

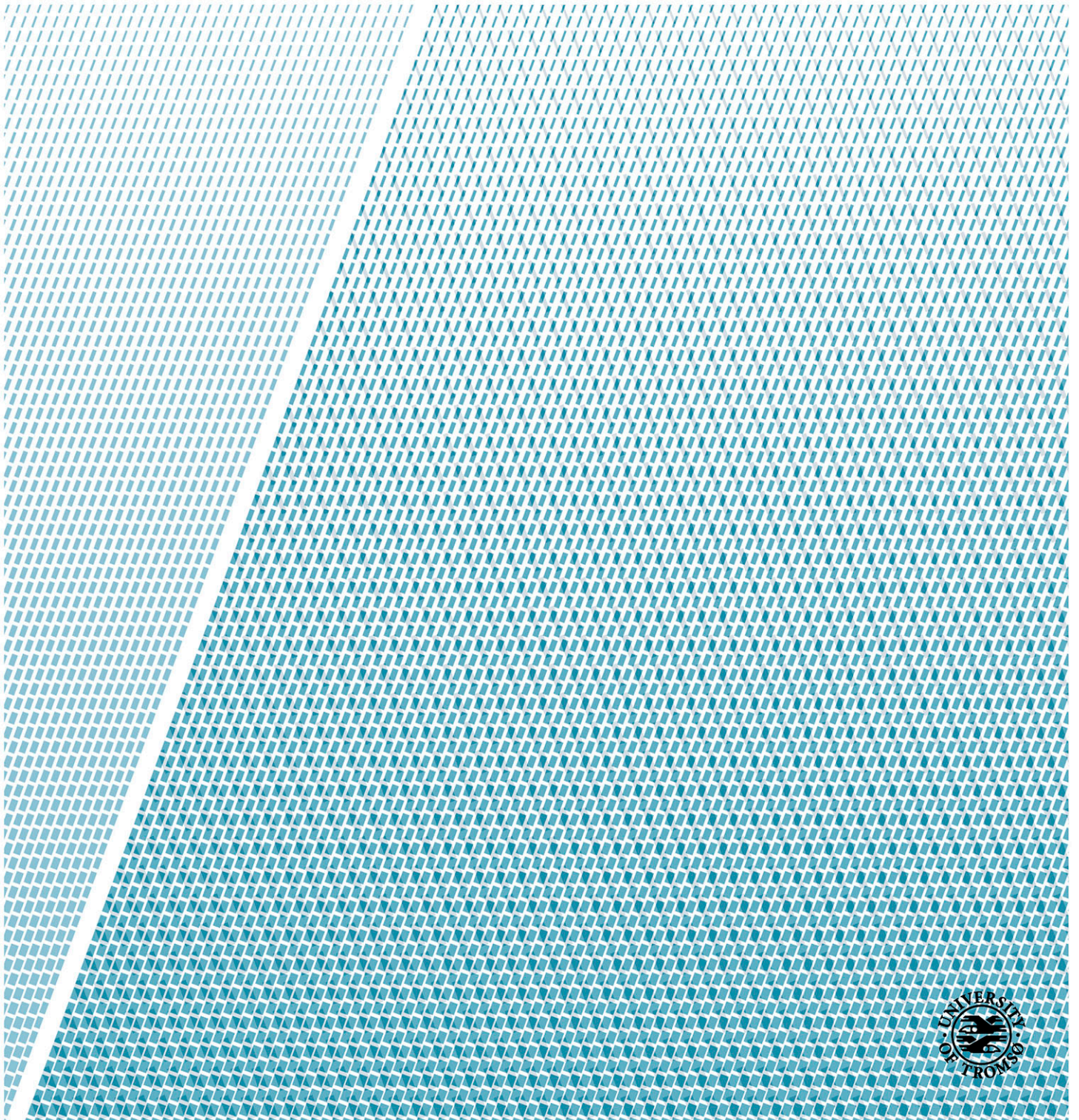
## **State Ownership**

*The History, Risk Review and Historical Performance of the Norwegian  
State Portfolio from 2003-2014.*

—

**Ørjan Ånesen**

Master's Thesis in Economics – *June 2015*





## Foreword

The background for this master thesis was a great interest in the financial markets and more specifically the stock exchange market. It was my supervisor who came up with the idea of this topic after a newspaper column he wrote concerning state ownership returns compared to the Norwegian stock market.

The overarching theme of the thesis is a performance analysis of the Norwegian state portfolio and includes topics such as alpha and risk.

I wanted to investigate whether the state portfolio can manage to create a higher return than the Norwegian equity market, which is used as a benchmark. I've also analyzed against the broader foreign indexes as well, since the money from a potential sale will be re-invested in the Government pension fund of Norway.

Work on this thesis has given me insight into both how state ownership is managed through different processes, but also how difficult it is to beat a benchmark index in returns when assembling a so-called optimal portfolio.

The software used for the statistical analysis is *Stata*. *Excel* has been used for some of the data handling.

Finally, I would like to thank my supervisor, Espen Sirnes, for help with the research question and task choice, and especially with access to the adjusted prices for the stocks in the state portfolio.

Tromsø, June 2015

## Abstract

The purpose of this thesis was to test whether there was a significant difference in the risk adjusted returns for the state portfolio, measured against the Norwegian market index or an alternative investment in the global stock market for the period 2003-2014.

The Norwegian government has an extensive ownership. The companies they own accounts for almost 1/3 of the value of all the stocks on the Oslo Stock Exchange. Compared to other Nordic countries, Norway has a high owner share.

Earlier articles on the subject have mostly revolved around how the ownership is managed, and to a small extent on the basis of the actual performance figures for each company and the entire portfolio as a whole. The debates in the media about these companies have mostly also acted on transactions in the shareholding, criticism on how they operate and rarely about their actual return (such as the Government Pension Fund of Norway is mostly about).

The relative returns are quite similar for the whole period. The state portfolio had the best returns in the period from 2003-2008, while the OSEBX had the best returns from 2009-2014.

To find the answer to whether the Norwegian state ownership could be seen as successful or not, I looked at the returns measured against risk over time, and compared it to the different foreign benchmarks, and the Government Pension Fund Global of Norway.

The results gave some indications that the state portfolio was an equally good portfolio to own, measured against the OSEBX in the period from 2003-2014. It beats the Norwegian market index in risk-adjusted return in every period that yields a significant alpha, when comparing against the same benchmark. The regression revealed that there were two alphas that were significant when testing the alphas for the OSEBX and the state portfolio against each other - one alpha with an excess return for the state portfolio and one alpha with an excess return for the Norwegian market. The regression between the state portfolio and the Norwegian market

indicates no significant alpha, but the state portfolio has a lower risk in the period and also a higher return, giving some indications of a risk-adjusted excess return.

The various risk measures were inconsistent in the results, giving the highest appraisal ratios to OSEBX, while the state portfolio had the highest Sharpe- and adjusted Sharpe ratios for the same periods. The trend after 2009 is negative for the state portfolio with both lower returns and risk measure ratios.

**Keywords:** State Ownership. Norway. Portfolio Theory. CAPM. Realized Alpha.

## Table of Contents

<b>FOREWORD</b> .....	<b>III</b>
<b>ABSTRACT</b> .....	<b>IV</b>
<b>FIGURES</b> .....	<b>VII</b>
<b>TABLES</b> .....	<b>VII</b>
<b>1. INTRODUCTION</b> .....	<b>1</b>
<b>2. STATE- AND PRIVATE OWNERSHIP</b> .....	<b>3</b>
2.1 ADVANTAGES WITH PRIVATE- AND STATE OWNERSHIP.....	3
2.2 STATE OWNERSHIP IN OTHER COUNTRIES.....	5
2.3 WHAT DO NORWAY OWN AND WHY.....	6
2.3.1 Statoil.....	6
2.3.2 Telenor.....	7
2.3.3 DNB.....	8
2.3.4 Norwegian Hydro.....	9
2.3.5 Kongsberg Group.....	10
2.3.6 SAS.....	11
2.3.7 Yara International.....	11
2.3.8 Cermaq.....	12
2.3.9 Criticism.....	13
2.4 STATE DIVESTMENT AND STRATEGY.....	13
2.4.1 Strategies for the government with the ownership.....	13
2.4.2 Earlier debates about divestments in the companies.....	14
2.4.3 Opposition and support for selling.....	15
2.4.4 Effects with a divestment.....	16
<b>3. THEORY</b> .....	<b>18</b>
3.1 RELATIVE RETURNS.....	18
3.2 CAPM.....	18
3.3 FAMA FRENCH THREE FACTOR MODEL.....	20
3.4 CALCULATING ALPHA.....	21
3.5 SHARPE RATIO (SR).....	23
3.5.1 Adjusted Sharpe ratio (ASR).....	23
3.6 APPRAISAL RATIO (AR).....	24
3.7 TREYNOR RATIO (REWARD-TO-VOLATILITY RATIO).....	25
3.8 MODIGLIANO AND MODIGLIANO ( <b>M2</b> ).....	26
<b>4. DATA HANDLING AND METHODOLOGY</b> .....	<b>28</b>
4.1 STOCK PRICES, INDEXES AND RISK-FREE RATE.....	28
4.2 MAKING A STATE PORTFOLIO.....	29
4.3 TWO SUB-PERIODS.....	29
4.4 REGRESSIONS.....	31
4.4.1 Conditions for the regression.....	32
4.4.2 Violations of the conditions.....	33
4.4.3 The null- and alternative hypothesis.....	35
<b>5. RESULTS</b> .....	<b>36</b>
5.1 RELATIVE RETURNS.....	36
5.2 RISK MANAGEMENT.....	37
5.2.2 Volatility, Sharpe ratio and adjusted Sharpe ratio.....	37
5.2.3 Appraisal ratio.....	39
5.3 REGRESSIONS.....	39
5.3.1 Stocks versus the OSEBX-index.....	40

5.3.2 Stocks versus the World-index .....	42
5.3.3 Stocks versus the FTSE-index.....	44
5.3.4 The two portfolios against the three indexes .....	45
5.3.5 SPU against the OSEBX-index and the state portfolio .....	48
5.4 REALIZED ALPHAS .....	48
5.4.1 The two portfolios against the three indexes .....	50
5.4.2 The OSEBX-index against the two foreign benchmarks.....	52
5.4.3 SPU against the OSEBX-index and the state portfolio .....	52
<b>6. CONCLUSION .....</b>	<b>56</b>
<b>6.1 RECOMMENDATIONS.....</b>	<b>58</b>
<b>7. REFERENCES .....</b>	<b>59</b>
7.1 BOOKS .....	59
7.2 ARTICLES .....	59
7.3 WEB PAGES .....	61
7.4 PUBLIC DOCUMENTS.....	63
<b>8. APPENDICES.....</b>	<b>65</b>

## Figures

FIGURE 1: DIVERSIFICATION EFFECT .....	20
FIGURE 2: TREYNOR RATIO .....	26
FIGURE 3: ALPHA, $M2$ AND SHARPE RATIO.....	27
FIGURE 4: THE TWO SUB-PERIODS SHOWN GRAPHICALLY WITH THE OSEBX-INDEX.....	30
FIGURE 5: THE REGRESSION ANALYSIS WITH THE OLS METHOD. ....	32
FIGURE 6: MONTHLY UNADJUSTED EXCESS RETURN DISTRIBUTION FOR THE OSEBX AND STATE PORTFOLIO OVER SPU. ....	37
FIGURE 7: MONTHLY ALPHAS DISTRIBUTION FOR THE STATE PORTFOLIO AND OSEBX OVER THE SPU.....	49

## Tables

TABLE 1: THE STATE PORTFOLIO BY 31.12.2014. ....	16
TABLE 2: UPDATED STATE PORTFOLIO AFTER SELLING SAS AND DIVESTING IN TELENOR. ....	16
TABLE 3: RELATIVE RETURNS FOR THE TWO PORTFOLIOS AND THREE INDEXES.....	36
TABLE 4: REGRESSION ANALYSIS FOR THE UNDERLYING STOCKS IN THE STATE PORTFOLIO COMPARED TO THE OSEBX-INDEX.....	40
TABLE 5: REGRESSION ANALYSIS FOR THE UNDERLYING STOCKS IN THE STATE PORTFOLIO COMPARED TO THE WORLD-INDEX.....	42
TABLE 6: REGRESSION ANALYSIS FOR THE UNDERLYING STOCKS IN THE STATE PORTFOLIO COMPARED TO THE FTSE-INDEX. ....	44
TABLE 7: REGRESSION ANALYSIS OF THE SPU AND THE STATE PORTFOLIO MEASURED AGAINST THE OSEBX- /WORLD- /AND THE FTSE-INDEX. ALL THE INDEXES ARE THE INDEPENDENT VARIABLE.....	45

TABLE 8: REGRESSION ANALYSIS OF THE OSEBX VERSUS THE WORLD- AND FTSE-INDEX. THE TWO INDEXES ARE THE INDEPENDENT VARIABLES.....	47
TABLE 9: REGRESSION ANALYSIS OF THE STATE PORTFOLIO AND OSEBX AGAINST SPU. SPU IS THE INDEPENDENT VARIABLE.....	48
TABLE 10: THE REGRESSION OF THE RISK-ADJUSTED ALPHA FOR THE STATE PORTFOLIO COMPARED TO THE OSEBX-/WORLD-/ AND THE FTSE INDEX. (EQUATION 5) .....	51
TABLE 11: REALIZED ALPHAS FOR THE OSEBX-INDEX AGAINST THE TWO FOREIGN INDEXES.....	52
TABLE 12: REALIZED ALPHAS FOR THE STATE PORTFOLIO AND THE OSEBX-INDEX AGAINST SPU.....	52
TABLE 13: THE REALIZED ALPHAS REGRESSED AGAINST EACH OTHER. ....	54



## 1. Introduction

About 30% of the total value of the Oslo stock exchange (OSE) is currently owned by the Norwegian state. Preserving national headquarters is an important argument for keeping the majority vote, or at least a negative control of the companies they own (1/3 of the stocks).

The purpose of this thesis is to test whether there is a significant difference in the risk-adjusted returns for the state portfolio, measured against the Norwegian market index or an alternative investment in the global stock market for the period 2003-2014.

This is important because Norway has abundant capital invested in the stock markets worldwide. This is money put aside to cope with pension payments in the future. It is an obligation to the Norwegian people to invest the money that they own in the best possible way, meaning how much risk that is taken for any potential excess return they achieve.

Although the government acting professional and transparent, it will be increasingly important to be open and clear about the guidelines they must follow for each company they control. In 2006 it was created four categories after what type of ambitions the government had with the ownership (more about this in chapter 2.4.1). The point on how they are quality assured to these guidelines, and what to do if they aren't is very important, and is hereby referred to as corporate governance.

Espen Sirnes, associate professor from the University of Tromsø, wrote an article in DN with the headline "*Samme avkastning for statlige selskaper og indeks*"<sup>1</sup> [1], which inspired this master thesis.

The article is also mentioned in the book by Lie et.al (2014), who especially look at state ownership over time. They investigate how the Norwegian government has managed the growing wealth in the years after we found oil and how the companies following the acquisitions has been driven in relation to good corporate governance.

---

<sup>1</sup> Translated to English it becomes: "*Same return for state companies and index*".

<sup>2</sup> He used an equally weighted portfolio, because the value-weighted was too heavily influenced by one

Professor Bernt Arne Ødegaard with the University of Stavanger investigated in 2009 if there could be any “state discount” for the state owned companies in the period from 1989-2007. He found some indications of this, but a negative relationship was only significant in the period from 1989-1997. When he looked at the risk-adjusted returns for the state portfolio he found no significant results in excess returns of the Oslo stock exchange.<sup>2</sup> (Ødegaard, 2009).

The thesis addresses to the following companies ordered after percentage share owned: Statoil (67%), Cermaq (59.2%)<sup>3</sup>, Telenor (54%), Kongsberg group (50%), Yara International (36.2%), Norwegian Hydro (34.3%), DNB (34%) and SAS AB (14.3%). Total value of these stocks is approximately (minus Cermaq) NOK 535 billion at year-end 2014.

The thesis is divided into six parts. Chapter 2 begins with a review of some of the benefits of state- and private ownership. I then go through the companies in the state portfolio where I look at what they do, and some of the criticism they have been subjected to. Chapter 3 is the theory I’ve been using. Chapter 4 provides an overview of which data is used, how the data is retrieved and what methods that have been used in the calculations. Chapter 5 is all the results from the analysis. In chapter 6 I present the conclusions I have reached on the basis of the analysis section before I come with my recommendations for the state ownership.

---

<sup>2</sup> He used an equally weighted portfolio, because the value-weighted was too heavily influenced by one stock.

<sup>3</sup> Cermaq was sold 20.October 2014 for NOK 5.2 billion.

## 2. State- and private ownership

When the new government was elected in October 2013, the guidelines for state owned companies changed to some extent towards more private ownership. They have communicated from the start that they wish to reduce its ownership interests on the Oslo Stock Exchange. They announced in mid-2014 that they wanted to reduce its ownership in Telenor from 54% to 34%, and the Kongsberg Group from 50% to 34%. The announcement stated that: ” *This will enhance the state’s ability to reduce its shareholding or support potential mergers, acquisitions or other strategic changes that may create value* “. [2]

The government does not want the Norwegian State to be a long-term owner in companies where there are no special reasons for the ownership.

In January 2015 the parliament granted the request to divest the shareholdings in Telenor down to 34%, and to sell all or parts of the remaining shares in SAS (Norwegian Parliament, 2014).

### 2.1 Advantages with private- and state ownership

Research on comparing private investors against a state, argues that private investors can to a greater extent be close to the markets, knowing which needs are required at what time. They can participate in board meetings and push the company for innovation and efficient operation.

Private owners do in general have stronger incentives for efficient operation of companies, both in terms of cost reduction and innovation. This has been underlined by several empirical studies, which shows that privatization generally leads to more and better production for a lower cost. See for example The World Bank (1995) and Schleifer (1998).

By looking at both private and foreign investors, Nordkvelde et.al (2014, p.14) says that: “*While the entire Norwegian economy declined in 2009, foreign-owned enterprises were still adding value at an annual growth rate of 14%. This “hedging” or “buffer” provided by foreign-owned enterprises during tough economic times is a crucial contribution to Norway’s economy*”.

When they further look at taxes paid, they conclude that there seems to be small

differences between foreign ownership and Norwegian ownership in terms of taxes paid to the Norwegian state, whereas the Norwegians pay slightly more.

Also worth mentioning is that Norway came 6<sup>th</sup> in the ranking of countries in the world where it is best doing businesses. When looking at taxes paid per year they came out in 4<sup>th</sup> place (The World Bank, 2014, p.208).

The government argues that there isn't any support for the statement that private investors do it better than a state does: "The literature provides no clear answer as to whether private ownership provides a better return than public ownership" (Ministry of Trade, Industry and Fisheries, 2014 p.17).

Associate professor at BI Norwegian Business School, Sverre A. Christensen, who studies state ownership, says that private owners are more competent than a state is, but this only correct when it comes to small businesses. [3]

Numbers for 2013 show that the private investors own about 37% of the total share holdings listed on the Oslo Stock Exchange [4]. These investors contribute to a competent and diverse ownership, both in terms of innovation and cost minimization. They also help with the transferring knowledge and expertise to Norwegian companies, both private and publicly owned. The high ownership share shows that Norwegian workers, owners, and industry is competitive, even against several low cost countries.

Wages for workers in Norway with higher education within economics, management and innovation are quite similar compared to other countries, but Norway has on average quite high wages, which in turn requires higher productivity. In the long run, Norway should have a productivity of the last employee that corresponds approximately to the labor costs. Norway has to work smarter, with better technology, organize better and be more flexible to adjustments to compete with countries with lower costs, and to do that, they need the contribution of private investors. (Lie et.al, 2014)

The government is stating that private ownership should be the main rule in Norwegian industry, and that direct state ownership should be justified explicit.

What argues against a state to be an owner in competitive markets varies from company to company, but concerns towards state ownership is that it may contribute to economic- and political decisions (i.e. headquarters in Norway) that collides with profit maximization, which is the main why investors buy shares in companies.

On the other hand, state-owned companies are more secured than companies with a majority of more private investors. This was particularly evident during the financial crisis in 2008, where we for example saw DNB's ability to obtain financing dried out overnight. The Norwegian government had to sell government bonds to ensure continued operation for DNB, because they didn't have sufficient funds to cope with renewals of loans and credit. DNB was at that time almost the only bank that ensured liquidity to the market. In such cases, when companies owned by a state need funds, the state can be seen as a last alternative. It was in such a situation that DNB was taken over by the state in the early 90's during the banking crisis (more about this in 2.3.3). This in turn, may provide incentives to believe that things will eventually work out, because the state will lose more by not saving the company than to let it go bankrupt. Discussions around this imply good and well-planned corporate governance.

## 2.2 State ownership in other countries

When comparing state ownership<sup>4</sup> to other Nordic countries, Norway is by far the biggest owner measured in NOK. From government pages we have that Finland has an owner share of approximately 150 billion<sup>5</sup>, (Finland, 2014), Sweden about 80 billion (Sweden, 2013) and Denmark about 13 billion (Denmark, 2014).

Comparing against countries outside the Nordic, Norway has a very high state-owned owner share also here (Ministry of Trade, Industry and Fisheries, 2014).

Sweden has in recent years divested in Nordea from 21% down to 0%, which has given the government about SEK 60 billion. Reasons for the sale was to reduce government debt, but also the idea that a state should not be the owner of companies operating in commercial markets with well functioning competition (Sweden, 2013 p.5 and p.49).

---

<sup>4</sup> Companies publically listed.

<sup>5</sup> Finland has direct ownership with a value of approximately NOK 94 billion and an indirect ownership via Solidium with a value of approximately NOK 61 billion.

### 2.3 What do Norway own and why

Why the Norwegian state owns so much of the companies on the OSE has to do with a series of events. The government has not had a plan to buy all the companies, but they have been defined as strategically motivated purchases after the acquisitions. Examples of this are the basis of keeping headquarters in Norway and to hold most of the work, production and innovation in Norwegian industry.

Here I will give a brief explanation of what each company do, how many of the workers who actually work in Norway and how the returns has been in recent years. I also review some of the criticism that the companies have been exposed to. Company information is taken from either the companies' annual reports or the government's annual reports on state ownership. The returns are retrieved from State ownership report (2013).

#### 2.3.1 Statoil

Statoil was founded in 1972 under the reasoning that it was to secure national control of the oil operations, which were at that time dominated by international companies. Statoil has grown large, and is today one of the leading companies in their field. They were in 2013 the 20<sup>th</sup> largest oil company in the world by market value and 11<sup>th</sup> by revenue. [5]

In 2007 they merged with Hydro with the reasoning that they had to expand into the international market. They have today search- and production activities in 33 countries, and the production outside Norway was in 2013 about 29% of the total entitlement production (Statoil's annual report, 2013).

Statoil is the only stock in the portfolio that the government had a plan for all along. This is probably the most successful investment the government has done in newer time.

Statoil's stock return from 2003-2014 is about 300%, adjusted for dividends and splits. In the same period the STOXX Europe 600 index for oil & gas has a return of about 5%.

Statoil has 23 413 employees and 87% are working in Norway. The company has produced an average return of 10.4% over the last 5 years, excluded for dividends. Market value at 31.December 2014 of NOK 418 350 499 914.

Statoil's international activities have created debate and political discussions. Especially has the oil sand investments in Canada been under criticism. The oil recovery is regarded as a more negative environmental recovery process than more conventional methods.

Some say that the company could increase the revenues by only concentrating their operations in Norway. CEO of Statoil, (at that time), Helge Lund, told in mid-march 2014 that this was not a relevant plan, and said that Statoil needs to improve its competitive power [6]. He also defended the investments in North America, and said the investments were for the long perspective.

The question is whether the current owners can participate enough to expansion in the international market, or that others may be considered as better owners.

In 2000 when Statoil were listed on the OSE, Jens Stoltenberg said on a convention for The Labor Party that: *“For å kunne drive oljeproduksjon i andre deler av verden trenger Statoil nye partnere, ny kompetanse og mer kapital<sup>6</sup>”* (Lie et.al, 2014 p.80).

Today it is much of the same arguments that are being discussed.

### 2.3.2 Telenor

"Televerket", which Telenor was called until 1995, has been an important part of the infrastructure in Norway since it was founded over 100 years ago.

They had a monopoly until 1998 when new rules opened up for other companies to enter the market, but their transformation after that has been impressive. Since Telenor were listed in December 2000 on the OSE and NASDAQ, they have been searching for growth outside Norway. They are today an international company with operations in 13 countries excluding their JV's (Telenor's annual report, 2013).

Telenor's stock return from 2003-2014 is about 700%, adjusted for dividends and splits. In the same period the STOXX Europe 600 telecommunications has a return of 52%.

Telenor has 33 100 employees and 19% of them are working in Norway. The

---

<sup>6</sup> Translated it becomes: *“To run an oil production in other countries Statoil need new partners, new expertise and more capital”*.

company has produced an average return of 29.9% in the last 5 years, excluded for dividends.

Market value at 31.December 2014 of NOK 227 470 891 295.

Telenor is perhaps the state-owned company that has been subjected to most criticism, (at least when we do a quick search in Google with the words “Telenor” and “critics”.) This is mostly because of the investments in subsidiaries in many countries. Many of the countries are ranked high on the international corruption list from the Transparency International. [7]

The case with the most attention is the investment in Ukraine with the buy of 33% of the shares in VimpelCom in 1998. The stocks value has since January 2014 lost half its value, and Telenor’s share has decreased from over NOK 40 billion to just below NOK 20 billion.

The government has been very restrictive in talking about Telenor and its investments in subsidiaries, but now more people are pushing on the government to act, and Minister of Industry Mæland is being put under pressure to get answers from Telenor and CEO, Jon Fredrik Baksaas. [8]

Almost all of the company growth is happening in the foreign markets. From Telenor’s first quarter 2015 over half of the company revenue came from Asia, while Europe and Norway are both around 20% of the revenue distribution. [9]

Such a development alone is enough to re-assess and develop new reasons for the state ownership in Telenor.

### **2.3.3 DNB**

In 1992 the government rescued DNB after the banking crisis that had been ongoing since 1989. This crisis also contributed to several other banks got into trouble and were bought by foreign investors. DNB was then the bank Norway "had to have", and thus secured its ownership in.

DNB has a market share of 30% in the Norwegian loan market and 45% in the deposit market. The next on the list is Nordea with respectively 13 and 11%. [10]

DNB’s stock return from 2003-2014 is about 400%, adjusted for dividends and splits. In the same period the Euro STOXX financials has a return of 2%.



They have 12 452 employees and 72% of them are working in Norway. The company produced an average return of 36.8% the last 5 years excluded for dividends.

Market value at 31.December 2014 of NOK 180 308 033 913.

As for the example with Nordea, where the Swedish government has divested completely in, the question is whether the Norwegian state should consider doing the same with DNB. Norway does not need the money, but there have been discussions whether it will strengthen the banks possibility to grow through mergers and/or acquisitions abroad. 20% of the revenues to DNB came in 2013 from international units (DNB's annual report, 2013). It will also send a signal that the government is serious about its policy that the state should not be an owner in well functioning markets.

#### **2.3.4 Norwegian Hydro**

As oppose to Statoil and Telenor, Hydro has never been fully controlled by the government, and is also the company with longest history in the stock market – since 1907.

The company did many restructurings around 2000 with separation away from both salmon farming and petrochemicals, while the fertilizer operation became a new company under the name Yara International. The international business in oil and gas was in 2006 said to not be competitive in the long term. It was by this that Hydro decided to merge with Statoil's petroleum operations in 2007. Hydro then became a company solely in the aluminum business, but with still a substantial production of electric power in Norway. Hydro is seen as one of the leading companies in their industry.

Hydro's stock return from 2003-2014 is about 180%, adjusted for dividends and splits. In the same period, the Europe STOXX industrial has a return of 170%.

Hydro has 12 564 employees and 27% of them are working Norway. The company has produced an average return of 2.9% over the last 5 years excluded for dividends.

Market value at 31.December 2014 of NOK 87 808 286 833.

In Norwegian Hydro, the debate about a reduction in the shareholding have been pretty much non-existent in recent years, and there seems to be no reason to reduce it

either. It must be noted that Norwegian Hydro has the second lowest return in the state portfolio, with only having SAS lower on the list (more about this in chapter 5). By just looking at the return adjusted for risk, it might be a worthwhile debate from a profit maximization standpoint.

On the other hand, the company has a very high level of expertise in their field. This could help to develop the expertise of several Norwegian companies - a so-called cluster. This could to some extent compensate for the less satisfactory returns.

### **2.3.5 Kongsberg Group**

Norwegian defense technology was partially privatized and listed on the Oslo Stock Exchange in 1993, with the government as the largest shareholder with a share of 50%. The name was a few years later changed to Kongsberg Group.

The group involves activities in the maritime market and towards oil -and gas operations at sea. They have in the latter years produced highly advanced technology, including missile systems that the U.S military uses. The group also delivers electronic equipment within navigation- and position systems to the shipping industry.

Kongsberg Group's stock return from 2003-2014 is about 600%, adjusted for dividends and splits.

Kongsberg Group has 7 493 employees and 64% of them are working in Norway.

The company has produced an average return of 12.1% in the last 5 years excluded for dividends.

Market value at 31.December 2014 of NOK 14 760 000 000.

The government was given permission to reduce its shareholding from 50% to 34%, but the decision was later overruled in the parliament and the government will keep its 50%. The reason was that the company produces highly sophisticated military equipment, and Norway lacks legislation to ensure that this technology does not fall into the wrong hands. The reduction in the shareholding is now put on hold until the government has examined the consequences of a sale, and any new legislation is in place. [11]

### 2.3.6 SAS

The Norwegian Government currently owns 14.3% of the total shares in SAS. Sweden and Denmark are the two other big owners with a share of respectively 21.4% and 14.3%. The government is granted permission to sell all or part of the remaining shares in SAS (Norwegian Parliament, 2014).

The returns in SAS has been miserable for the government, with -96% in the period from 2003-2014, adjusted for dividends and splits. Take into account the risk-free rate and the investment yields a negative return of 138%.

SAS has 14 127 employees and 38% of them are working in Norway. The company has produced an average return of -26.7% the last 5 years excluding for dividends. Market value at 31.December 2014 of NOK 4 704 700 000.

After reaching an all time high in mid-June 2007, SAS has been under constant cost pressure with several consecutive issues to raise new capital. In 2009 there was an issue where the Norwegian government had to contribute with NOK 800 million, while a year later it was carried out yet another issue where the Norwegian government contributed with an additional NOK 575 million [12]. In the period up to the second issue, it was speculated from several quarters that the Norwegian government would not contribute with new capital, but rather sell their shareholding. From mid-2010, after the last issue, and to the end of 2014, the return for SAS shareholders is minus 35%.

In 2012, it was speculated that SAS could go bankrupt, but the Norwegian government said at the time that a new issue lap was out of the question. Later, this perception changed to that they would contribute to a new issue, but with certain requirements for SAS. SAS made then a contingency plan that should be followed to save the company. The issue was not carried out.

### 2.3.7 Yara International

Yara is a company with main focus on production, distribution and sales of nitrogen-based chemicals. After the separation from Hydro, Yara has continued to work on their strong position in foreign countries and is operating in 50 different countries and is selling their products to more than 150 countries. They have, fully- or part owned factories in almost every continent, and they are said to be the most cost efficient in

the world.

Yara's stock return from March 2004-2014 is about 700%, adjusted for dividends and splits. In the same period, the STOXX Europe 600 Chemicals has a return of 260%. Yara International is the stock in the state portfolio that has given the highest return. Yara has 9 759 employees and 10% are working in Norway. The company has produced an average return of 15% in the last 5 years, excluded for dividends. Market value at 31.December 2014 of NOK 92 204 831 295.

Yara International is the company with the best results in the state portfolio. Looking behind those results, the company was being investigated for a corruption case in both India and Libya involving four of the earlier senior managers. They were being accused for having paid bribes so that Yara could build a fertilizer plant in Libya and to secure a contract in India and Russia. Yara accepted the fine of NOK 295 million in January 2015 and thereby acknowledged the bribery of high-ranked officials, even though the former senior managers all denied this. [13]

After the National Authority for Investigation and Prosecution of Economic and Environmental Crime had come to their conclusion, Minister of Industry Mæland called the chairman of the board to a meeting to review what had happened in the case [14].

### **2.3.8 Cermaq**

Cermaq originally did business in corn and corn products before they went on to produce fish feed through a series of reorganizations on the mid-90's. In 2000 the company went on to salmon farming and started doing business in Norway, Chile, Canada and Great Britain. In 2005 the company were listed on the OSE. The company was sold on 21.October 2014 to Mitsubishi Corporation for NOK 8.8 billion leaving the government with their ownership of 59.2% approximately NOK 5.25 billion in cash. [15]

From late 2005 and to the sale, Cermaq's stock return was 340%, adjusted for dividends and splits.

They have 4 361 employees and 14% of them working in Norway. The company produced an average return of 36.6% the last 5 years excluding for dividends. Market value at 31.October 2014 of NOK 8 880 000 000.

### **2.3.9 Criticism**

Recurring criticism towards the companies seems to have one thing in common: the foreign operations, where the state is seen as a sort of hindrance. As many companies have learned, the expansion abroad is far from painless, and a government that owns a large part of the company will have trouble defending all the strategic investments being made. It is a balancing act between being a serious owner, while having responsibility beyond what a private owner has.

The problems stem from emerging economies, since they are an interesting focus area for many companies with growth ambitions. The Norwegian companies will find it difficult to pull out of these countries now without having to cope with potentially big losses for both the company and society. On the other hand, one can also look at it in the way that a commercial involvement can be an important bridge for economic modernization - including both corporate governance and management planning.

## **2.4 State divestment and strategy**

Here I will give a brief introduction to the strategies that the government has for the state-owned companies, before I look at some scenarios where the ownership to some companies will be reduced or completely sold.

### **2.4.1 Strategies for the government with the ownership**

The companies in the government portfolio have since 2006 been categorized under 4 different categories:

1. Companies with business objectives.
2. Companies with business objectives and national anchoring of the main office.
3. Companies with business objectives and others specified objectives.
4. Companies with sector political objectives.

SAS and Cermaq are under category number 1, while the rest of the companies listed on the OSE are under category number 2. The categories clarifies the government's ambitions and makes it easier for companies to adhere to the government's interests as

shareholders, and to follow up and further develop corporate governance from the stated ambitions.

As mentioned before, the government wants to sell the companies in category 1, where we know that Cermaq has already been sold, and that the government has given permission to sell all or parts of the remaining shares in SAS.

#### **2.4.2 Earlier debates about divestments in the companies**

It has for a long time been discussions about the government and their ownership shares in the companies. From Nærings- og handelsdepartementet (2002), it was announced in a state ownership message that the government would ask for permission to reduce its owner share in Norwegian Hydro from 43% to 34% and in Kongsberg Group from 50% to 34%. They had at that time already authorization to sell shares in Telenor from 78% to 34%, DNB from 47% to 34%, and to open up for more private investors in Statoil (82%) with 1/3 of the company value [16].

Norwegian Hydro's shareholding was not reduced before 2012 - ten years later.

Kongsberg Group is at the same level as then (50%), while DNB was reduced the same year. Telenor was reduced to 62% in 2004 and reduced again in 2005 to what is today's current level (54%).

From official Norwegian report 2004:7 (2006) there was given an assessment to the government regarding its commercial ownership.

The report stated that the government should focus on the results for the invested companies and compare them with alternative investment opportunities. The committee suggested that the government should consider the level of achievement each company had in relation to what was expected, then the total state ownership as a whole. The report also stated that there should be good reasons for a state to operate in competition with others, and that a state is best as an owner when they own together with others. From this, when they own together with others, they should also act as other owners also.

In my analysis, each company will be assessed against the equity markets - foreign and domestic - to see which companies that give satisfactory results.

### 2.4.3 Opposition and support for selling

The debate about state ownership goes back a long time and is not something that has recently emerged. However, after the new government took over in autumn 2013 the debate about state ownership flared up again.

Ingebrigt Steen Jensens facebook campaign with the header “*Nei til salg av Norge*<sup>7</sup>” is a good example of this. The page has increased in rapid speed since it was made public and has now about 30 thousand "likes", or about 0.6% of the total Norwegian population. The slogan is very efficient, hitting national sentiments among the population.

When the previous government with Minister of Industry Giske in 2011 said that they wanted to sell Cermaq and SAS, and to list the property company Entra on the OSE, there was no campaign against this. But when the new government announced that it wanted to sell flytoget, feelings grew stronger. Flytoget is a company located in category number 1 - Companies with business objectives. In other words, the category in which the government has profit as its main goal. One would almost think that Flytoget was the jewel in the Norwegian industry when hearing the ongoing debate.

The problem is when emotions take over, because then it's probably no argument in the world that can penetrate this. This does not mean that emotions are wrong, but when we have access to the facts, and they can give a clear answer, the facts should be the superior choice.

To give an example; a state's main source of income comes from tax revenues. When the state also owns many large companies, a downturn in these share prices provides a loss in both the investment and tax revenues. By selling some of the shares, the risk is reduced, and the government portfolio becomes more diversified. Here Statoil is a good example of high risk. They pay a lot in taxes, and the ownership share of the Norwegian state is high, and Norway is dependent on oil, especially the oil price, which Statoil also is.

---

<sup>7</sup> Translated it becomes: ” *No to the sale of Norway*”.

In Table 1, we see the updated state portfolio by 31.12.2014. The state has ownership interests in seven companies, and we see Statoil and Telenor are the two highest value-weighted companies. Combined they account for over 75% of the portfolio, and thus the return of the portfolio depends heavily on these two companies.

**Table 1: The State portfolio by 31.12.2014.**

Company	%-share Owned	Number of stocks	Price	Market Value	Market Value State	Value-Weighted
Cermaq	0.0%	92 500 000	96	8 880 000 000	-	0.0%
DNB	34.0%	1 628 798 861	110.7	180 308 033 913	61 304 731 530	11.4%
Kongsberg Gruppen	50.0%	120 000 000	123	14 760 000 000	7 380 000 000	1.4%
Norsk Hydro	34.3%	2 068 998 276	42.44	87 808 286 833	30 118 242 384	5.6%
SAS	14.3%	329 000 000	14.3	4 704 700 000	672 772 100	0.1%
Statoil	67.0%	3 188 647 103	131.2	418 350 499 914	280 294 834 942	52.3%
Telenor	54.0%	1 501 458 030	151.5	227 470 891 545	122 834 281 434	22.9%
Yara	36.2%	276 227 775	333.8	92 204 831 295	33 378 148 929	6.2%
Average owned	36.2%		Sum	1 034 487 243 500	535 983 011 319	100%

If the government decides to sell the entire shareholding in SAS and decrease the shareholding to 34% in Telenor, the value-weighted portfolio will look like this:

**Table 2: Updated state portfolio after selling SAS and divesting in Telenor.**

Company	%-share Owned	Number of stocks	Price	Market Value	Market Value State	Value-Weighted
Cermaq	0.0%	92 500 000	96	8 880 000 000	-	0.0%
DNB	34.0%	1 628 798 861	110.7	180 308 033 913	61 304 731 530	12.5%
Kongsberg Gruppen	50.0%	120 000 000	123	14 760 000 000	7 380 000 000	1.5%
Norsk Hydro	34.3%	2 068 998 276	42.44	87 808 286 833	30 118 242 384	6.1%
SAS	0.0%	329 000 000	14.3	4 704 700 000	-	0.0%
Statoil	67.0%	3 188 647 103	131.2	418 350 499 914	280 294 834 942	57.2%
Telenor	34.0%	1 501 458 030	151.5	227 470 891 545	77 340 103 125	15.8%
Yara	36.2%	276 227 775	333.8	92 204 831 295	33 378 148 929	6.8%
Average owned	31.9%		Sum	1 034 487 243 500	489 816 060 910	100%

The portfolio value decreases from NOK 535 billion to about NOK 490 billion, a decrease of 8.4%. The proportion owned of the total value of stocks, both Norwegian and foreign, on the Oslo Stock Exchange, decreases from 29.8% to 27.1%.

Statoil shares gets even more weighted (from 52.3% to 57.5%), and the question is whether it might be a good idea to reduce this shareholding as well. If for example, we assume that the shareholding is reduced to 51%, then this would reduce the risk, and the value-weighted share in Statoil will go from 57.5% to 50.7%. This is also too high considered good portfolio theory, where we can assume that one stock should not be value-weighted more than all the others stocks combined (Roncalli, 2010).

#### 2.4.4 Effects with a divestment

Generally, a divestment from the state will argue for less government interference and increased flexibility and independence for the companies, which will potentially make



it easier to operate abroad and to conduct good corporate governance. The shares will get more liquidity and a more appropriate price, with less volatility.

There are some who argue that there is a government discount in the companies the state owns. This is empirically difficult to agree with because of efficient markets, and there is no paperwork that can conclude that this is the case (see Ødegaard, 2009).

The discount means that a foreign investor will get a discount because of the increasing risk they are taking by investing in a company where a state is the majority owner.<sup>8</sup>

In for example Statoil and Telenor, a divestment from the current 67% to 51% and from 50% to 34%, would give the government a lot of the same control as before, but it would provide added value for the remaining shares since they would get more owners.

One proposal that has been raised is to give the Norwegian people a discount if there were going to be a divestment in one or both companies. This would increase the Norwegian people's appetite for stocks, and perhaps move some of the investments away from real estate. This was done under the listing (IPO) for Statoil's shares in 2001 where the original price was NOK 69, but the Norwegian people could buy the stock for NOK 66 – a discount of 4.3%.

This is a suggestion that has been denied by the Minister of Industry Mæland. [17]

---

<sup>8</sup> From my calculations, the risk seems to be fairly low, with some few exceptions (this is when calculating against the Norwegian market).

### 3. Theory

Here I will go through the different methods used to derive the CAPM, the different alphas and the risk measures.

#### 3.1 Relative returns

When calculating the long-term interest rate I use geometrical average return, since it gives the best picture of the long-term returns.

The geometrical average will in any case be lower than the arithmetical returns.

The difference between these two will be bigger when the deviations are bigger in the periods calculated. In comparison with similar studies, it may occur differences due to the choice with regards to the calculations of the return (Gjesdal og Johnsen, 1999).

For the math, see Cartwright & Field (1978).

The most natural thing is to take the logs of the stock price, and then calculate the difference.

$$\ln(p_{t+1}) - \ln(p_t) \quad (1)$$

I calculate the returns by using equation (1) and so the difference in geometrical and arithmetical average will not matter. The relative returns in this thesis are the returns for a stock, portfolio or index that has not been adjusted for risk.

#### 3.2 CAPM

This paper will be based on the CAPM model for calculating risk and expected return.

Models and equations are derived from Jensen (1968) unless otherwise stated. The model is based on the assumptions that:

1. All investors are averse to risk, and are single period expected utility of terminal wealth maximizers.
2. All investors have identical decision horizons and homogenous expectations regarding investment opportunities.
3. All investors are able to choose among portfolios solely on the basis of expected returns and variance returns.

4. All transactions costs and taxes are zero.
5. All assets are infinitely divisible.

This gives the following model:

$$e(r_i) = r_f + \beta_i[e(r_m) - r_f] \quad (2)$$

Where  $e(r_i)$  is expected return to stock  $i$ ,  $r_f$  is the risk free rate,  $\beta_i$  is the stocks beta relative to the market and  $r_m$  is the market return.

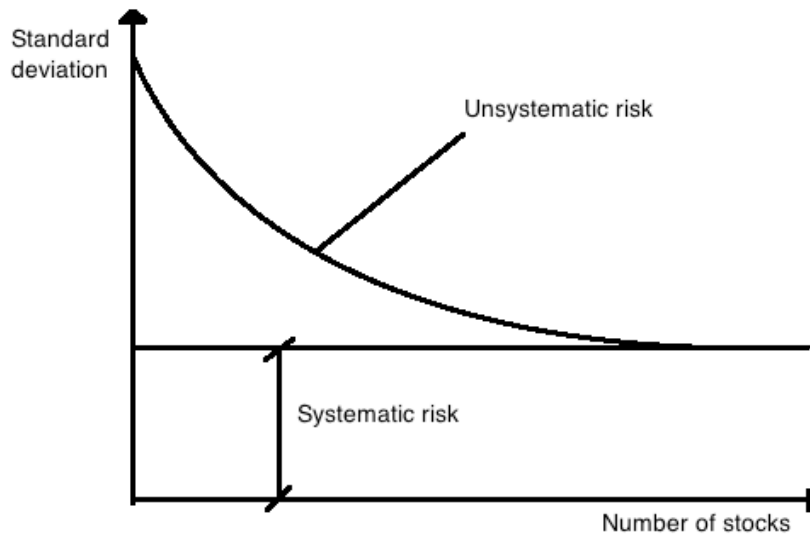
The standard deviation to the return,  $\sigma$ , is a measure of the risk. It is defined as the square root of the variance  $\sqrt{\sigma^2}$ , and shows how much the data varies over time.

The equation tells us what a portfolio can be expected to return given it's level of systematic risk,  $\beta_i * \sigma_m^2$ . When picking stocks for a portfolio, the systematic risk is given, while the unsystematic risk,  $\sigma_\epsilon^2$ , can be diversified away (see figure 1).

From equation (2), the investors are compensated for the extra risk they are taking.

The unsystematic risk represents the part of a stock that is unrelated to the stock market. This could be anything from a delivery delay to a new product entering the company industry. The unsystematic risk (which is the  $R^2$  in the regressions), tells us how variations in returns to a variable (Y) can be explained by variations in returns for another variable (X).

**Figure 1: Diversification effect**



The purpose of this thesis is to calculate and verify alphas for various portfolios and indexes. Alpha is a measure of performance on a risk-adjusted basis. Therefore, returns outside the normal may be calculated from the CAPM model as follows:

$$r_i - r_f = \alpha_i + \beta_i[r_m - r_f] + \varepsilon_i \quad (3)$$

where  $\varepsilon_{i,t}$  is the error term with an expected value of zero. Comparison of alphas for two different portfolios should give equal values according to theory and efficient markets, thus  $\alpha = 0$ . In stock analysis the purpose is to find stocks that provide  $\alpha > 0$  compared to a benchmark.

Equation (3) tells us that the regression line intersects the y-axis at a point ( $\alpha$ ), which in this thesis will be the stocks- or the portfolios abnormal return.

### **3.3 Fama French Three Factor Model**

From Fama French (1992) they conclude, after testing for E/P, B/M, leverage and market size, that  $\beta$  gives little information about average returns. While used alone, Fama French (1993) finds that the E/P, B/M leverage and market size does have explanatory power. These findings are quite opposite of what we might think, because the normal thing to assume is that the  $\beta$  should have explanatory power, while factors like E/P, B/M, leverage and size don't have explanatory power.

Fama French (1995, p.131) states, “*If stocks are priced rationally, systematic differences in average returns are due to differences in risk.*”

From this, a three-factor asset pricing model that both include market factor and risk factors related to size and B/M are likely to capture the average of returns on U.S stocks (Fama French, 1993),

$$r_i - r_f = \alpha_i + \beta_m(r_m - r_f) + \beta_{SMB}SMB + \beta_{HML}HML + \varepsilon_i \quad (4)^9$$

where SMB is the smallest companies in the index minus the largest and HML is the companies with the highest book-to-market value minus the companies with the lowest book-to-market value. To use equation (4), a fixed effects model is preferred. Fama French (1995) point out that firms with low B/M is typically firms with high average returns on capital, while high B/M is typically firms that are having financial problems.

### 3.4 Calculating Alpha

According to Ødegaard (2009), the alpha can be calculated by the regression,

$$er_i = \alpha_i + \beta_i er_m + \varepsilon_i \quad (5)^{10}$$

where  $er$  is the excess return,  $\alpha_i$  is the alpha and  $\beta_i$  is the beta. If the CAPM is correct such a regression should give

$$\alpha_i = 0$$

If there are excess or a negative excess return, this is found by  $\alpha_p \neq 0$ .

The regression (5) assumes that the risk of the portfolio for the government is constant over time, which is difficult to agree with.

Ødegaard (2009) then introduce a new formulation that makes us change the risk over

---

<sup>9</sup> This equation will not be used in this thesis, but the interpretation of the beta is important to know.

<sup>10</sup> The same equation as derived by Jensen (1968).

time. We calculate at each point  $t$  a realized alpha,

$$\alpha_{pt} = er_{pt} - \beta_{pt}er_{mt} \quad (6)$$

where  $\beta_{pt}$ , beta of the portfolio is calculated as a weighted average of the estimated betas for each stock. This gives the opportunity to have the "right" risk at the right time. This calculation also has limitations since the calculation point in the regression has the risk for the two previous years, while the risk at the calculation time may have changed.<sup>11</sup>

It is equation (5) and (6) that will be the basis for my further calculations when starting to regress the data.

Equation (6) is not a “mainstream” method of calculating the alphas, but is used when we don’t want to have a constant portfolio risk over time. This is because the portfolio weight has changed (and hence risk), since it for example have been divestments in companies, while there also have been acquisitions of others.

A potential weakness with this method is that the alphas no longer can be interpreted as the profit/loss by alternatively holding the constant market portfolio in the calculated period. The method weighs in many ways up for this by taking into consideration the floating risk, and that the different alphas is compared against the same benchmark for two or more variables.

What could have been done instead is to make new variables for alpha and beta for each second year and from that compare the different alphas. Using the GLS<sup>12</sup> instead of the OLS that I use could solve the heteroscedasticity problem. This method should give the same results as when we calculate by using equation (5) (by dividing the period up into six parts, and make dummy variables for the 5 other periods), and I therefore use equation (6) instead. As I will show, the heteroscedasticity is taken into consideration when using the OLS method, and further calculations is corrected for this.

---

<sup>11</sup> This is especially the case in 2008, which is some of the reason why I remove 6 months of this year when I regress the two sub-periods (more about the two sub-periods in 4.3).

<sup>12</sup> GLS is more efficient than OLS when dealing with autocorrelation or heteroscedasticity. For larger samples (not what we have), the FGLS is preferred over GLS.

### 3.5 Sharpe ratio (SR)

To calculate the performance, that uses volatility as a risk measure, I use the Sharpe ratio (Sharpe, 1966). It divides the excess return of an asset  $i$  over a risk-free interest rate by the assets volatility.

$$SR_i = \frac{r_i^d - r_f}{\sigma_i} \quad (7)$$

where  $r_i^d$  is the mean asset return,  $r_f$  is the risk-free rate and  $\sigma_i$  is the standard deviation.

Risk-averse investors prefer high returns and low volatility, thus the highest Sharpe ratio should be chosen when assessing investment possibilities.

#### 3.5.1 Adjusted Sharpe ratio (ASR)

To calculate the adjusted Sharpe ratio, the measures of skewness and kurtosis are explicitly included.

Skewness (S), measures the asymmetry of the probability distribution of a random variable ( $r$ ) around the mean ( $\mu$ ). From Wiesinger, (2010, p. 11-12) we get

$$S = \frac{\frac{1}{T} \sum_{t=1}^T (r_t - \mu)^3}{\sigma^3} \quad (8)$$

Skewness yields positive right-skewed distributions when values are concentrated in the left side of the distribution. Negative values yield the opposite.

The calculations for the skewness-test for the different portfolios in this thesis yield in every case a negative value indicating left-skewed distribution.

Risk-averse investors prefer returns with positively skewed distributions.

Kurtosis (E), describes the degree of “peakedness” of a distribution when compared to a normal distribution.

$$E = \frac{\frac{1}{T} \sum_{t=1}^T (r_t - \mu)^4}{\sigma^4} - 3 \quad (9)$$

A high value indicates a concentration of values around the mean and at the tails of the distribution.

Risk-averse investors prefer distributions with low kurtosis.

Pezier and White (2006) then derive the ASR-equation taking into consideration that investors prefer positive skewness and negative excess kurtosis.

$$ASR_i = SR_i \left[ 1 + \left(\frac{S}{6}\right) SR_i - \left(\frac{E}{24}\right) SR_i^2 \right] \quad (10)$$

where SR is the Sharpe ratio, S is the skewness and E is the kurtosis.

### 3.6 Appraisal ratio (AR)

For this thesis, the appraisal ratio and the information ratio<sup>13</sup> are considered the same thing.

The appraisal ratio measures the abnormal return per unit of unsystematic risk.

$$AR = \frac{\alpha_p}{\sigma(e_p)} \quad (11)$$

where AR is the appraisal ratio,  $\alpha_p$  is the alpha and  $\sigma(e_p)$  is the unsystematic risk.

A high ratio means the allocation of stocks in a portfolio is good compared to the market. This will also mean that the market has to be inefficient.

From Grinold & Kahn (2006) the level of this ratio should lie around 0.5 for a good top-quartile manager, 0.75 for a very good one and 1 for an exceptional one.

This sort of calculations should give the same indications as the alphas calculated in the later regression, only adjusted for a constant (residual volatility). As for the significance level it will be the same as the calculated alphas from equation (5).

---

<sup>13</sup> Information ratio is a measure of performance that considers the excess return relative to the risk a portfolio or a stock has taken compared to the market portfolio.



### 3.7 Treynor ratio (reward-to-volatility ratio)

Developed by Jack Treynor (1965). The Treynor ratio is similar to the Sharpe ratio with the exception of a different measure of risk. It measures the excess return over a risk-free rate per unit of systematic risk (beta).

$$T_p = \frac{r_p - r_f}{\beta_p} \quad (12)$$

where  $r_p$  is the return of the portfolio,  $r_f$  the risk-free rate and  $\beta_p$  is the portfolio's beta.

The stock market's Treynor ratio is expressed as:

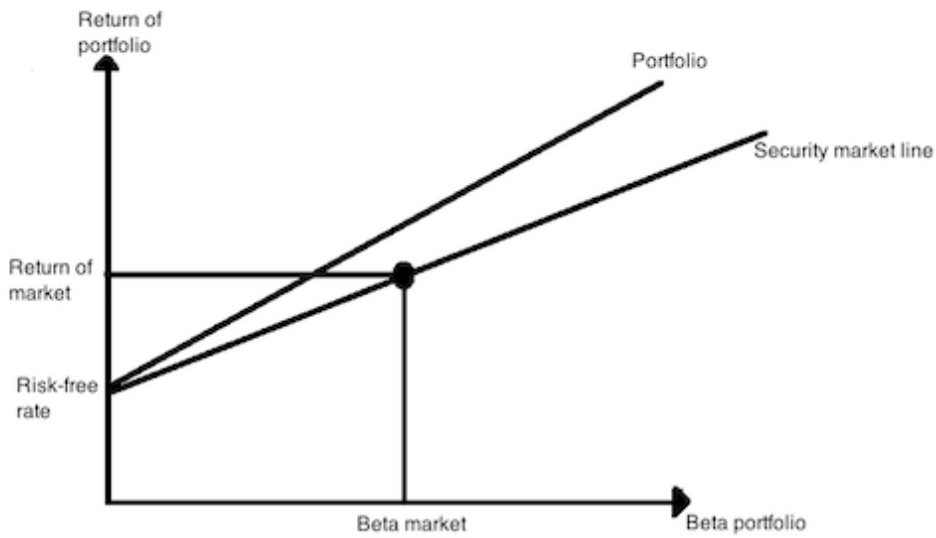
$$T_m = \frac{r_m - r_f}{\beta_m} \quad (13)$$

where  $r_m$  is the market's stock return and  $\beta_m$  is the market's beta. Since the systematic risk of a market per definition is 1, equation (13) will become:

$$T_m = r_m - r_f \quad (14)$$

The Treynor equation for the market specifies the slope of the security market line. If a portfolio has a higher Treynor ratio than the market, the slope for the portfolio is steeper indicating that the portfolio has done it better (figure 2).

Figure 2: Treynor ratio



### 3.8 Modigliano and Modigliano ( $M^2$ )

The  $M^2$  (Modigliani & Modigliani, 1997) is a newer performance measure, which also is correlated with the Sharpe ratio. It adjusts the portfolio with help of a risk-free asset<sup>14</sup> so that the portfolio gets the same standard deviation as the market portfolio. From here it is easy to compare the level of achievement by just comparing the returns. It is expressed as:

$$M^2 = r_{p^*} - r_m \quad (15)$$

where  $r_{p^*}$  is the adapted portfolio after the risk-free asset is used.

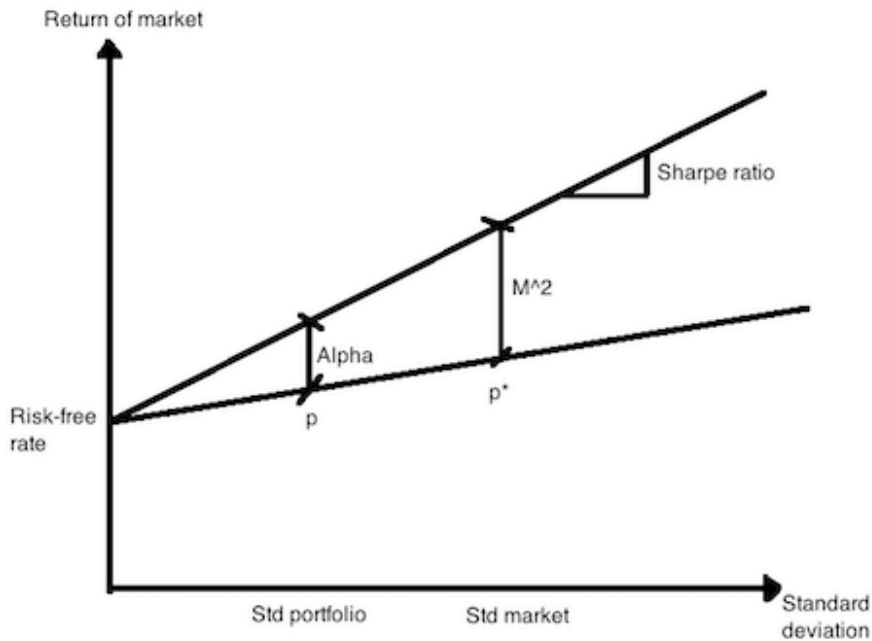
This means that the  $M^2$  is the portfolio's average return minus the market's average return.

To compare it with the Sharpe and the alpha, I use a figure.

---

<sup>14</sup> This may be a government bond.

Figure 3: Alpha,  $M^2$  and Sharpe ratio.



As we see here, the  $M^2$  is nothing but a positive linear transformation of the Sharpe ratio. A rank between the portfolios based on either Sharpe or  $M^2$  will always be the same.

Figure 3 also shows how an alpha can increase the slope (Sharpe) to a portfolios capital allocation line.

The different risk measures yield many of the same values (indications) when calculated separately. In this thesis the Sharpe- and adjusted Sharpe ratio will be calculated along with the appraisal ratio. As for the rest with Treynor and  $M^2$ , these will give the same indications as the ones that will be used, and they are therefore redundant.

## 4. Data handling and Methodology

Here I will briefly go through the indexes that I use, and how the risk-free rate is obtained. I then show how I have assembled the state portfolio from the stocks that the government has owned in the period 2003-2014. Then I explain the three periods I use before I finish this chapter by showing how the regressions are handled.

### 4.1 Stock prices, indexes and risk-free rate

To get a comparison against the world stock market, I use the STOXX Global 3 000 index [18], hereby referred to as “World”, which has a fixed number of 3000 components that represent the foreign equity market. The prices used from the index are in dollars.

The Global Pension Fund Global of Norway<sup>15</sup>, hereby referred to as “SPU”, is used as the other portfolio (along with the state portfolio), since it is here the money from a potential sale will be invested. The benchmark that SPU use is the FTSE Global All Cap-index (NBIM, 2015), hereby referred to as “FTSE”, and is the other global index used. The FTSE includes approximately 7 400 stocks of companies located in 47 countries, including both developed- and emerging markets. [19]

The OSEBX-index is used as the benchmark for the Norwegian market. It consists of 55 stocks, and is representative for the whole Norwegian market.

SPU and the FTSE returns are retrieved from excel sheets from the Norwegian Bank Investment Management home page [20], while the World- and OSEBX-index is retrieved from their respective home pages.

The World-index is included in this thesis for the reasoning to use it as a supplement to the FTSE-index. It “only” has 3 000 components, compared to the FTSE who has 7 400. From this the results may be more negatively biased in relation to investments in small companies, and emerging markets. This also gets an effect when we take into account the risk, since the beta for the World-index may deviate more than the FTSE-index.

All the indexes are adjusted for dividends and splits, and are in monthly returns.

---

<sup>15</sup> I only look at the stock portfolio

For the risk-free rate, the 3-month NIBOR from Norway is used [21]. It is calculated into daily rates, and then aggregated into monthly rates in *Stata*. The rate that is used is from the period  $P_{t-1}$  when the investment happens in period  $P_t$ , since this is the rate an investor could have gotten by having invested in period  $P_{t-1}$  instead of  $P_t$ . It is assumed 250 trading days in one year.

$$\text{Daily rates: } (1 + r)^{\left(\frac{1}{250}\right)-1} \quad (16)$$

#### 4.2 Making a state portfolio

To get this exactly right we need to construct a portfolio for all the stocks the government owns at each time. To make things a bit easier, I reallocate the portfolio once a year corresponding to the value by 1.1 from 2003-2014 (see appendix 23). I also reallocate every time there is a divestment/acquisition of a stock. For example, if the government buys shares in a company in June, the reallocation is happening the first trading day the following month (July).

The returns for each stock in the state portfolio are adjusted for dividends and splits by my supervisor, Espen Sirnes.

The values used to calculate the value-weighted portfolio is taken from the state ownership reports for the years 2002-2013, while the last year is calculated from the stock price at closing 30.12.2014. The value of the OSE is taken from excel-sheets from Oslo Stock Exchange home page for each year. This is the value from all listed companies (OSEAX) [4].

#### 4.3 Two sub-periods

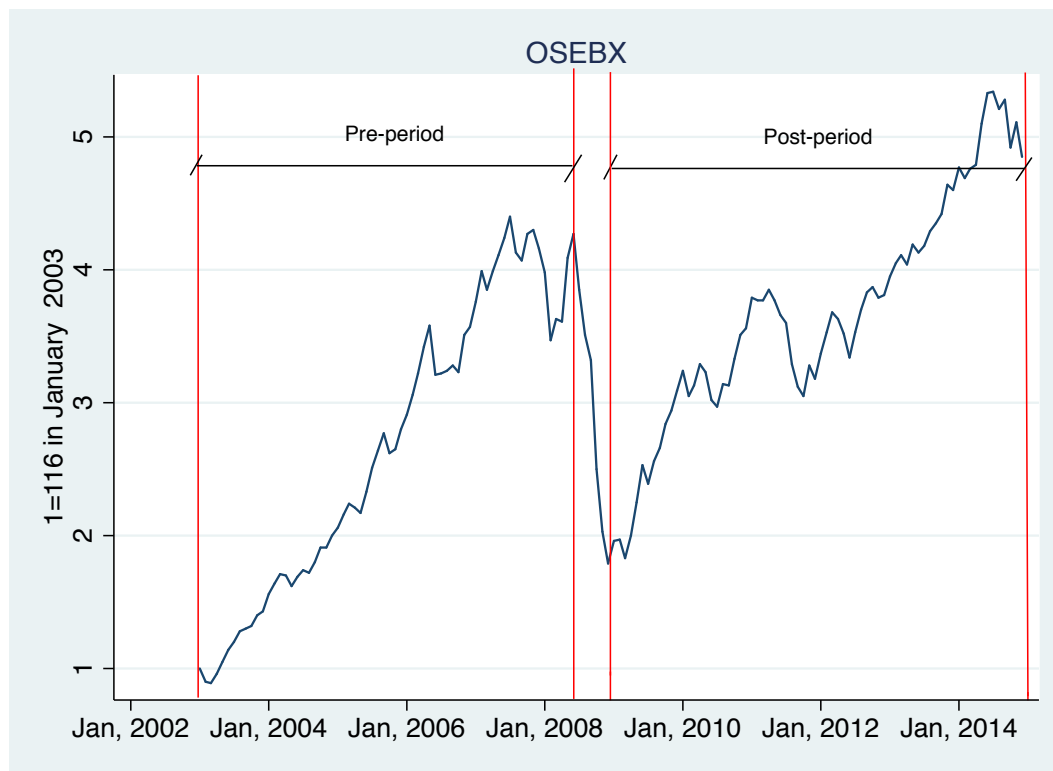
To check returns both before and after the financial crisis, I divide the regressions into two sub-periods, as well as an entire period consisting of both the two sub-periods. The first period goes from 1.january 2003 to 30.june 2008, and is called the “pre-period”.

The second period goes from 1.january 2009 to 30.december 2014 and is called the “post-period”.

As you may notice, the period from 30.june 2008 to 31.december 2008 is not

included. The reason is because of the extreme volatile market in that period, and this would get an effect when calculating the risk-adjusted return in the sub-periods due to the restrictions in the number of observations. The period is however present in the calculations when regressing the whole period.

**Figure 4: The two sub-periods shown graphically with the OSEBX-index.**



The pre-period is characterized by an upward sloping trend until the middle of June 2008, before the financial crisis occurs. The OSEBX-index drops more than 50% in 6 months, and it takes over 5 years to come back to the level before 2008.

The second period has more or less the same upward sloping trend (as the pre-period has) until December 2014, only interrupted by the European crisis in early 2011. Even though the pre- and post-period look alike, the differences between the two foreign markets and the Norwegian market is quite different in returns, with the Norwegian market doing it much better than the two foreign indexes in the pre-period and more alike in the post-period (see appendix 7).

To compare with the risk-free rate I use in the regressions, (see appendix 2) we see that the levels of the 3-month NIBOR dropped heavily from January 2003 to January

2004 due to the after shock of the “dot-com bubble<sup>16</sup>” leading to a strong NOK due to differences in the interest rates. After 2004 it has the same trend as the Norwegian market, until after the financial crisis where we see the rate and the market moving in opposite directions.

The bigger picture tells us that the Norwegian interest rate and the return of the financial market were positive correlated from January 2004 until late 2011. After that there is more or less a negative correlation between them.

The normal it to assume that low rates imply an increasing interest towards the stock market, since the risk-free rate, indicated by the 3-month NIBOR, is eaten up by inflation leading to lower relative returns.<sup>17</sup>

#### 4.4 Regressions

The regression examines the relationship between two variables. We use it to estimate the effect of changing one variable over another. The variable one wishes to examine is the dependent variable (Y), while the independent variable (X) is the one(s) that is used to predict variable Y.

$$Y_t = \alpha + \beta X_t + \varepsilon_t \quad (17)$$

where  $\alpha$  is the constant,  $\beta$  is the ratio (or slope) between  $X_t$  and  $Y_t$  and  $\varepsilon_t$  is the error term.

The most common method is to use the ordinal least square method (OLS), where we can draw a straight line between the observed values of a set of data. To do this, equation (17) is used. This yield the best estimate for the real values that we get, typically referred to as  $\hat{\alpha}$  and  $\hat{\beta}$ . The error term becomes  $\hat{\varepsilon}$ , and is the difference between the value of  $Y_t$  and the estimated  $\widehat{Y}_t$ .

$$\widehat{Y}_t = \hat{\alpha} + \hat{\beta} X_t \quad (18)$$

$$Y_t - \widehat{Y}_t = \hat{\varepsilon}_t \quad (19)$$

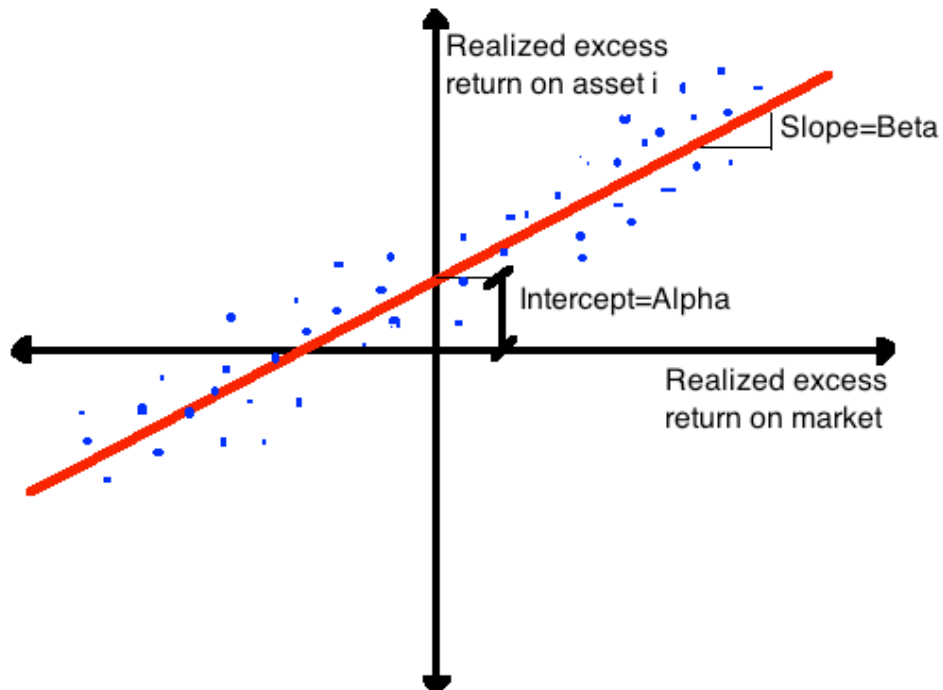
---

<sup>16</sup> The dot-com bubble was an event that occurred in the period from 1997-2000, where there was a rapid rise in the technology sector. The bubble was at its peak in mid March 2000.

<sup>17</sup> This is just one of many interpretations. There is no guarantee that a raise in the interest rate will have a negative effect on stock prices.

When summing the actual values of  $Y_t$ , the upside and the downside cancel each other out, and the sum becomes zero. This is because the regression line shows the average of the data.

**Figure 5: The regression analysis with the OLS method.**



#### 4.4.1 Conditions for the regression

When carrying out the regressions, there are five assumptions of the model. From Griffiths et.al (2012) we have:

1. The value of  $Y$ , for each value of  $X$ , is  $Y = \beta_1 + \beta_2x + \varepsilon$
2. The average value of the random error  $\varepsilon$  is  $E(\varepsilon) = 0$  since we assume that  $E(Y) = \beta_1 + \beta_2x$ .
3. The variance of the random error  $\varepsilon$  is  $var(\varepsilon) = \sigma^2 = var(Y)$ .
4. The covariance between any pair of random errors,  $\varepsilon_i$  and  $\varepsilon_j$  is  $cov(\varepsilon_i, \varepsilon_j) = cov(Y_i, Y_j) = 0$ .
5. The variable  $X$  is not random and must take at least two different values.

Under these assumptions, the estimators have least possible variance of all the linear and indifferent estimators, also called BLUE (best linear unbiased estimators).



To measure how well the dataset fits the model, the  $R^2$  is used. It is a number between 0 and 1 that indicates how much of the variance of a variable that is explained by the model itself. A high number indicates that the model explains the changes in the dependent variable well and there are small deviations between the observations and the estimated regression line.

#### 4.4.2 Violations of the conditions

Heteroscedasticity tells us that the variances to the error terms shall be constant. This means that the variance cannot differ with respect to time or size on the variables. A breach to this leads to heteroscedasticity. Failure to do this may lead to wrong conclusions that the conditional distribution of returns is much larger in the tails than a normal distribution (Seguin, 1989).

I test for heteroscedasticity by doing the Breusch-Pagan (1979) test<sup>18</sup> in *Stata*, where a significant result leads to accepting that there is heteroscedasticity in the data.

Each portfolio and index gives significant results, indicating the presence of heteroscedasticity<sup>19</sup>. This means that variables can be affected by the error terms from the other variables in the model. This will not affect the estimation of the beta and alpha, but this can lead to significance of a variable that is not significant and vice versa.

To check whether this has affected the calculations, I run the regressions in *Stata* with the presence of robust standard errors that will take into consideration that there is heteroscedasticity in the data and correct for this. The regressions significance levels only changes for a small value, which we cannot say is changing the end result to the degree that it becomes significant or not. I though proceed with the regression equation (17) when having corrected for heteroscedasticity.

Another condition for the regression analysis is that the error terms can't be affected by earlier error terms. If they are affected it will lead to autocorrelation. Presence of autocorrelation may yield misleading results for the alphas and betas. To check for autocorrelation, a Durbin-Watson (1951) test is used.

$$d = \frac{\sum_{t=1}^{n-1} (\hat{u}_{t+1} - \hat{u}_t)^2}{\sum_{t=1}^n \hat{u}_t^2} \quad (20)$$

---

<sup>18</sup>  $\hat{\mu}^2 = \gamma_0 \gamma_1 x + v$

<sup>19</sup> I haven't made a table of this.

where  $\hat{u}_t$  represents the residuals of the  $i$ th observation.

The Durbin-Watson test in *Stata* gives values ranging from 1.61 to 2.31 for all regressions. A common rule of thumb is that if the Durbin-Watson statistic is in the range of 1.5 to 2.5, we assume that autocorrelation is not prominent.

Even though the values are within the specified range, I check the outliers. To do this, I run the Cochrane-Orcutt procedure. Here I estimate a model from the OLS (equation 17), and thereafter use the error terms to find the parameters for the autocorrelation. This test automatically adjusts the X- and Y variables, and tests for first order autocorrelation.<sup>20</sup>

After doing this in *Stata*, I run the Durbin-Watson test again. The values are now in the range from 1.98 to 2.02. The X- and Y variables do not change to the extent that it will affect the end result, and I therefore continue with the OLS model when only having corrected for heteroscedasticity.<sup>21</sup>

When testing the hypotheses, there is always a chance of making an error, and we usually deal with two types:

Type 1: When we reject the null hypothesis when it is true.

This type of error is easy to avoid – just by narrowing the significance levels. If for example an error is costly, we make the level small (0.01).

Type 2: When we do not reject a null hypothesis that is false.

This type of error we cannot control or calculate the probability of it actually being wrong, because it depends on the unknown true parameter  $\beta_k$ .

In this thesis, if there is a conclusion that the portfolio or index has managed a significant alpha, when in fact it hasn't, it is committed a type 1 error.

On the other hand, if the null hypothesis is accepted when the portfolio or index has a significant alpha, then it is committed a type 2 error. The chances of making this type of error will decrease with increasing number of observations.

---

<sup>20</sup> There were not tested for higher order autocorrelation.

<sup>21</sup> The math and calculations I have chosen not to include in the thesis, since this sort of calculations doesn't change the regression equations.

#### 4.4.3 The null- and alternative hypothesis

The null hypothesis for the regressions are:

$H_0 =$  *There is no significant excess return of owning the state portfolio*

And the alternative hypothesis will thus become:

$H_1 =$  *There **is** a significant excess return of owning the state portfolio*

## 5. Results

I will first go through the unadjusted returns for the portfolios and indexes so we can get an overview over how good the different markets and stocks have done it. I then go through the risk measurements, before I implement this into the unadjusted returns to get the alphas and realized alphas. I then summarize the results by comparing the OSEBX and state portfolio up against the foreign indexes and SPU.

### 5.1 Relative returns

From the graphs (see appendix 3 and 6), there are three stocks; Statoil, Norwegian Hydro and SAS that end the period from 2003-2014 with a lower return than the broader Norwegian market. Telenor, Kongsberg Group, Yara and Cermaq do it much better than the market, while DNB finishes approximately at the same level.

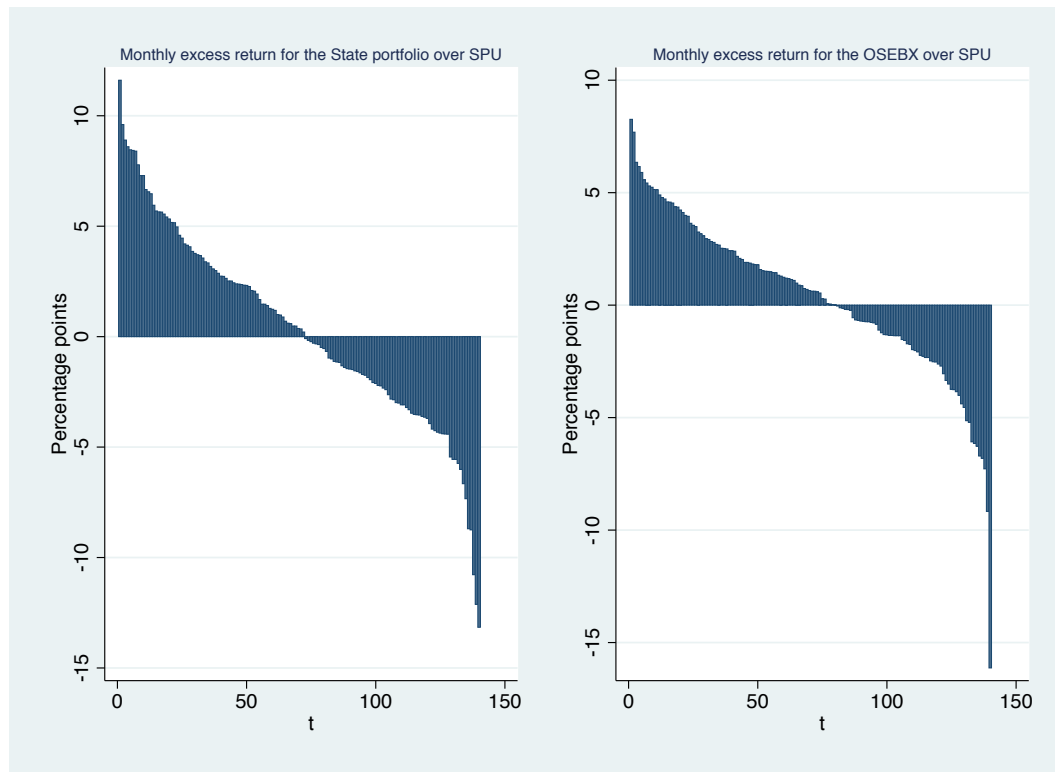
**Table 3: Relative returns for the two portfolios and three indexes.**

	State portfolio	OSEBX	SPU	FTSE	World
2003-2014	426%	385%	187%	166%	165%
2003-2008	363%	327%	92%	93%	130%
2009-2014	99%	148%	131%	116%	101%
2008	-41%	-55%	-35%	-40%	-40%
Average yearly return	13%	14%	8.2%	7.8%	9.1%

The Norwegian market, represented with the OSEBX and state portfolio, does it much better than the foreign markets from 2003-2014 because of the good performance in the period from 2003 to mid-2008.

In the period from 2009-2014 the returns are more evenly, with the OSEBX and SPU doing it very well, and the FTSE, World and state portfolio doing it pretty much equally good. The state portfolio is the portfolio/index that does it best in the whole- and pre-period, while doing it worst in the post-period (see also appendix 7 for graphical view).

**Figure 6: Monthly unadjusted excess return distribution for the OSEBX and state portfolio over SPU.**



Here we see the distribution of returns over the SPU for both the OSEBX and state portfolio. The distribution is quite evenly, but with a bit right skewness. The average for the state portfolio over SPU is 0.34 percentage points (left), while it is 0.37 percentage points for the OSEBX (right).

## 5.2 Risk management

Here I will go through the volatility, Sharpe ratio, adjusted Sharpe ratio and the appraisal ratio for each of the three indexes and two portfolios.

### 5.2.2 Volatility, Sharpe ratio and adjusted Sharpe ratio

The standard deviation is slightly higher for the OSEBX than the state portfolio, varying from 5.83% to 4.48%, while the World-and FTSE has the lowest standard deviations varying from 2.91% to 4.04% (see appendix 8).

The volatility is negative for the state portfolio against the OSEBX, which is good. Not surprisingly is the volatility higher against the foreign indexes since the return is higher.

For SPU, the same applies, with lower volatility against the OSEBX, while against the foreign indexes the volatility is higher with the exception of the pre-period against the World (see appendix 10 for table).

The Sharpe ratio has been positive for the state portfolio in the whole period and in the two sub-periods. The pre-period has been the best one with a Sharpe ratio of 0.43. In excess Sharpe ratio the first period is better than all the indexes, while the last period yields a negative excess Sharpe ratio, as expected because of the lower returns. The whole period yields zero excess Sharpe ratio compared to the OSEBX, while compared to the World and FTSE, it yields an excess Sharpe ratio of 0.05 and 0.01 (see appendix 11 for table).

As said in chapter 3, the Sharpe ratio does not capture the amount of asymmetric risk (skewness in returns) and the “volatility of volatility” (distribution of data around the mean). The adjusted Sharpe ratio seeks to capture these two properties, as it provides portfolios with a higher amount of downside risk a lower Sharpe ratio than what the “usual” Sharpe ratio would.

The state portfolio has positive adjusted Sharpe ratio values in the whole period and the two sub-periods. Compared to the OSEBX, the ASR is higher in the pre-period, while lower in the post-period, indicating that the OSEBX yielded a higher return in excess of the risk-free rate per unit volatility after 2009. Compared to the World the whole-and pre-period provides a higher ASR for the state portfolio, while the post-period yields an equal ASR. Against the FTSE, the pre-period is the only period with a positive ASR, while the whole period give an equal value, and the post-period give a negative value of -0.06 – almost identical to the OSEBX.

SPU yields a positive ASR compared to the OSEBX in the whole period, while the sub-periods yield negative values. Measured against the FTSE, SPU yield barely excess ASR's in the whole- and pre-period, while giving equal value in the post-period.

The comparison with the indexes yields an equal or higher ASR for the OSEBX, with the highest difference in the pre-period. The state portfolio is better than the OSEBX in the pre-period when we compare against the two foreign indexes but lower in the

post-period. For the whole period they yield the same ASR against both indexes (see appendix 11 and 12).

### 5.2.3 Appraisal ratio

The AR is a correction factor used by the part of the return that cannot be explained by market risk. In the calculation of alpha the unsystematic risk becomes  $1 - R^2$ .

The measurements (see appendix 13) for the OSEBX and state portfolio against the foreign indexes gives a ratio that indicates an exceptional result, but since the Norwegian market in general had higher returns in the whole period than the foreign markets, these conditions are only used for comparison between the OSEBX and state portfolio.

Comparing the OSEBX and state portfolio, we see that the OSEBX beats the state portfolio in 9 out of 7 periods. The both have positive ratios in every period against the other indexes and portfolio, but we see that the ratios after 2009 becomes negative for the state portfolio when using the OSEBX as the dependent variable.

The SPU is beaten in every period by both the OSEBX and state portfolio, except when measuring against the FTSE<sup>22</sup>. It has a positive ratio against the World in the whole- and post-period.

The appraisal ratio indicates that the OSEBX has been the best investment choice compared to the state portfolio, while it was the other way around for the Sharpe- and adjusted Sharpe ratio.

Since this ratio is correlated with the calculations of alphas, which will be calculated in 5.4, the appraisal ratios should correlate with them in accordance to excess returns. The level of significance should also be the same (see chapter 3.6).

## 5.3 Regressions

In this chapter, the regression is used to examine if there is a significant alpha for the portfolios over the indexes when they are adjusted for risk. The beta (risk) is also calculated from the regressions.

---

<sup>22</sup> The ratio number for SPU against the FTSE is abnormal and I don't take this ratio into consideration. The reason is because of the high unsystematic risk, leading to a high ratio value for a small alpha.

First I regress the three indexes compared to each stock in the state portfolio. Then I regress the two portfolios against the three indexes, before I regress the two portfolios against their respective benchmarks to check if there are any excess returns. I finish up by comparing the realized alphas.

The indexes are the independent variable(s), while each stock (or portfolio) is the dependent, if not otherwise stated.

Betas and alphas are listed in each box and their corresponding p-value in parenthesis. P-values that are statistically significant at a 10% level or lower are in bold type<sup>23</sup>.

The alphas are monthly and explain how many percentage points better or worse the dependent variables do it measured against the independent variable(s).

The equation used for the following regressions is the CAPM (5).

### 5.3.1 Stocks versus the OSEBX-index

To see if there are any stocks that can provide a significant alpha, I regress each stock against the OSEBX-, World- and FTSE-index.

General note: Yara enters the regressions in April 2004, while Cermaq enters October 2005.

**Table 4: Regression analysis for the underlying stocks in the state portfolio compared to the OSEBX-index.**

OSEBX	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
STL	Beta: 0.66 Alpha: 0.15 (0.656) $R^2=44\%$	Beta: 0.76 Alpha: 0.56 (0.361) $R^2=39\%$	Beta: 0.66 Alpha: -0.37 (0.429) $R^2=37\%$
TEL	Beta: 0.90 Alpha: 0.41 (0.312) $R^2=51\%$	Beta: 0.70 Alpha: 0.67 (0.267) $R^2=36\%$	Beta: 0.76 <b>Alpha: 1.02 (0.07)</b> $R^2=35\%$
DNB	Beta: 0.93 Alpha: 0.90 (0.824)	Beta: 0.56 Alpha: 0.22 (0.680)	Beta: 0.99 Alpha: 0.89 (0.243)

<sup>23</sup> The p-value tells us the probability to achieve a test result that is equal or more extreme given that the null hypothesis is true. The smaller the p-value is, the higher the probability is that the findings are not a coincidence. In statistics it is normal to assume that the p-value should be smaller than 0.05 to be significant, but in the regressions I set the significance level to 0.10, since it in the stock market is considered difficult to beat an index over time, even though this makes the chance of a type 1 error increase.



	$R^2=49\%$	$R^2=32\%$	$R^2=34\%$
NHY	Beta: 1.05 Alpha: -0.39 (0.373) $R^2=54\%$	Beta: 0.81 Alpha: 0.53 (0.455) $R^2=35\%$	Beta: 1.16 Alpha: -0.75 (0.229) $R^2=51\%$
KOG	Beta: 0.512 Alpha: 0.65 (0.133) $R^2=23\%$	Beta: 0.555 Alpha: 1.06 (0.128) $R^2=21\%$	Beta: 0.599 Alpha: 0.04 (0.613) $R^2=17\%$
SAS	Beta: 0.818 Alpha: <b>-2.87 (0.008)</b> $R^2=11\%$	Beta: 1.104 Alpha: <b>-2.70 (0.046)</b> $R^2=22\%$	Beta: 0.630 Alpha: <b>-5.47 (0.006)</b> $R^2=8\%$
YAR	Beta: 1.015 Alpha: 0.34 (0.594) $R^2=38\%$	Beta: 0.366 (0.089) Alpha: <b>3.54 (0.002)</b> $R^2=4\%$	Beta: 1.083 Alpha: 0.06 (0.938) $R^2=36\%$
CEQ	Beta: 0.317 Alpha: 0.91 (0.300) $R^2=3\%$	Beta: Alpha: $R^2=$	Beta: 0.25 Alpha: <b>2.38 (0.03)</b> $R^2=6\%$

Betas are all significant, except for Yara in pre-period. This has to do with the number of observations, since Yara enters the state portfolio 16 months after the other stocks. I also remove Cermaq from pre-period for the same reason.<sup>24</sup>

The betas seem to increase in the period during- and after the financial crisis. This is not surprising, since in economical crisis, the stock market tends to become more volatile (Manda, 2010). See appendix 9 for a graphical view.

Two stocks, Norwegian Hydro and Yara International, have higher betas than the OSEBX. For Yara, the monthly risk adjusted excess return is 0.434, while it is -0.394 for Norwegian Hydro, meaning that the stock underperformed compared to the underlying risk it had. The p-value for both the alphas is higher than 0.10 so we need to accept the null hypothesis and conclude that there were no strong results of excess return of owning the Yara or hydro stock in relation to the risk the stocks had compared to the market. It must be emphasized, even though the alphas is not significant, that in the cases with Yara and Hydro, the investment in Yara is good, while the investment in Hydro is less satisfactory.

<sup>24</sup> Since Cermaq is both purchased and sold during the period from 2003-2014, the  $R^2$  is very low. (This also applies for the regressions against the two foreign indexes).

For the whole period there is one stock that gives significant results: SAS has an alpha of -2.875, which is significantly down to a 0.01 level. From this we reject the null hypothesis and conclude that the stock underperformed relative to the risk it had in the period from 2003-2014, measured against the Norwegian stock market.

The highest weighted stock in the portfolio, Statoil, has in the whole period an alpha of 0.151, but this is never significant.

In the pre-period, there are two stocks that are significant. Yara provides an alpha of 3.54 (at a 0.01 level) and SAS with an alpha of -2.49 (at a 0.05 level).

The post-period yielding three stocks that is significant, with Cermaq and Telenor having positive alphas of 2.38 and 1.02 and SAS yielding a negative alpha of -5.47. Telenor is significant at a 0.10 level, while Cermaq is significant at a 0.05 level and SAS at a 0.01 level.

### 5.3.2 Stocks versus the World-index

The regressions against the foreign indexes will normally have more significant alphas, especially in the pre-period, since the Norwegian stock market generally performed better than the foreign indexes did. The same applies for the regression with the FTSE-index.

**Table 5: Regression analysis for the underlying stocks in the state portfolio compared to the World-index.**

World	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
STL	Beta: 0.74 Alpha: 0.35 (0.308) $R^2=33\%$	Beta: 0.84 <b>Alpha: 1.19 (0.072)</b> $R^2=25\%$	Beta: 0.63 Alpha: -0.05 (0.926) $R^2=24\%$
TEL	Beta: 1.02 Alpha: 0.65 (0.113) $R^2=40\%$	Beta: 0.81 <b>Alpha: 1.21 (0.057)</b> $R^2=25\%$	Beta: 0.83 <b>Alpha: 1.29 (0.024)</b> $R^2=32\%$
DNB	Beta: 1.26 Alpha: 0.29 (0.439) $R^2=55\%$	Beta: 0.77 Alpha: 0.53 (0.297) $R^2=32\%$	Beta: 1.36 Alpha: 1.02 (0.124) $R^2=48\%$
NHY	Beta: 1.44 Alpha: -0.14 (0.701)	Beta: 1.08 Alpha: 1.01 (0.148)	Beta: 1.46 Alpha: -0.48 (0.372)

	$R^2=62\%$	$R^2=33\%$	$R^2=61\%$
KOG	Beta: 0.63 Alpha: <b>0.74 (0.067)</b> $R^2=21\%$	Beta: 0.62 <b>Alpha: 1.51 (0.033)</b> $R^2=13\%$	Beta: 0.66 Alpha: 0.26 (0.712) $R^2=15\%$
SAS	Beta: 1.31 Alpha: <b>-2.57 (0.007)</b> $R^2=17\%$	Beta: 1.93 <b>Alpha: -2.49 (0.034)</b> $R^2=37\%$	Beta: 1.64 Alpha: <b>-5.40 (0.004)</b> $R^2=14\%$
YAR	Beta: 1.26 Alpha: 0.70 (0.240) $R^2=37\%$	Beta: 0.85 <b>Alpha: 3.51 (0.001)</b> $R^2=13\%$	Beta: 0.90 Alpha: 0.68 (0.436) $R^2=18\%$
CEQ	Beta: 0.41 Alpha: 0.91 (0.246) $R^2=4\%$	Beta: Alpha: $R^2=$	Beta: 0.40 Alpha: <b>2.39 (0.023)</b> $R^2=2\%$

6 out of 8 stocks yield a positive alpha in the pre-period, while 4 of these are significant. One stock (SAS) yields a negative and significant alpha. 5 out of 8 stocks yield a positive alpha on the post-period, but here only two are significant with Cermaq yielding an alpha of 2.39 and Telenor with an alpha of 1.29 (the alphas were respectively 2.38 and 1.02 measured against the OSEBX). Three stocks yield a negative alpha, with SAS being the only significant one with an alpha of -5.40 (it was -5.47 against OSEBX).

In the whole period there are two stocks that give a significant alpha: Kongsberg Group with an alpha of 0.74 (at a 0.10 level), and SAS with an alpha of -2.57 (at a 0.01 level).

Yara has the highest positive alpha in the three periods with 3.51 in the pre-period, which is significant at a 0.01 level.

The same applies here as for the comparison with the OSEBX, where the betas increase from the pre-period to the post-period. This is applicable for 5 out of the 7 stocks.

### 5.3.3 Stocks versus the FTSE-index

**Table 6: Regression analysis for the underlying stocks in the state portfolio compared to the FTSE-index.**

FTSE	Jan 2003 –Sep 2014	Jan 2003 – Jun 2008	Jan 2009 – Sep 2014
STL	Beta: 0.55 Alpha: 0.59 (0.118) $R^2=15\%$	Beta: 0.70 <b>Alpha: 1.48 (0.04)</b> $R^2=11\%$	Beta: 0.32 Alpha: 0.60 (0.232) $R^2=9\%$
TEL	Beta: 1.20 Alpha: 0.47 (0.246) $R^2=43\%$	Beta: 1.07 <b>Alpha: 1.19 (0.053)</b> $R^2=30\%$	Beta: 0.74 <b>Alpha: 1.19 (0.048)</b> $R^2=28\%$
DNB	Beta: 1.13 Alpha: 0.29 (0.529) $R^2=34\%$	Beta: 0.81 Alpha: 0.67 (0.214) $R^2=24\%$	Beta: 0.87 Alpha: 1.35 (0.113) $R^2=21\%$
NHY	Beta: 1.06 Alpha: -0.14 (0.784) $R^2=26\%$	Beta: 0.68 <b>Alpha: 1.56 (0.058)</b> $R^2=8\%$	Beta: 0.94 Alpha: -0.45 (0.560) $R^2=27\%$
KOG	Beta: 0.59 Alpha: <b>0.83 (0.049)</b> $R^2=14\%$	Beta: 0.72 Alpha: <b>1.58 (0.027)</b> $R^2=12\%$	Beta: 0.54 Alpha: 0.51 (0.493) $R^2=11\%$
SAS	Beta: 1.23 Alpha: <b>-2.87 (0.004)</b> $R^2=11\%$	Beta: 1.77 <b>Alpha: -1.95 (0.034)</b> $R^2=20\%$	Beta: 1.24 <b>Alpha: -6.06 (0.002)</b> $R^2=9\%$
YAR	Beta: 0.95 Alpha: 0.77 (0.276) $R^2=16\%$	Beta: <b>Alpha: 3.99 (0.001)</b> $R^2=0\%$	Beta: 0.73 Alpha: 0.69 (0.473) $R^2=12\%$
CEQ	Beta: 0.36 Alpha: 0.90 (0.259) $R^2=1\%$	Beta: Alpha: $R^2=$	Beta: <b>Alpha: 2.66 (0.014)</b> $R^2=0\%$

As expected, the trend from the comparison with the World is quite similar. 6 out of 7 stocks give a significant alpha in the pre-period and 5 out of these are significant at 0.05 level. 6 of 8 stocks have a positive alpha in the whole period, where Kongsberg Group and SAS are the only ones with a significant alpha with 0.83 and -2.8 (these were 0.74 and -2.57 against the FTSE).

In the post-period, three stocks are significant. Telenor and Cermaq with positive alphas of 1.19 and 2.66, while SAS yielding an alpha of -6.06.

Yara also here yield the highest alpha in all three periods with almost 4 in the pre-period, which are significant at a 0.01 level.

We see from the above regressions that the Norwegian market has done it much better in the period from 2003 to June 2008, but has struggled more after 2009. In the whole period, only one stock (Kongsberg Group) has statistically outperformed the foreign markets, while one stock (SAS) has statistically underperformed.

These two stocks have weighted averages in the period from 2003-2014 with 1.1% for Kongsberg Group and 0.3% for SAS, and thus the effect of the two stocks are marginal for the state portfolio as a whole.

#### 5.3.4 The two portfolios against the three indexes

General note: The SPU and FTSE end in September 2014.

**Table 7: Regression analysis of the SPU and the state portfolio measured against the OSEBX-/World-/and the FTSE-index. All the indexes are the independent variable.**

OSEBX	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
State Portfolio	Beta: 0.77 Alpha: 0.13 (0.599) $R^2=71\%$	Beta: 0.74 Alpha: 0.58 (0.162) $R^2=58\%$	Beta: 0.73 Alpha: -0.07 (0.829) $R^2=76\%$
SPU	Beta: 0.57 Alpha: 0.05 (0.815) $R^2=65\%$	Beta: 0.47 Alpha: -0.06 (0.834) $R^2=57\%$	Beta: 0.73 Alpha: 0.07 (0.838) $R^2=60\%$
World	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
State Portfolio	Beta: 0.89 Alpha: 0.39 (0.177) $R^2=58\%$	Beta: 0.86 <b>Alpha: 1.16 (0.016)</b> $R^2=41\%$	Beta: 0.74 Alpha: 0.24 (0.497) $R^2=48\%$
SPU	Beta: 0.52 Alpha: 0.35 (0.230) $R^2=33\%$	Beta: 0.33 Alpha: 0.52 (0.150) $R^2=14\%$	Beta: 0.63 Alpha: 0.56 (0.179) $R^2=34\%$
FTSE	Jan 2003 – Sep 2014	Jan 2003 – Jun 2008	Jan 2009 – Sep 2014
State Portfolio	Beta: 0.76 Alpha: 0.51 (0.166) $R^2=34\%$	Beta: 0.79 <b>Alpha: 1.41 (0.011)</b> $R^2=23\%$	Beta: 0.47 Alpha: 0.61 (0.154) $R^2=23\%$
SPU	Beta: 1.03	Beta: 1.02	Beta: 1.02

	Alpha: 0.02 (0.218) $R^2=99\%$	Alpha: <b>0.05 (0.087)</b> $R^2=99\%$	Alpha: <b>0.03 (0.089)</b> $R^2=99\%$
--	-----------------------------------	--	--

The regression between the state portfolio and OSEBX for the whole period gives a beta of 0.77 and an alpha of 0.13, but this is never significant. From other studies the beta ranges from 0.66 to 0.86. See Ødegaard (2009) or Sirnes (2014, [1]).

We notice that the unadjusted return for the OSEBX after 2009 is 148%, while it for the state portfolio is 99%. By switching the variables around<sup>25</sup> (making the state portfolio the independent), the alpha become 0.51, with a p-value of 0.12, just above being significant. The reason it doesn't become significant is because of the lower risk for the state portfolio. Even though it isn't significantly better, the difference in 0.49 needs to be seen as the better investment in the period after 2009, and goes in under the trend that the state portfolio is losing terrain against the different benchmarks – both foreign and domestic.

For SPU against the OSEBX, the betas are below one and with an insignificant alpha in every period.

Measured against the World, the state portfolio yields a positive and significant alpha in the pre-period with 1.16. The others periods doesn't yield a significant alpha.

SPU's beta against the World is much lower compared to what the state portfolio has. In other words, there was less risk in investing in the SPU compared to the state portfolio when measuring against the World. This is also why, even though the World has a higher return than the FTSE, the alphas become lower.

Against the FTSE, the whole period gives no significant alpha, but the SPU has higher risk than the state portfolio (1.03 against 0.76). The pre-period yields a positive and significant alpha for both portfolios with the state portfolio being the one with highest alpha and the highest significance level (1.41 against 0.05). The post-period yield a positive and a significant alpha for the SPU<sup>26</sup>, while the state portfolio's alpha is positive, but not significant.

<sup>25</sup> I didn't make a table out of this. It is only for these two variables it is of any importance.

<sup>26</sup> The reason such a low alpha become significant is because of the high  $R^2$ , and thus a low unsystematic risk. It is also only significant at a 0.10 level.

To determine whether it is the Norwegian stock market profits that the state portfolio outperforms the foreign markets, or whether it is due to the fact that companies in the portfolio outperformed the Norwegian market, we look at the regressions for the OSEBX against the two foreign benchmarks and then compare the alphas for the same comparison against the state portfolio (also see 5.3.1).

**Table 8: Regression analysis of the OSEBX versus the World- and FTSE-index. The two indexes are the independent variables.**

World	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
OSEBX	Beta: 0.95 Alpha: 0.44 (0.177) $R^2=54\%$	Beta: 0.82 <b>Alpha: 1.11 (0.03)</b> $R^2=35\%$	Beta: 0.83 Alpha: 0.57 (0.135) $R^2=50\%$
FTSE	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Sep 2014
OSEBX	Beta: 1.16 Alpha: 0.31 (0.301) $R^2=63\%$	Beta: 1.25 <b>Alpha: 0.95 (0.024)</b> $R^2=56\%$	Beta: 0.84 Alpha: 0.53 (0.133) $R^2=23\%$

Against the World, the only significant alpha is the one in the pre-period, with a value of 1.11. The same applies against the FTSE, while here the alpha is 0.95. To compare; the state portfolio yielded alphas of respectively 1.16 and 1.41 in the significant periods, which is higher than what the OSEBX managed, with an excess value of respectively 0.05 against the World and 0.46 against the FTSE<sup>27</sup> (see table 7).

The beta for the OSEBX against the World is lower for each period.

For the FTSE, the beta is higher in both pre- and the whole period, while it is lower in the whole period.

<sup>27</sup> This is just comparison based on the values where the alphas are significant. To conclude with anything, the significance level also needs to be calculated. This will be done in chapter 5.4.3.

### 5.3.5 SPU against the OSEBX-index and the state portfolio

**Table 9: Regression analysis of the state portfolio and OSEBX against SPU. SPU is the independent variable.**

SPU	Jan 2003 – Sep 2014	Jan 2003 – Jun 2008	Jan 2009 – Sep 2014
State Portfolio	Beta: 0.75 Alpha: 0.49 (0.181) $R^2=34\%$	Beta: 0.76 <b>Alpha: 1.37 (0.013)</b> $R^2=22\%$	Beta: 0.46 Alpha: 0.59 (0.163) $R^2=23\%$
OSEBX	Beta: 1.13 Alpha: 0.28 (0.340) $R^2=65\%$	Beta: 1.22 <b>Alpha: 0.90 (0.033)</b> $R^2=57\%$	Beta: 0.82 Alpha: 0.50 (0.150) $R^2=60\%$

In the only significant period, the state portfolio is 0.47 better than the OSEBX. This result indicate that there was an excess return of owning the state portfolio in the pre-period rather than the OSEBX when comparing against SPU, but this will be checked closer in chapter 5.4.3.

Since the beta is lower for the state portfolio compared to the OSEBX, we need to calculate the realized alpha to check if the result changes.

### 5.4 Realized Alphas

When calculating the alphas for the stocks and the state portfolio, the method above assumes a constant portfolio risk over time. This is not the case in real life as we can see in appendix 16, where it is shown how the risk changes over time. This was especially the case in 2006 when Statoil and Hydro merged, but also the Telenor stock has increased its weight from 2006, while the Statoil stock has decreased theirs (see appendix 1). To calculate the alphas more correct we need to be able to change the weights and risk in the portfolios over time, and to do this, equation (6) is used.

The method that is used with rolling betas is, as stated in chapter 3.4, calculated from return data two years back in time. This makes the risk (derived from the weights) more correct for the period that is being calculated.<sup>28</sup>

From other studies (see for example Banz, 1981), the beta is calculated 5 years back in time, but due to the restrictive time period, the betas is calculated two years back. It

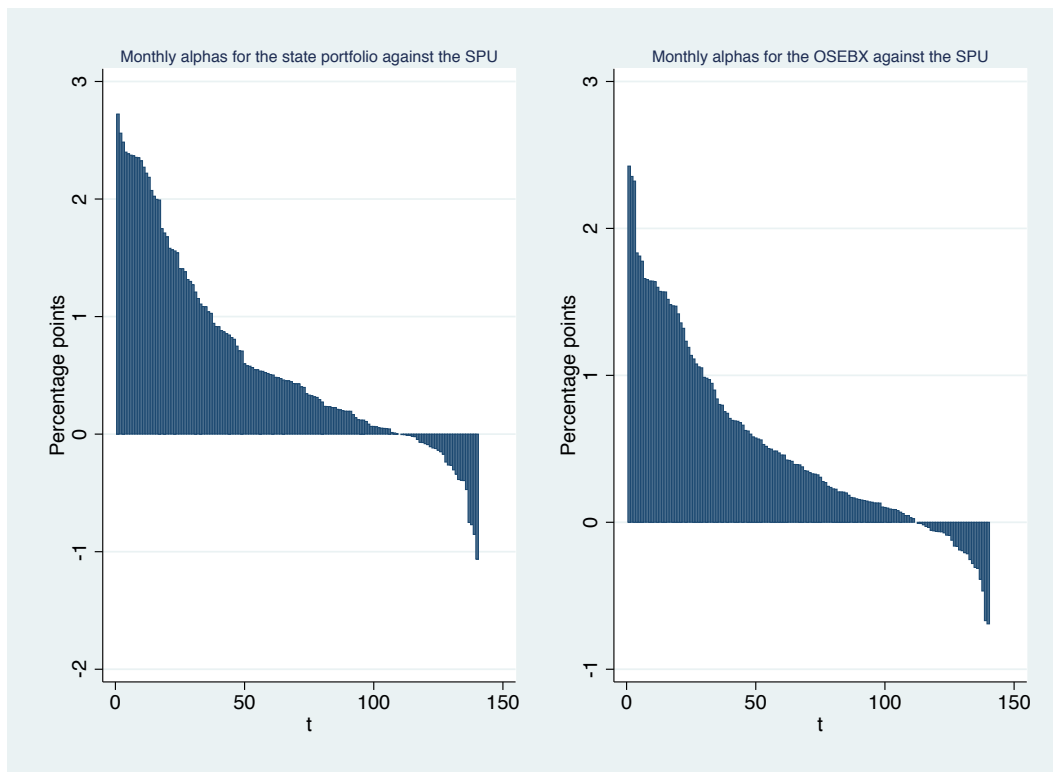
<sup>28</sup> It is assumed a beta of 1 before 2003. The same applies for companies being bought during the period, were the beta is assumed 1 for the two previous years.



also has to do with the two sub-periods, where a 5 year period wouldn't capture the risk up until that point as good as a two year period does, since the time period I have is only 12 years.

General note: In the tables it says  $x_1$  vs  $x_2$ , meaning how much more  $x_1$  earns in percentage points over  $x_2$ , because there is only a single variable in the regression. The single variable is calculated from the regression equation (17), with two variables that has been checked for heteroscedasticity and autocorrelation while being corrected for the former.

**Figure 7: Monthly alphas distribution for the state portfolio and OSEBX over the SPU.**



From the figure we now see that the alphas are right skewed, indicating more periods with a higher alpha than the SPU. The average for the state portfolio is now 0.60 percentage points, while it is 0.50 percentage points for the OSEBX. From figure 6 we remember that the average excess return was 0.37 percentage points higher for the OSEBX, while it was 0.34 higher for the state portfolio. The reason for the average alphas now giving the highest average for the state portfolio is due to the higher risk for the OSEBX against SPU.

#### 5.4.1 The two portfolios against the three indexes

From appendix 16, we see that the state portfolio has a higher risk than the FTSE before the financial crisis. After this the beta sinks considerably and doesn't stop until late 2011. The beta then drifts in the interval between 0.20-0.50, which is very low. Measured against the OSEBX and World the beta has mostly remained below one, but with an increasing beta from January 2012.

The beta for SPU is low compared to the World and OSEBX, while it is more or less constant against the FTSE, but with an increasing trend toward all indexes. This is especially the case when measuring against the OSEBX, but we see that the beta has fallen from early 2013 until the end of the period against these two indexes (OSEBX and World), which indicates a decreasing risk.

When taking into account the risk over time, the alphas converge more towards and around zero, but with more and bigger fluctuations as shown in appendix 17 and 18, where there is a figure of both the alphas with a constant and moving beta. The first period gives the highest alpha. The trend from all the graphs are also quite clear, with a downward sloping alpha trend line for the state portfolio, measured against both the OSEBX and World, while for the SPU the trend is quite flat against the World and FTSE, but upwards against OSEBX (this is as expected since the SPU should correlate with the foreign indexes).

The most noteworthy is the alphas for the SPU vs OSEBX, where we see the trend line is upward sloping with the constant risk, while it becomes marginally downward sloping with rolling beta. This is because the beta for SPU against the OSEBX increases in the post-period that weights up for the low beta up until 2009.

**Table 10: The regression of the risk-adjusted alpha for the state portfolio compared to the OSEBX-/World-/ and the FTSE index. (Equation 5)**

State Portfolio vs OSEBX	Alpha	P-value
Jan 2003 – Dec 2014	0.19	0.40
Jan 2003 – Jun 2008	0.51	0.17
Jan 2009 – Dec 2014	0.005	0.99
State Portfolio vs World	Alpha	P-value
Jan 2003 – Dec 2014	<b>0.65</b>	<b>0.03</b>
Jan 2003 – Jun 2008	<b>1.35</b>	<b>0.003</b>
Jan 2009 – Dec 2014	0.17	0.67
State Portfolio vs FTSE	Alpha	P-value
Jan 2003 – Sep 2014	<b>0.78</b>	<b>0.03</b>
Jan 2003 – Jun 2008	<b>1.58</b>	<b>0.003</b>
Jan 2009 – Sep 2014	0.48	0.26

Also here, as for the regressions with constant risk, the regression is not significant for the state portfolio against the OSEBX-index.

Against the foreign indexes, the realized alphas are now significant in the whole period for the state portfolio compared to the World and FTSE with respectively 0.65 and 0.78, which is significant at a 0.05 level. The alpha for the pre-period is significant at a 0.01 level, and yields 1.35 against the World and 1.58 against the FTSE.

The alpha for SPU is significant in the pre-period against the World. This has to do with the very low beta that gets an effect when calculating the realized alpha. When I regressed with a constant beta, the alpha was 0.52 with a p-value of 0.15, meaning that the rolling risk in the pre-period were lower than the constant risk was (see appendix 19 for table).

### 5.4.2 The OSEBX-index against the two foreign benchmarks

See appendix 20 for graphical view of the alphas (stationary and non-stationary).

**Table 11: Realized alphas for the OSEBX-index against the two foreign indexes.**

OSEBX vs World	Alpha	P-value
Jan 2003 – Sep 2014	0.50	0.125
Jan 2003 – Jun 2008	<b>1.08</b>	<b>0.03</b>
Jan 2009 – Dec 2014	0.52	0.16
OSEBX vs FTSE	Alpha	P-value
Jan 2003 – Dec 2014	<b>0.61</b>	<b>0.03</b>
Jan 2003 – Jun 2008	<b>1.25</b>	<b>0.002</b>
Jan 2009 – Dec 2014	0.37	0.32

The realized alpha compared to the state portfolio is 0.27 higher for the state portfolio (1.35-1-08) in the pre-period measured against the World (it was 0.04 higher with constant risk). Against the FTSE, both have two significant periods – the whole- and pre-period – with a higher alpha for the state portfolio with respectively 0.17 in the whole- and 0.33 in the pre-period (it was 0.46 in the pre-period with constant risk).

### 5.4.3 SPU against the OSEBX-index and the state portfolio

Last I compare the OSEBX and state portfolio against the SPU, where SPU is used as the independent variable.

See appendix 21 for a graphical view of the betas and alphas.

**Table 12: Realized alphas for the state portfolio and the OSEBX-index against SPU.**

State portfolio vs SPU	Alpha	P-value
Jan 2003 – Sep 2014	<b>0.72</b>	<b>0.06</b>
Jan 2003 – Jun 2008	<b>1.59</b>	<b>0.004</b>
Jan 2009 – Sep 2014	0.48	0.36
OSEBX vs SPU	Alpha	P-value
Jan 2003 – Sep 2014	0.46	0.37
Jan 2003 – Jun 2008	<b>1.15</b>	<b>0.09</b>

Jan 2009 – Sep 2014	0.35	0.63
---------------------	------	------

While the state portfolio yields a significant alpha in the whole- and pre-period, the OSEBX only yields a significant alpha in the pre-period.

The difference in the pre-period is 0.44 in favor of the state portfolio (it was 0.47 with constant risk). The reason for this is the lower risk, plus that the unadjusted return in the period for the OSEBX is 327% while it is 363% for the state portfolio. Adding these two factors together yields the higher significant alpha for the state portfolio.

The same conclusion also applies for the whole period, where the difference is 0.26, but the alpha is only significant for the state portfolio. From this it is difficult to conclude with something certain, but at least we can say that the state portfolio would have been the preferred choice of investors with hindsight, when measuring the risk-adjusted return.

Last I check if the realized alphas are significantly different from each other. The table is made from the regressed alphas for the two variables and describes if the alphas is consistently higher for the dependent variable. The three top ones is regressed with the indexes as the independent variable. The three on the bottom is regressed with the indexes as the dependent variable. The results that are significant and of importance are the ones that is included in the table. One should assume that a significant result in the first regressions should also be significant in the second regression, only with the constant having the opposite sign.

**Table 13: The realized alphas regressed against each other.**

	2003-2014	2003-2008	2009-2014
State vs World OSEBX vs World		<b>0.51 (0.00)</b>	
State vs FTSE OSEBX vs FTSE	-0.03 (0.31)	0.05 (0.36)	
State vs SPU OSEBX vs SPU		0.06 (0.26)	
World vs State World vs OSEBX		<b>-0.45 (0.00)</b>	
FTSE vs State FTSE vs OSEBX	<b>0.076 (0.001)</b>	0.05 (0.24)	
SPU vs State SPU vs OSEBX		0.03 (0.39)	

The state portfolio and OSEBX compared to the World gave a regression equation with an alpha of 0.27 in the pre period (from 5.4.2). This alpha seems to hold, since the regressions of these two alphas give a positive constant of 0.51 in average excess alphas for the state portfolio with a p-value of 0.00.

For the state portfolio and OSEBX compared to the FTSE, for both the whole- and pre-period, the difference in the alphas were 0.32 in the pre-period and 0.17 in the whole period in excess for the state portfolio. None of these two alphas yield a significant p-value (0.36 and 0.31).

Last is the measure against SPU, where the pre-period gave a difference in the alphas of 0.44 in advantage for the state portfolio. This one also yields an alpha that is not significant (0.26).

The interesting here is when we reverse the variables. The significant alpha for the state portfolio against the World is still significant with an alpha of -0.45 (this is expected since the reverse measure yielded a significant alpha of 0.51).

The measure of the realized alphas against the FTSE now yields a positive and significant alpha in advantage for the OSEBX with 0.076 in excess over the state portfolio and a p-value of 0.001 (the reversed measure gave an alpha of -0.03, but

with a p-value of 0.31), indicating higher alphas over time for the OSEBX than what the state portfolio managed.

## 6. Conclusion

It has for many years been discussions of what companies the Norwegian state should be an owner of, but these discussions have usually been about the more socio-economic plan rather than the more fundamental plan.

This thesis has had as its main task to address the risk and the historical return to the Norwegian state portfolio from 2003-2014, and to compare it with alternative investments. It has been done too little research on this topic, and since the state ownership is big in Norway compared to other countries, the research question is of importance.

The findings in the thesis suggest that state portfolio has been an equally good portfolio to own as the OSEBX, both in terms of risk and return, even though the weights in the portfolio do not follow completely good portfolio theory.

For the relative returns, the period from 2003-2014 yield a return of 426% for the state portfolio, while the OSEBX yield a return of 385%. Dividing it into the two sub-periods, the state portfolio has the best return in the period from 2003-2008 with 363% against the OSEBX that yield a return of 327%. In the period from 2009-2014 it is the OSEBX that has the highest return with 148%, against the state portfolio that yield a return of 99%.

When calculating the realized alphas, the state portfolio beats the OSEBX when comparing against the two foreign indexes, with an average of respectively 0.46 percentage points against the FTSE and 0.05 percent against the World. The same is also measured against SPU, where the state portfolio beats the OSEBX by 0.47 percentage points. This is only the result where the alphas are significant at a 10% level or lower.

Since the above measure can't conclude anything, I regress the alphas for the OSEBX and state portfolio against each other for a comparison of the alphas to check the significance level. The alpha measure against the World is in advantage for the state portfolio. Against the FTSE, the alpha measure concludes the opposite, with the OSEBX having the highest alphas over time measured against the state portfolios alphas.



The adjusted Sharpe ratios for the state portfolio is positive for every period, but the trend when comparing against the indexes is that the period from 2009 to 2014 yield negative and/or equal excess values, while the period from 2003-2008 yield positive excess values.

For the appraisal ratio, the OSEBX beats the state portfolio in 7 out of 9 periods. Both the state portfolio and OSEBX beats the other indexes and portfolio, while against each other the trend from the Sharpe ratios are also present here, with higher values for the state portfolio in the period from 2003-2008, and lower from 2009 to 2014.

The various risk measures were inconsistent in the results, giving the highest appraisal ratios to the OSEBX, while the state portfolio had the highest adjusted Sharpe ratios for the same periods. The trend after 2009 is lower excess values for the state portfolio against all the indexes – both foreign and domestic.

Shares that mainly contributed to the good performance of the state portfolio were Statoil, Telenor, Yara International and Kongsberg Group. Since both Telenor and Statoil accounts for about 75% of the entire portfolio, the portfolio is highly dependent on how these stocks do it against the markets. SAS has contributed negatively to the portfolio, but since their average value-weight is 0.13% of the total value of the portfolio, it has a small impact on the end results.

The different measures, both in terms of risk and alphas are inconsistent, giving highest risk ratios and alphas to different portfolios/indexes in different periods, and it is therefore difficult to conclude with anything. The state portfolio has not been a poor portfolio to own, but the same can be said for the OSEBX.

## 6.1 Recommendations

Even though the state portfolio yields a higher return with a lower risk in the period from 2003-2014, the reason to be invested in the companies from a profit maximization view does not longer hold. The trend after 2009 is quite clear, with a negative development against both the foreign- and domestic benchmarks.

The reason for the ownerships, since 6 out of 7 companies is located in category number 2, is for profit maximization along with keeping the main offices in Norway.

The recommendation is to divest down to 34% for all the companies that is above this level, if the reason for divesting completely out of the companies is not applicable.

The most important is thus to get the portfolio weighted-value of Statoil to decrease, so that the portfolio is not so heavily dependent on one stock.

## 7. References

### 7.1 Books

Lie, E., Myklebust E., Norvik, H. (2014). Staten som kapitalist. *Akademisk Publisering*. Pax Forlag, 9-188.

Grinold, C. R. & Kahn, N. R. (2000). Active Portfolio Management. *McGraw-Hill*(2), 620.

Griffiths, E. W., R. Hill, C., Guay, C. L. (2012). Principles of Econometrics. *Wiley* (Fourth Edition), 747.

### 7.2 Articles

Banz, R. W. (1981). The relationships between return and market value of common stocks. *Journal of Financial Economics*, 9(1), 3-18.

Cartwright, D. I., & Field, M. J. (1978). A Refinement of the Arithmetic Mean-Geometric Mean Inequality. *Proceedings of the American Mathematical Society*, 71(1), 36-38.

Fama, E. F., & French, K. R. (1992). The Cross-Section of Expected Stock Returns. *The Journal of Finance*, 47(2), 427-465.

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33(1), 3-56.

Fama, E. F., & French, K. R. (1995). Size and Book-to-Market Factors in Earnings and Returns. *The Journal of Finance*, 50(1), 131-155.

Jensen, M. C. (1968). The Performance of Mutual Funds in the Period 1945-1964. *The Journal of Finance*, 23(2), 389-416.

Manda, K. (2010). Stock Market Volatility During the 2008 Financial Crisis. *The Leonard N. Stern School of Business*, 32.

Modigliani, F., Modigliani, L., (1997). Risk-Adjusted Performance. *Journal of Portfolio Management*, 45-54.

Nordkvelde, M. K., Karthik K. G., Reve, T. (2014). Foreign Multinationals in Norway. *BI Norwegian Business School*, 2-14.

Pezier, J. W., Anthony. (2006). The Relative Merits of Investable Hedge Fund Indices and of Funds Hedge Funds in Optimal Passive Portfolios. *ICMA*, 32.

Roncalli, T. (2010). Understanding the Impact of Weights Constraints in Portfolio Theory. *Lyxor Asset Management*, 13.

Sharpe, W. F. (1966). Mutual Fund Performance. *The Journal of Business*, 39(1), 119-138.

Shleifer, A. (1998). State versus private ownership. *National Bureau of Economic research*, 4-33.

The World Bank. (1995). Bureaucrats in Business : the economics and politics of government ownership - Summary. *1*, 2-50.

The World Bank. (2014). Doing Business 2015. *12*, 252.

Treynor, L. J. (1965). How to rate management of investment in funds. *Harvard Business Review*, 43(1), 63-75.

Wiesinger, A. (2010). Risk-Adjusted Performance Measurement - State of the Art Adjusted Sharpe Ratio. *University of St. Gallen*, 52.

Ødegaard, B. A. (2009). Statlig eierskap på Oslo Børs. *UiS Working Papers in Economics and Finance* (2009/25).

### 7.3 Web Pages

- [1] “*Samme avkastning for statlige selskaper og indeks*”. Espen Sirnes’ home page. Website: <http://espensirnes.blogspot.no/> Published 23. July 2014. Date: 11/2/2015.
- [2] Announcement of divestment. Norwegian government. Website: <https://www.regjeringen.no/en/aktuelt/The-Norwegian-Government-proposes-increased-flexibility-in-the-state-ownership-of-Telenor-ASA-and-Kongsberg-Gruppen-ASA/id763967/> Published 19. June 2014. Date: 15/04/2015.
- [3] Sverre A. Christensen about state ownership. Dagbladet. Website: [http://www.dagbladet.no/2015/01/19/nyheter/innenriks/statlig\\_eierskap/samfunn/37264563/](http://www.dagbladet.no/2015/01/19/nyheter/innenriks/statlig_eierskap/samfunn/37264563/) Published 20. January 2015. Date: 19/3/2015.
- [4] Numbers for private investors and value of Oslo Stock Exchange. Oslo Stock Exchange. Website: [http://www.oslobors.no/OsloBoers/Statistikk/Aarsstatistikk/\(index\)/0/\(year\)/2013](http://www.oslobors.no/OsloBoers/Statistikk/Aarsstatistikk/(index)/0/(year)/2013) Date: 15/04/2015.
- [5] World’s largest oil companies 2013. Forbes. Website: <http://www.forbes.com/pictures/mef45efmej/20-statoil-norway-32/> Date: 15/04/2015.
- [6] Helge Lund about the criticism of Statoil. Aftenbladet. Website: <http://www.aftenbladet.no/energi/olje/Helge-Lund-slar-tilbake-mot-Statoil-kritikk-3375250.html> Published 12. March 2014. Date: 28/2/2015.
- [7] Corruption perceptions index. Transparency International. Website: <https://www.transparency.org/cpi2014/results> Updated by December 2014. Date: 27/02/2015.
- [8] Politicians demand answers from Telenor. Klassekampen. Website: <http://klassekampen.no/article/20141119/ARTICLE/141119955> Published 19. November 2014. Date: 27/02/2015.

[9] Revenue distribution, Telenor. Telenor. Website:  
<http://www.telenor.com/about-us/telenor-at-a-glance/> Updated by April 2015. Date:  
19/3/2014.

[10] Bank statistics. Finance Norway. Website:  
<https://www.fno.no/hoved/statistikk/bank/> Updated by December 2014. Date:  
03/03/2014.

[11] Veto against divestment in Kongsberg Group. Dagens Næringsliv. Website:  
<http://www.dn.no/nyheter/naringsliv/2015/01/27/0851/Telenor/stanser-nedsalget-i-kongsberggruppen> Published 27. January 2015. Date: 02/03/2015.

[12] Possible new emission in SAS. Dagens næringsliv. Website:  
<http://www.dn.no/nyheter/naringsliv/2012/11/02/giske-apner-for-ny-emisjon-i-sas>  
Published 02. November 2012. Updated by 10. February 2014. Date: 13/4/2015.

[13] Corruption in Yara International. Dagsavisen. Website:  
<http://www.dagsavisen.no/innenriks/yara-topp-tiltalt-for-korrupsjon-1.279656>  
Published 15. January 2015. Date: 02/03/2015.

[14] Hearing about the corruption in Yara International. Nettavisen. Website:  
<http://www.nettavisen.no/na24/3740754.html> Published 15. January 2015. Date:  
02/03/2015.

[15] Sale of Cermaq. E24. Website:  
<http://e24.no/boers-og-finans/cermaq/staten-takker-ja-naa-er-cermaq-salget-i-boks/23319412> Published 20. October 2014. Date: 15/04/2015.

[16] Earlier announcements about state ownership. Norwegian Government. Website:  
[https://www.regjeringen.no/nb/aktuelt/et\\_mindre\\_og\\_bedre\\_statlig\\_eierskap/id247182/](https://www.regjeringen.no/nb/aktuelt/et_mindre_og_bedre_statlig_eierskap/id247182/) Published 19. April 2002. Date: 17/13/2015.

[17] Minister of Industry Mæland denies stock discount. E24. Website: <http://e24.no/makro-og-politikk/maeland-vil-ikke-invitere-folket-til-aksjekjoep/23235936> Published 20. June 2014. Date: 28/02/2015.

[18] STOXX Global 3000 Index. STOXX. Website: [http://www.stoxx.com/indices/index\\_information.html?symbol=SXGBMP](http://www.stoxx.com/indices/index_information.html?symbol=SXGBMP) Date: 15/04/2015.

[19] FTSE Global All Cap Index. ETF. Website: [http://etfdb.com/index/the\\_the\\_FTSE-global-all-cap-index/](http://etfdb.com/index/the_the_FTSE-global-all-cap-index/) Date: 20/4/2015.

[20] Global Pension Fund of Norway. Norges bank Investment Management. Website: <http://www.nbim.no/fondet/avkastning/> Updated to September 2014. Date: 30/4/2015.

[21] 3-Month NIBOR. Norges Bank. Website: <http://www.norges-bank.no/en/Statistics/Historical-monetary-statistics/Short-term-interest-rates/> Updated 30. December 2014. Date: 15/04/2015.

#### 7.4 Public Documents

Annual reports from the companies in the state portfolio.

Finland. (2014). “*Value of State Shareholdings*”.  
<http://vnk.fi/en/value-of-state-shareholdings> Date: 30/5.2015.

Denmark. (2014). “*Statens Selskaber 2014*”.  
<http://www.fm.dk/publikationer/2014/statens-selskaber-2014> Date: 30/5/2015.

Sweden. (2013). “*Annual Report State Owned Companies 2013*”.  
<http://www.government.se/reports/2014/10/annual-report-state-owned-companies-2013/>  
Date: 30/5/2015.

Ministry of Trade, Industry and Fisheries. (2014). “*Diverse and value-creating ownership*”. Melding til Stortinget, 27. <https://www.regjeringen.no/en/dokumenter/meld.-st.-27-2013-2014/id763968/>. Date: 30/5/2015.

Nærings- og Handelsdepartement. (2002). St.Meld. nr. 22. 179. <https://www.regjeringen.no/nb/dokumenter/stmeld-nr-22-2001-2002/id196046/?docId=STM2001200220022000DDDEPIS&ch=1&q=>  
Date: 30/5/2015.

Norwegian Parliament. (2014). Innst. 140 S (2014-2015). *Meld. st. 27 (2013-2014)*, 46. <https://www.regjeringen.no/nb/dokumenter/Meld-St-27-20132014/id763968/>  
Date: 30/5/2015.

NBIM. (2015). SPU Annual Report 2014. 105. <http://www.norges-bank.no/en/Published/Publications/Annual-Report/2014-Annual-Report/>  
Date: 30/5/2015.

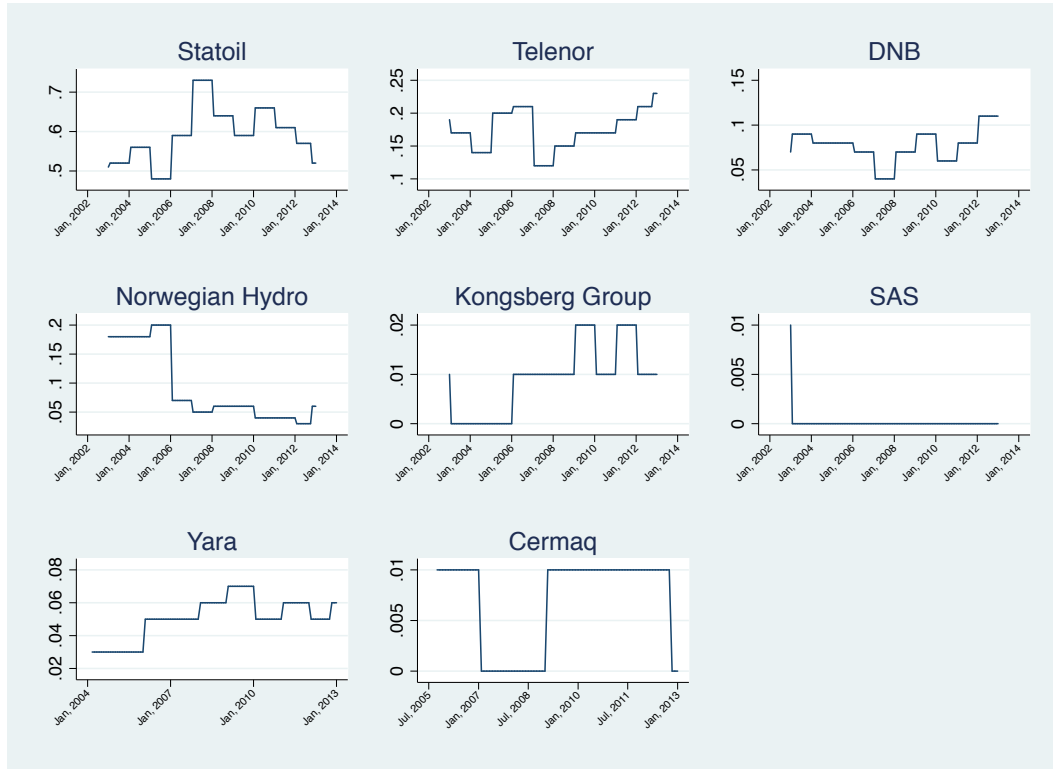
Official Norwegian Report. (2006). NOU 2004:7 ”*An active and Long-Term State ownership*”. [https://www.regjeringen.no/contentassets/01527a83111e45639d5dbb0d84882a44/en-gb/pdfs/stm200620070013000en\\_pdfs.pdf](https://www.regjeringen.no/contentassets/01527a83111e45639d5dbb0d84882a44/en-gb/pdfs/stm200620070013000en_pdfs.pdf). Date: 30/5/2015.

State Ownership Reports from 2002-2013.

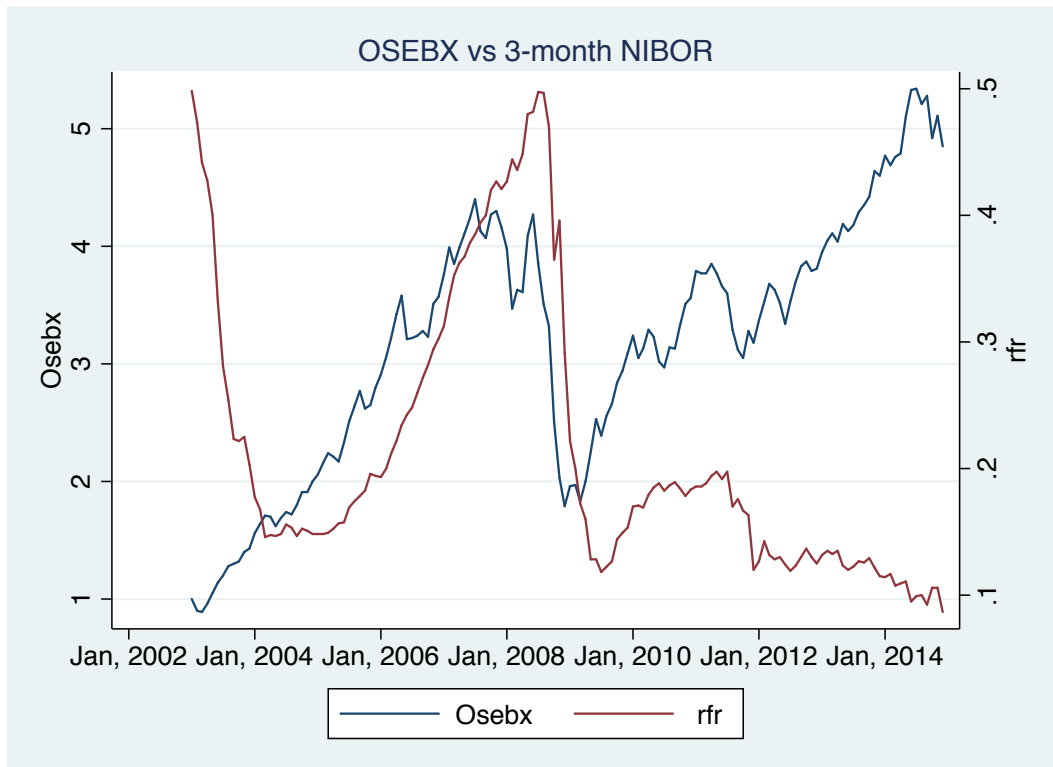


## 8. Appendices

Appendix 1: Portfolio weights of each stock.



Appendix 2: The 3-month NIBOR and the OSEBX (monthly data).



Appendix 3: Mean monthly return for the whole- and sub-periods.

Rank	Variable	Mean return (2003-2014)	Variable	Mean return (2003-2008 <sup>29</sup> )	Variable	Mean return (2009-2014)
1	Yara	1.61%	Yara	4.36%	Cermaq	2.88%
2	Telenor	1.45%	KOG	2.41%	DNB	2.25%
3	KOG	1.37%	NHY	2.37%	Telenor	2.10%
4	Cermaq	1.37%	Statoil	2.30%	Yara	1.55%
5	DNB	1.14%	Telenor	2.30%	OSEBX	1.38%
6	OSEBX	1.10%	State	2.29%	SPU	1.25%
7	State	1.03%	OSEBX	2.21%	FTSE	1.21%
8	Statoil	0.97%	DNB	1.57%	State	0.98%
9	SPU	0.82%	World	1.28%	World	0.94%
10	FTSE	0.79%	SPU	1.12%	KOG	0.93%
11	NHY	0.72%	FTSE	1.06%	NHY	0.83%
12	World	0.68%	Cermaq	0.82%	Statoil	0.60%
13	Rfr	0.21%	Rfr	0.27%	Rfr	0.14%
14	SAS	-2.15%	SAS	-0.28%	SAS	-3.94%

<sup>29</sup> Until June 1. 2008.

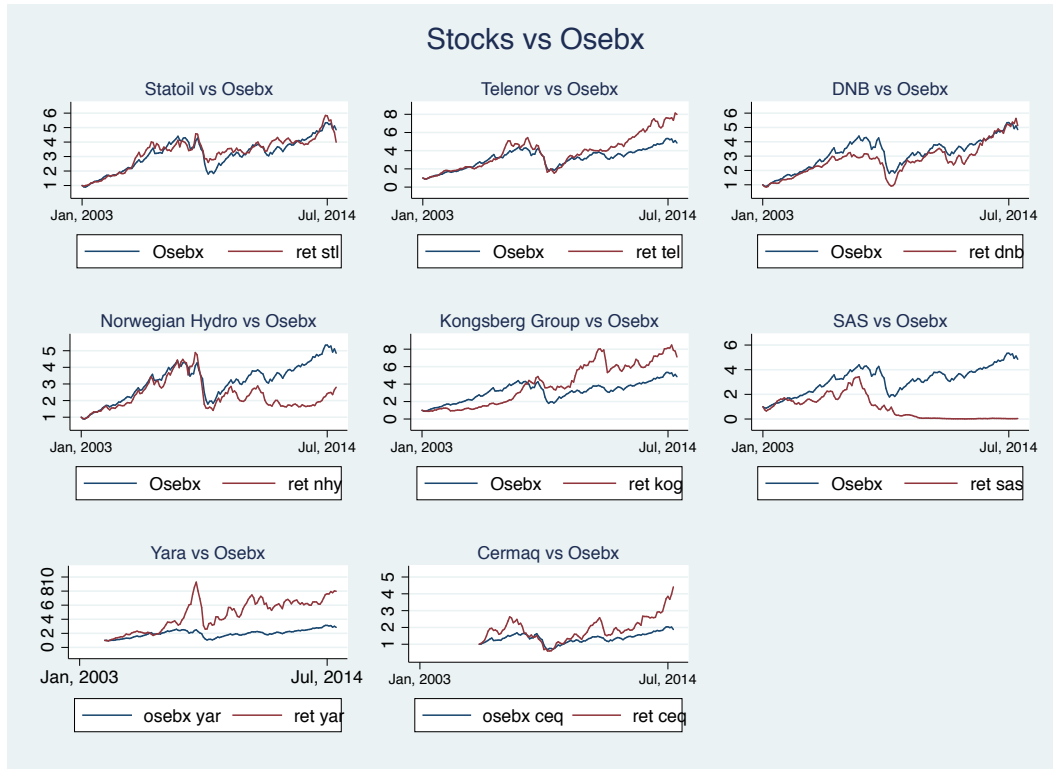
Appendix 4: Monthly relative return, in percent.



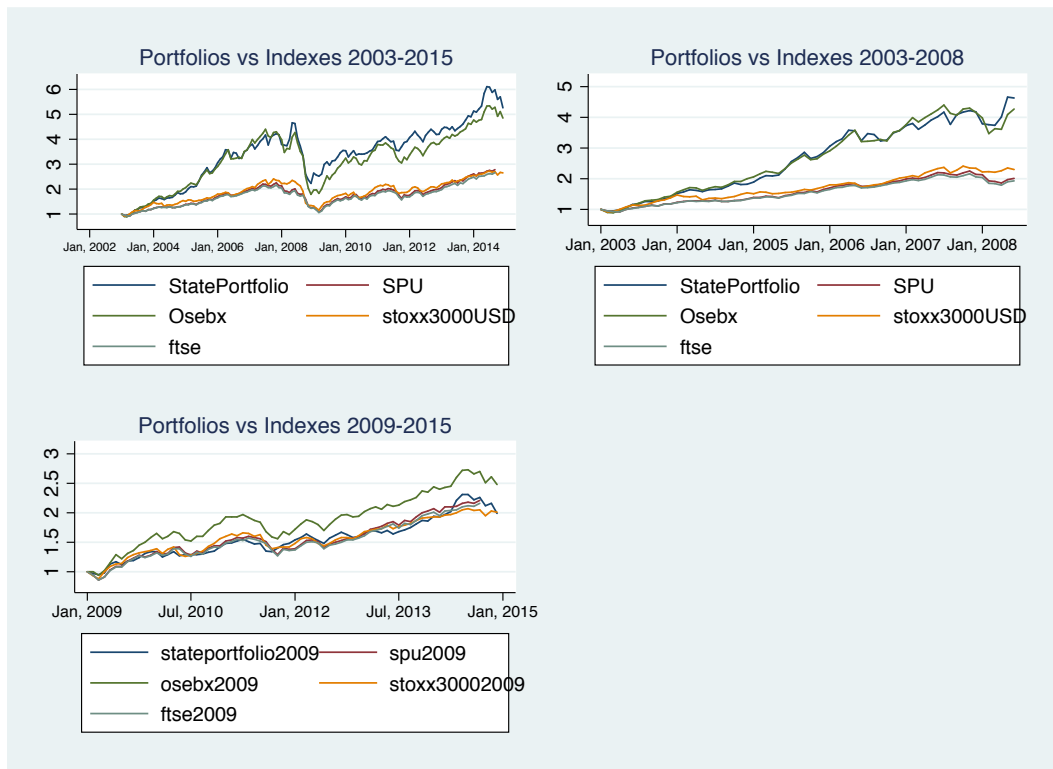
Appendix 5: Monthly relative return distribution for the three indexes and the two portfolios.



Appendix 6: The returns of the stocks in the state portfolio compared to the Norwegian market (adjusted for dividends and splits).



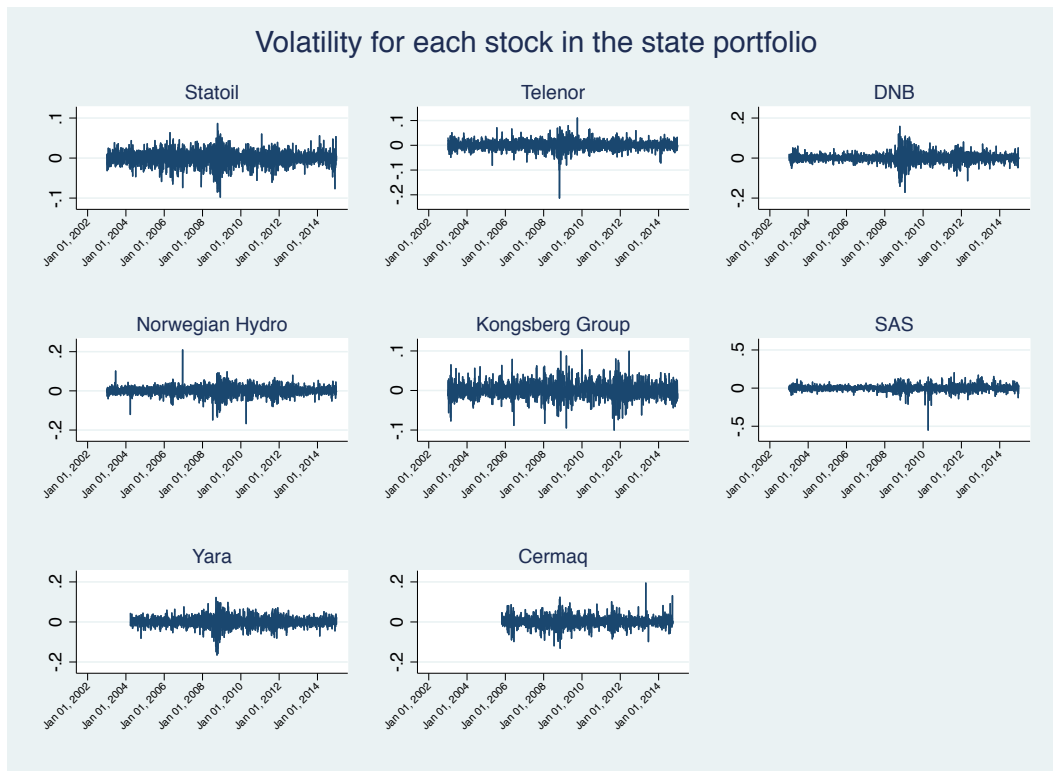
Appendix 7: The three indexes and the two portfolios returns in the three periods (adjusted for dividends and splits).



Appendix 8: Standard deviations (monthly).

	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
State Portfolio	5.34%	4.73%	4.09%
SPU	4.12%	2.98%	4.11%
OSEBX	5.83%	4.86%	4.48%
World	3.98%	3.50%	3.48%
FTSE	4.01%	2.91%	4.04%

Appendix 9: Volatility for the stocks in the state portfolio.



Appendix 10: Expected relative volatility<sup>30</sup> for the state portfolio and SPU measured against the benchmarks.

State Portfolio vs OSEBX	(Portfolio minus benchmark)
Jan 2003 – Dec 2014	-0.49
Jan 2003 – Jun 2008	-0.13
Jan 2009 – Dec 2014	-0.39
State Portfolio vs FTSE	
Jan 2003 – Sep 2014	1.33
Jan 2003 – Jun 2008	1.82
Jan 2009 – Sep 2014	0.05
State Portfolio vs World	
Jan 2003 – Dec 2014	1.36
Jan 2003 – Jun 2008	1.23
Jan 2009 – Dec 2014	0.61
SPU vs OSEBX	
Jan 2003 – Dec 2014	-1.71
Jan 2003 – Jun 2008	-1.88
Jan 2009 – Dec 2014	-0.37
SPU vs World	
Jan 2003 – Dec 2014	0.14
Jan 2003 – Jun 2008	-0.52
Jan 2009 – Dec 2014	0.63
SPU vs FTSE	
Jan 2003 – Sep 2014	0.11
Jan 2003 – Jun 2008	0.07
Jan 2009 – Sep 2014	0.07

<sup>30</sup> NBIM has a target that the relative volatility shall not exceed 100 basis points against the FTSE NBIM (2015).

Appendix 11: The Sharpe- and adjusted Sharpe ratios.

State Portfolio	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
Sharpe ratio, equation (6)	0.15	0.43	0.20
Adjusted SR, equation (9)	0.14	0.40	0.20
SPU	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Sep 2014
Sharpe ratio, equation (6)	0.15	0.28	0.27
Adjusted SR, equation (9)	0.15	0.27	0.26
OSEBX	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
Sharpe ratio, equation (6)	0.15	0.40	0.27
Adjusted SR, equation (9)	0.14	0.36	0.27
World	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
Sharpe ratio, equation (6)	0.10	0.28	0.21
Adjusted SR, equation (9)	0.10	0.27	0.20
FTSE	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Sep 2014
Sharpe Ratio, Equation (6)	0.14	0.27	0.26
Adjusted SR, equation (9)	0.14	0.26	0.26

Appendix 12: Adjusted Sharpe ratio differences (portfolio minus benchmark).

<b>OSEBX</b>	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
State portfolio	0.00	0.04	-0.07
SPU	0.01	-0.09	-0.01
<b>World</b>	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
State Portfolio	0.04	0.13	0.00
OSEBX	0.04	0.09	0.07
SPU	0.05	0.00	0.06
<b>FTSE</b>	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Sep 2014
State portfolio	0.00	0.14	-0.06
OSEBX	0.00	0.10	0.01
SPU	0.01	0.01	0.00

Appendix 13: The appraisal ratios for the portfolios and indexes compared to each other (first variable after each thick line is the dependent variable in the regression).

<b>OSEBX</b>	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
State portfolio	0.38	1.38	-0.29
SPU	0.11	-0.14	0.17
<b>World</b>	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Dec 2014
State portfolio	0.81	1.97	0.46
OSEBX	0.83	1.71	1.14
SPU	0.11	-0.14	0.17
<b>FTSE</b>	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Sep 2014
State portfolio	0.67	1.83	0.79
OSEBX	0.73	2.15	0.69
SPU	18	5	3
<b>SPU</b>	Jan 2003 – Dec 2014	Jan 2003 – Jun 2008	Jan 2009 – Sep 2014
State portfolio	0.64	1.76	0.77
OSEBX	0.68	2.09	1.25



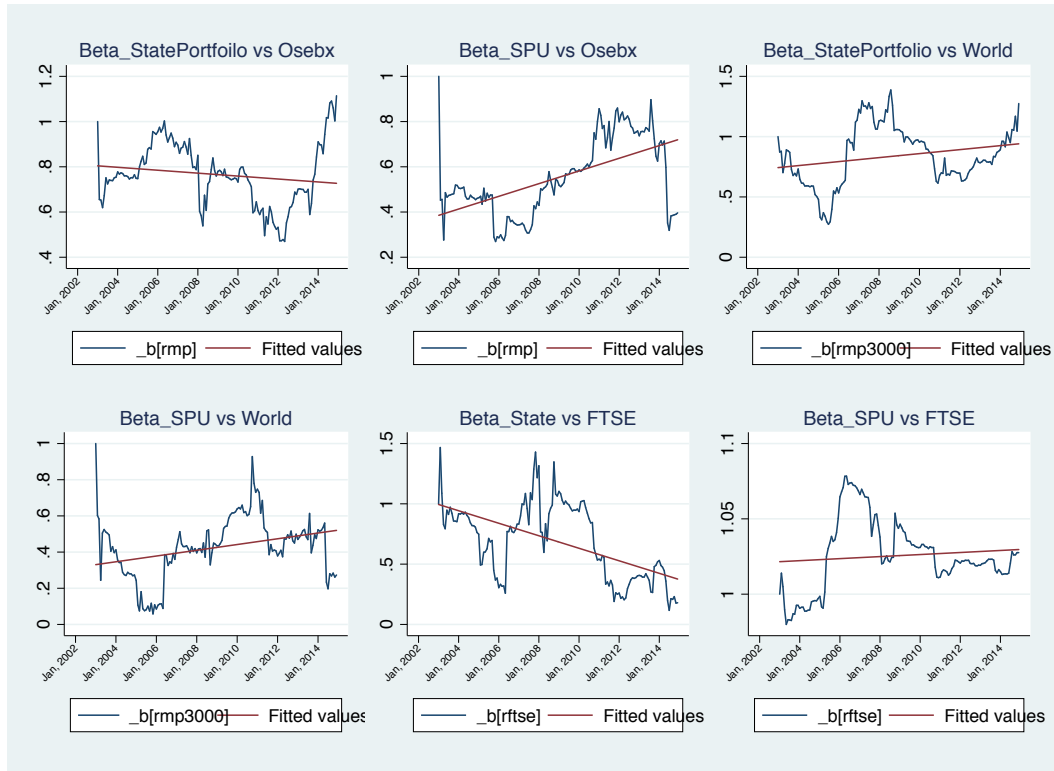
Appendix 14: Correlation table between the stocks in the portfolio.

	avkstl	avktel	avkdnb	avknhy	avkkog	avksas	avkyar	avkceq
avkstl	<b>1.0000</b>							
avktel	<b>0.3915</b>	<b>1.0000</b>						
avkdnb	<b>0.4572</b>	<b>0.5562</b>	<b>1.0000</b>					
avknhy	<b>0.7016</b>	<b>0.5331</b>	<b>0.6562</b>	<b>1.0000</b>				
avkkog	<b>0.3838</b>	<b>0.3541</b>	<b>0.3004</b>	<b>0.4115</b>	<b>1.0000</b>			
avksas	<b>0.1681</b>	<b>0.3461</b>	<b>0.1809</b>	<b>0.2968</b>	<b>0.1221</b>	<b>1.0000</b>		
avkyar	<b>0.4365</b>	<b>0.5669</b>	<b>0.4955</b>	<b>0.6466</b>	<b>0.3512</b>	<b>0.2457</b>	<b>1.0000</b>	
avkceq	<b>0.1174</b>	<b>0.2113</b>	<b>0.2638</b>	<b>0.3226</b>	<b>0.0364</b>	<b>-0.0228</b>	<b>0.1505</b>	<b>1.0000</b>

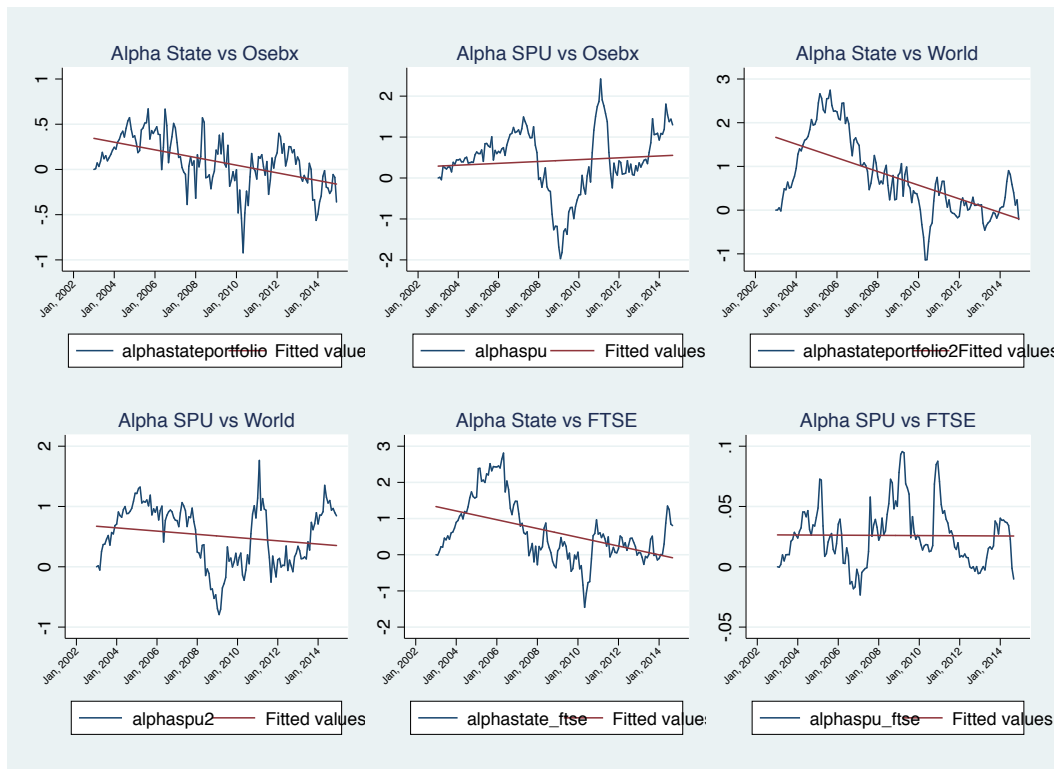
Appendix 15: Correlation between the portfolios and indexes.

	osebx	stox3000usd	stateportf~o	rspu	ftse
osebx	<b>1.0000</b>				
stox3000usd	<b>0.7332</b>	<b>1.0000</b>			
stateportf~o	<b>0.8394</b>	<b>0.7634</b>	<b>1.0000</b>		
rspu	<b>0.8039</b>	<b>0.5643</b>	<b>0.5844</b>	<b>1.0000</b>	
ftse	<b>0.7943</b>	<b>0.5586</b>	<b>0.5750</b>	<b>0.9958</b>	<b>1.0000</b>

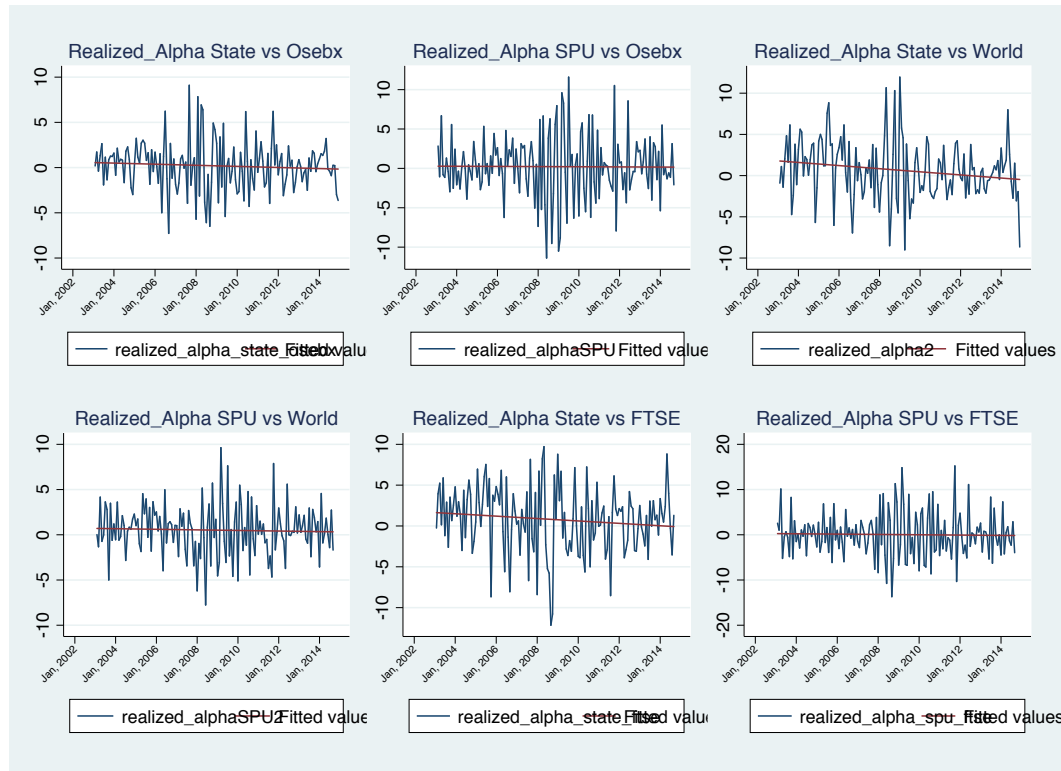
Appendix 16: Beta for the state portfolio and SPU compared to the OSEBX-/World-  
/and FTSE-index.



Appendix 17: Alphas with constant betas. (Non-stationary variables)



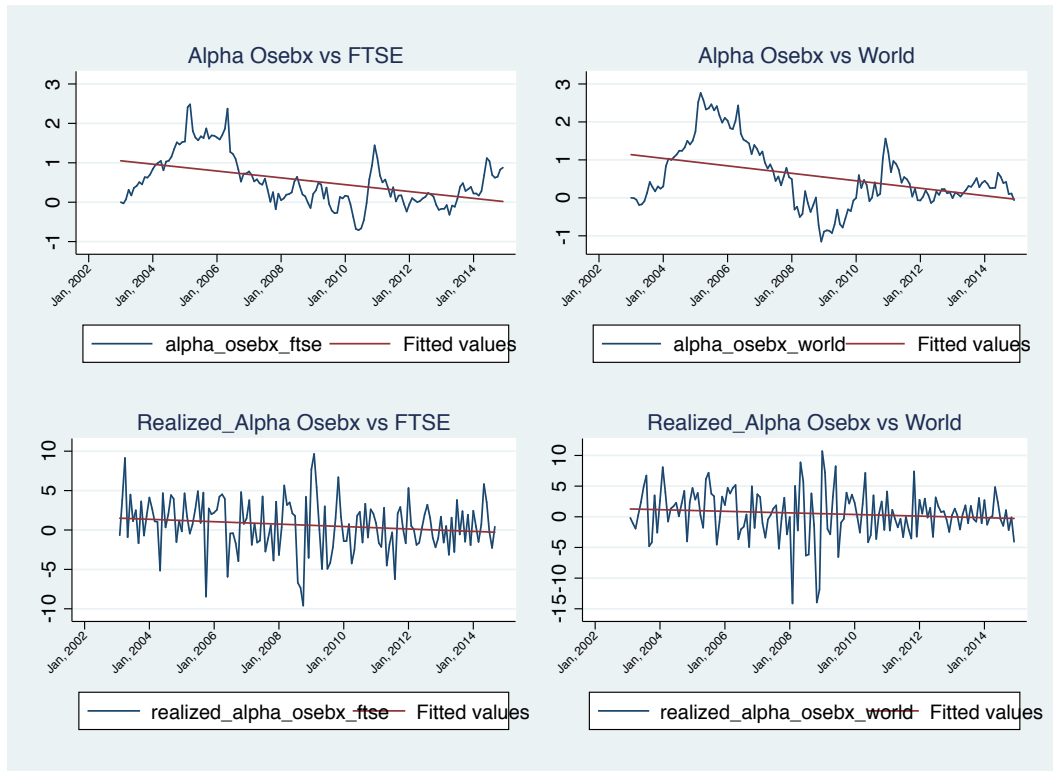
Appendix 18: Alphas with rolling betas. (Stationary variables)



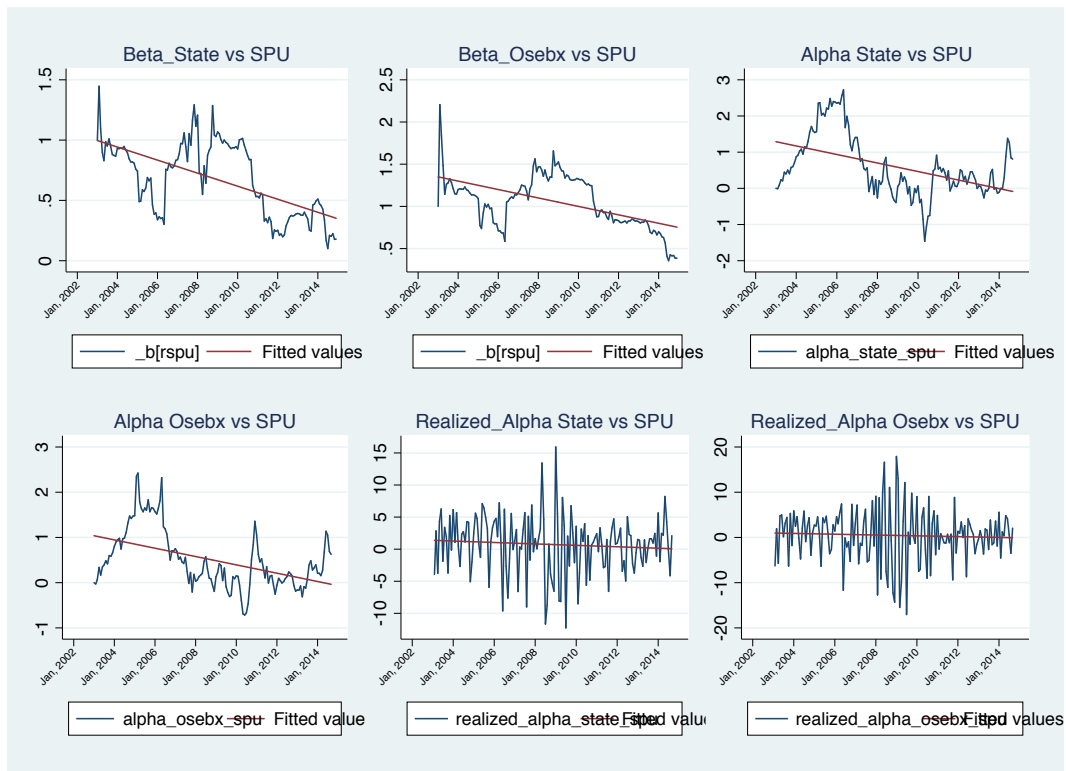
Appendix 19: The regression for the risk-adjusted alpha for the SPU compared to the OSEBX-/ FTSE and World-index (equation 5).

SPU vs OSEBX	Alpha	P-value
Jan 2003 – Sep 2014	0.21	0.53
Jan 2003 – Jun 2008	0.11	0.80
Jan 2009 – Sep 2014	0.18	0.74
SPU vs World	Alpha	P-value
Jan 2003 – Sep 2014	<b>0.51</b>	<b>0.04</b>
Jan 2003 – Jun 2008	0.46	0.16
Jan 2009 – Sep 2014	0.49	0.19
SPU vs FTSE	Alpha	P-value
Jan 2003 – Sep 2014	0.044	0.92
Jan 2003 – Jun 2008	-0.03	0.95
Jan 2009 – Sep 2014	-0.024	0.97

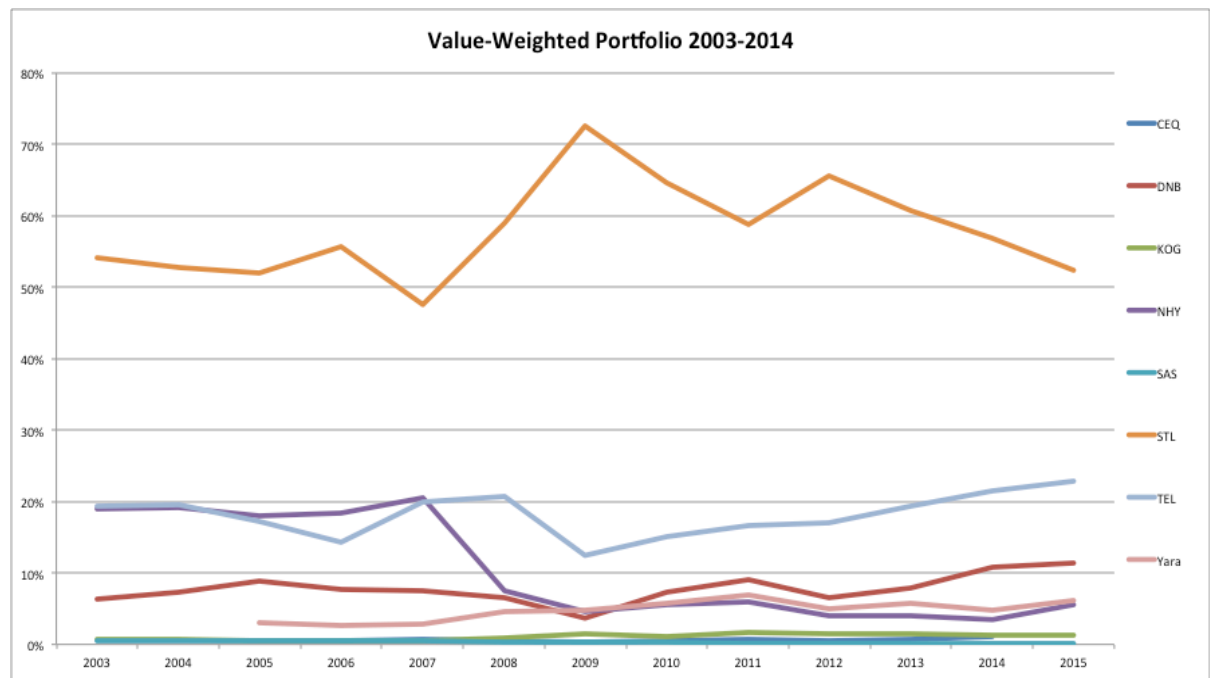
Appendix 20: The OSEBX against the two foreign benchmarks.



Appendix 21: The betas, alphas and realized alphas for the OSEBX and the state portfolio measured against SPU.



Appendix 22: Value-weighted portfolio from 2003-2014.



Appendix 23: Weighted portfolio re-allocated by 1.1 each year (numbers in NOK million).

Ticker	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CEQ				0.5%	0.7%	0.5%	0.3%	0.5%	0.7%	0.6%	0.7%	1.1%	
DNB	6.2%	7.3%	8.8%	7.7%	7.5%	6.6%	3.7%	7.2%	9.0%	6.5%	8.0%	10.9%	11.4%
KOG	0.7%	0.6%	0.5%	0.4%	0.5%	0.9%	1.5%	1.1%	1.6%	1.4%	1.5%	1.4%	1.4%
NHY	19.0%	19.1%	17.9%	18.4%	20.4%	7.4%	4.6%	5.5%	6.0%	3.9%	4.0%	3.5%	5.6%
SAS	0.5%	0.6%	0.4%	0.5%	0.5%	0.3%	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%
STL	54.1%	52.8%	52.0%	55.7%	47.6%	59.0%	72.5%	64.5%	58.8%	65.6%	60.7%	56.9%	52.3%
TEL	19.4%	19.6%	17.2%	14.3%	19.9%	20.6%	12.5%	15.1%	16.7%	17.0%	19.3%	21.4%	22.9%
YAR			3.1%	2.6%	2.9%	4.7%	4.7%	5.8%	7.0%	5.0%	5.8%	4.8%	6.2%
Sum	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Portfolio Value	191 152	250 728	301 921	427 740	533 674	570 806	332 612	479 634	503 277	500 262	489 498	552 289	535 983
Value OSE	502 938	689 734	931 650	1 403 267	1 915 777	2 156 989	997 005	1 518 418	1 737 293	1 508 500	1 567 907	1 798 128	1 795 608
%-share of OSE	38.0%	36.4%	32.4%	30.5%	27.9%	26.5%	33.4%	31.6%	29.0%	33.2%	31.2%	30.7%	29.8%