) said about exporters, that they tend to perform better, than supporting our hypothesis.

In our study, the event day, which is an interest rate change, is a result of the economic situation today and the expectations for the economy in the future. The direction of the interest rate change is decided by the economic situation, and then the interest change will in turn affect the market after the event. One does not have total control over the other. As a consequence, the economic situation will have a large impact on our sample data, making it difficult to separate the effect of an interest change from the effect of the macroeconomic circumstances.

Since the Norwegian central bank is an exogenous factor affecting all the stocks on Oslo Bors at the same time, we have had to be careful due to clustering effects on our data sample. Clustering is against the assumption of our model and may in turn have led to wrong test values and thus wrong conclusions. We have thus been careful to draw firm conclusions.

After convincing test results, we have come to the conclusion that there exists no proof that stocks of exporting companies are more sensitive to interest rate increases compared to stocks of non-exporting companies. However, it seems like exporting stocks are more

sensitive to interest reductions than non-exporting stocks. Overall, it may seem like other underlying macroeconomic factors may have more impact on stock behaviour than interest rate changes.

Bibliography

Abowd, J. M., & Kramarz, F. (2003). The costs of hiring and separations. *Labour Economics*.

Aitken, Hanson, & Harrison. (1997). Spillovers, foreign investment, and export behavior. *Journal of International Economics*.

AKVA. (2005-2012). *Annual Report.* Retrieved from: http://www.akvagroup.com/investor-relations/financial-info-/annual-reports.

Andreassen, H. M., & Helte, M. B. (2004). *Magma*. Hentet 11 13, 2012 fra http://www.magma.no/aksjemarkedet-og-rentesvingninger

Atea. (2005-2012). *Annual Report.* Retrieved from: http://www.atea.no/Documents/.com/Investor%20Relations/Annual%20Reports/Atea-Annualreport2012_UK_Web.pdf.

Austevoll. (2005-2012). *Annual Report.* Retrieved from: http://www.leroyseafood.com/en/Business/About-us/News/20131/April/Annual-Report-for-2012/.

Baldwin, R., & Krugman, P. (1989). Persistant trade effects of large exchange rate shocks. *Quarterly Journal of Economics*.

Bartram, S. (2002). The interest rate exposure on nonfinancial corporations. *European Finance Review*.

Bekaert, G., & Wei, M. (2007). Uncovered interest rate parity and the term structure. *Journal of International Money and Finance*, 1038-1069.

Bernard, A. B. (2003). Plants and Productivity in International Trade. *American Economic Review*.

Bernard, A. B., & Jensen, J. B. (1997). Exceptional Exporter Performance: Cause, Effect, or Both?

Bernard, A., Eaton, J., Jenson, J. B., & Kortum, S. (2000). Plants and Productivity in International Trade. *NBER Working Paper*.

Bernard, V. L. (1987). Cross-sectional Dependence and Problems in Inference in Market Based Accounting Research. *Journal of Accounting Research*.

Bouvet. (2005-2012). *Annual Report.* Retrieved from: http://www.bouvet.no/PageFiles/3779/%C3%85rsrapport%202012%20Bouvet%20ASA%20Engelsk%20for%20utskrift%20og%20skjerm%20(1).pdf.

Byggma. (2005-2012). *Annual Report.* Retrieved from: http://www.byggma.no/investor/rapporter/.

Campa, J. (2004). Exchange rates and trade: how important is hystersis in trade? . *European Econimic Review*.

Cavusgil, S. (1984). Differneces among exporting firms based on their degree of internationalisation. *Journal of Business Research*.

Cermaq. (2005-2012). *Annual Report.* Retrieved from:
    http://www.report2012.cermaq.com/media/27739/1-cermaq_annual_report_2012.pdf.

Damodaran, A. (2002). *Investment Valuation 2nd edition.* New York: John Wiley & sons.

Duff, V. (2013, November 20). *How Does the Federal Reserve Interest Rate Policy Affect You & Your
    Business?* Hentet November 25, 2013 fra Smallbusiness:
    http://smallbusiness.chron.com/federal-reserve-interest-rate-policy-affect-business-
    3653.html

Eltek. (2005-2012). *Annual Report.* Retrieved from:
    http://www.eltek.com/photoalbum/view2/P3NpemU9b3JnJmlkPTY0Njc4OCZ0eXBlPTE.

Fama, E. (1969). Efficient Capital Markets: A Review of Theory and Emperical Work.

Fløgstad, P. S., Olsen, F. V., & Skyrud, C. (2012). *ECO402 Assignment 3.* Bergen: NHH.

Gartner, M. (2006). *Macroeconomics.* Boston: Peason International.

Gartner, M. (2009). *Macroeconomics.*

GriegSeafood. (2005-2012). *Annual Report.* Retrieved from: http://grieg.no/0425-grieg-seafood-
    annual-report-2012/.

Harris, R. M. (2011). R&D, Innovation and Exporting . *Serc Discussion Paper*, 3.

Holmsen, A., Qvigstad, J., Røisland, Ø., & Solberg-Johansen, K. (2008). Communicating monetary
    policy intentions. *Norges Bank Working Paper*.

IGE, R. (2005-2012). *Annual Report.* Retrieved from:
    http://www.ige.se/pages/reports_q_and_a.aspx.

Infratek. (2005-2012). *Annual Report.* Retrieved from:
    http://aarsrapport2012.infratek.no/resources/files/Infratek_Annual_Report_2012.pdf.

Itera. (2005-2012). *Annual Report.* Retrieved from: http://itera.no/annualreport/.

KongsbergGroup. (2005-2012). *Annual Report.* Retrived from:
    http://www.kongsberg.com/~/media/KOG/Files/Investor/Quarterly%20reports/2013/Annua
    l%20report%202012/ANNUAL%20REPORT_2012.ashx.

Kothari, S., & Warner, J. B. (2006). Econometrics of Event Studies. *Tuck School of Business at
    Dartmouth*.

Krishnamurthy, A. V.-J. (2013). The Effects of Quantitative Easing on Interest Rates: Channels and
    Implications for Policy. *NBER*.

Kvinge, T. (2003). *Mapping Large Firms' Localization Strategies (translated).* Fafo.

LerøySeafood. (2005-2012). *Annual Report.* Retrieved from:
    http://www.leroyseafood.com/en/Investor/Reports/Financial-Reports/Annual-reports/.

MacKinlay, C. A. (1997). Event Studies in Economics and Finance. *Journal of Economic Litterature*.

MarineHarvest. (2005-2012). *Annual Report.* Retrieved from:
http://www.marineharvest.com/en/Investor1/Press-releases/2013/MHG-2012-Annual-
Report/.

Markit Economic Reseach. (2010). *US Labour Market*. Hentet November 29, 2013 fra Markit:
http://www.markit.com/assets/en/docs/commentary/markit-
economics/2013/jun/US_NFP_13_06_07.pdf

McCurdy, T. H. (1991). Tests for a Systematic Risk Component in Deviations from Uncovered Interest
Rate Parity. *The Review of Economic Studies*.

Nilsen, Ø. A. (2012). *Lecture notes in Econometric Techniques - Panel Data.* Bergen: NHH.

NorgesBank. (2006, June 29). *Monetary policy in Norway*. Hentet October 12, 2013 fra norges-
bank.no: http://www.norges-bank.no/en/price-stability/monetary-policy-in-norway/

NorskeSkog. (2005-2012). *Annual Report.* Retrieved from:
http://www.norskeskog.com/Investors/Reports.aspx.

NorwegianAirShuttle. (2005-2012). *Annual Report.* Retrieved from:
http://annualreport.norwegian.no/2012/the_year_in_brief.

Orkla. (2005-2012). *Annual Report.* Retrieved from: http://www.orkla.com/annual-report/2012.

OSE15 Materials . (2013). Hentet November 16, 2013 fra Oslo Børs:
http://www.oslobors.no/markedsaktivitet/stockIndexOverview?newt__ticker=OSE15GI

OSE20 Industrials. (2013). Hentet November 27, 2013 fra Oslo Børs:
http://www.oslobors.no/markedsaktivitet/stockIndexOverview?newt__ticker=OSE20GI

OSE30 Consumer Staples. (2013). Hentet November 16, 2013 fra Oslo Børs:
http://www.oslobors.no/markedsaktivitet/stockIndexOverview?newt__ticker=OSE30GI

OSE45 Information Technology. (2013). Hentet November 16, 16 fra Oslo Børs:
http://www.oslobors.no/markedsaktivitet/stockIndexOverview?newt__ticker=OSE45GI

Park, A., & Yang, D. (2010). Exporting and firm performance: Chinese exporters and the Asian
financial crisis. *The Review of Economics and Statistics*.

PSI. (2005-2012). *Annual Report.* Retrieved from:
http://www.psigroup.no/PageFiles/184/PSI%20Group_%C3%85rsrapport_2012_ENG_print%
20Final%20.pdf.

Regjeringen. (2013). *Regjeringen.no*. Hentet fra Verdens fremste sjønasjon:
http://www.regjeringen.no/nb/dep/fkd/dok/regpubl/stmeld/2012-2013/meld-st-22-
20122013/9.html?id=718688

Rodríguez, J. L., & Rodríguez, R. M. (2005). Technology and export behaviour: A resource-based view approach. *International Business Review*.

Salomon, R. &. (2005). EXPORT AND DOMESTIC SALES: THEIR INTERRELATIONSHIP AND DETERMINANTS. *Strategic Management Journal*.

ScanaIndustrier. (2005-2012). *Annual Report.* Retrieved from: http://www.scana.no/annual-reports.

Smith, M. (2004). Impact of the exchange rate on export volumes. *Reserve Bank of New Zealand Bulletin*.

Staikouras, S. K. (2006). Financial intermediaries and interest rate risk: II. *Financial Markets, Institutions and Instruments*.

Stock, J. H., & Watson, M. M. (2012). *Introduction to Econometrics.* Essex: Pearson Educational Limited.

Støve, B., & Tjøstheim, D. (2012). Measuring Asymmetries in Financial Returns: An Empirical Investigation Using Local Gaussian Correlation. *UiB-Matematiske Fakultet*.

Tide. (2005-2012). *Annual Report.* Tide AS.

TomraSystems. (2005-2012). *Annual Report.* Retrieved from: http://www.tomra.com/en/investor-relations/financial-information/annual-reports.

Wooldridge, J. (2008). *Introductory Econometrics - A Modern Approach.* Mason: South Western Cengage Learning.

Yara. (2005-2012). *Annual Report.* Retrieved from: http://www.yara.com/investor_relations/latest_annual_report/index.aspx.

Appendix

Share of export

OSE20
Exporters

Name	Tomra System	Norwegian	Kongsberg G	Repant
Share of export	95%	68%	78%	90%

Non-exports

Name	TTS Group	AKVA group	Tide	Infratek
Share of export	5 %	58%	24%	54%

OSE15
Exporters

Name	Norske Skog	Scana Industrier	Hydro	-
Share of export	96%	75%	96%	-

Non-exports

Name	Byggma	Yara	IGE resources	-
Share of export	26.6%	0 % (worldwide)	0 % (worldwide)	-

OSE45
Exporters

Name	Eltek	PSI group	Atea	-
Share of export	97%	62%	69.6%	-

Non-exports

Name	EVRY	Bouvet	Itera	-
Share of export	27%	3%	24%	-

OSE30
Exporters

Name	Leroy Sea	Marine H	Austevoll Seafood	Grieg Seafood
Share of export	83.8%	90 %	90 %	91 %

Non-exports

Name	Cermaq	Orcla	Havfisk	-
Share of export	55%	0 % (worldwide)	0%	-