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**Thesis**

**- Does it pay to be green? -**

Study programme:  
**MSc of Business and economics**  
**Major in finance**

Date of submission:  
01.09.2010

Supervisor:  
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Place of study:  
BI Oslo

“This thesis is a part of the MSc programme at BI Norwegian School of Management.  
The school takes no responsibility for the methods used, results found and conclusions drawn.”

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## Summary

We study the effect of implementing an environmental certificate in a company. The sample comprises only Norwegian firms and is separated into two parts. First, listed firms are studied to investigate if announcement of an environmental certificate has a significant positive effect on stock returns. Second, non-listed firms are studied to investigate if accreditation of an environmental certificate has a significant positive effect on firm performance.

To examine the effect on stock returns and firm performance in relation to environmental initiatives, we consider the three environmental certificates Miljøfyrtårn recognised in Norway, European Eco-Management and Audit Scheme (EMAS) recognised within the European Union (EU) and European Economic Area (EEA); and ISO14001:2004 which is recognised globally. Furthermore, only the largest firms in Norway are examined. The largest firms with a green certificate are identified on miljoindex.no and following from the list 'The 500 largest companies in Norway' (2008). Listed firms are found on the Oslo Stock Exchange.

The main conclusion for both listed and non-listed firms is that it does not pay to be green. The influence of an environmental certificate does not have a significant positive effect on firm performance.

These findings do not provide investors with incentives to do ERIs, given that investors are encouraged to make environmental responsible investments in order to achieve only financial gains. This is consistent with earlier studies, which are dispersed and find it difficult to relate environmental performance to financial performance. Subsequent, investors who carry out environmental responsible investments may experience positive feedback when doing business.

## **1.0 Introduction**

Environmental issues are a frequently discussed topic in society. The environmental focus has engaged firms to put more emphasis on environmental matters. Firms are often asked about their environmental contribution, and fulfilment of environmental standards can contribute to reduce firms' impact on the environment. This has increased the attention to environmental responsible investments (ERIs), which seek to maximize both financial returns as well as environmental sustainability.

The way of doing business has a large impact on environmental sustainability. Thus, it is important for firms to do ERIs to maintain a sustainable environment. The Nobel Peace Prize given to Al Gore Jr. in 2007 recognises the recent focus on global environmental issues and sustainable growth. In addition the United Nations' climate change conference in Copenhagen last December, put emphasis and focus on sustainability when doing business. An environmental certificate might be a good instrument for firms to take on environmental challenges and following achieve a green profile.

There are several reasons why firms should implement green certificates. When a company has been accredited with an environmental certificate, it is an indication of an environmental responsible policy and a green focus. A green certificate may give the company a competitive advantage. When adapting to an environmental standard the firm may experience product differentiation and thus achieve a competitive advantage and increased customer demand (Porter and van der Linde 1995). Product differentiation originates from increased resource productivity and waste reductions. These improvements reduce the firms' marginal costs. Consequently, firms may experience economical gain and competitive advantages related to environmental initiatives.

In economical terms a green certificate may induce abnormal returns and outstanding performance. If customer preferences are biased in favour of environmental friendly suppliers, public commitment to an environmental certificate might be valuable because it would improve the firm's competitive position (Fisher-Vanden and Thorburn 2008). Hence, announcement of

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commitment to an environmental certificate may yield positive financial returns and consequently trigger investors to invest in companies with a green profile. For the listed firms, information asymmetries regarding firm commitment to ERIs can be reduced by publicly pledging acknowledgement to a certificate.

Furthermore, accreditation of a green certificate might communicate information about reductions in future costs. The future cost reductions are related to reductions in energy and production costs as well as reductions in future environmental liabilities. With lower expected costs in the future the company may produce products or services more efficient, and consequently the company's expected future return will increase.

On the other hand, when fulfilling environmental standards the firm often need to do more than environmental legislation requires. Regulation sets a minimum of what is expected from the company and therefore the costs of implementing a green certificate might exceed potential benefits. If the potential benefits from an environmental certificate are exceeded, the firm value might be reduced instead of increased. Consequently, it is important that environmental measures are both environmental and economical efficient.

There are few previous studies regarding Norwegian firms on the relation between environmental initiatives and firm performance. We find it interesting to examine both listed and non-listed Norwegian firms, as this is an unexplored research area. To our knowledge this relation has not been investigated in previous studies on Norwegian firms.

In order to examine stock returns and firm performance in relation to environmental initiatives we consider the three environmental certificates Miljøfyrtårn, European Eco-Management and Audit Scheme (EMAS) and ISO 14001:2004.

## **2.0 Certificates**

An environmental management standard requires the firms to identify environmental objectives and targets, and develop an environmental policy. In order to link environmental standards to firm performance, we examine how firms with minimum one out of three environmental standards perform compared to uncertified firms. The three standards included in the study are ‘Miljøfyrtårn’ recognised in Norway, EMAS recognised within the European Union (EU) and European Economic Area (EEA); and ISO14001:2004 which is recognised globally.

### **2.1 Miljøfyrtårn**

First, we consider the Norwegian certificate ‘Miljøfyrtårn’. This certification is a national programme for environmental certification, supported and recommended by the Ministry of the Environment (Miljøverndepartement 2010). The certification is handled by ‘Stiftelsen Miljøfyrtårn’, which manages the organisation and financing of the certification.

The purpose of ‘Miljøfyrtårn’ is to increase the environmental performance of the company. This certification helps companies to focus on environmental friendly measures in their daily operations, by fulfilling industry standards set by ‘Stiftelsen Miljøfyrtårn’ (Miljøfyrtårn 2009).

In order to be a certified ‘Miljøfyrtårn’ company, the company must collaborate with a licensed consultant and carry out the following steps:

- 1) Perform an environmental analysis. The analysis focuses on the working environment, procurement, disposal, energy use, transport and emissions.
- 2) Find solutions regarding critical problems found in the environmental analysis.
- 3) Agree on environmental measures to meet the industry requirements set by ‘Stiftelsen Miljøfyrtårn’.

Following, environmental measures are supposed to be both efficient in terms of financial performance as well as environmental friendly. In order to be awarded ‘Miljøfyrtårn’, the company must actively fulfil environmental measures and become accredited by local governments.

## **2.2 EMAS**

Second, we consider the European Eco-Management and Audit Scheme (EMAS). The scheme is applicable for all companies independent of industry within the EU and EEA. EMAS is a voluntary management tool created to report and improve environmental performance, beyond environmental regulations. The standard is developed to help the firm conduct an environmental review, establish an effective environmental management system and audit; as well as provide a statement of the environmental performance (European Commission 2009).

In order to be EMAS certified, the company must perform the following activities:

- 1) Develop an environmental policy that describes the company's overall aims and principles with respect to the environment.
- 2) Make an initial environmental review, which is an analysis of how the company affects the environment.
- 3) Develop an environmental programme that states concrete and specific targets regarding their environmental policy.
- 4) Establish an environmental management system with operating procedures and controls; where responsibilities, operational procedures, training and communication systems are set.
- 5) Carry out an internal environmental audit in order to evaluate the management system.
- 6) Review the management system one more time.
- 7) Develop an environmental statement for the company's stakeholders.

After completion of these steps, the company assigns an independent verifier in order to become certified (European Commission 2010). The environmental audit and statement must accordingly comply with the EMAS rules before the company can be recognized as a certified EMAS company.

## **2.3 ISO 14001:2004**

Third, we consider the international environmental certification ISO 14001:2004. The ISO 14001 certification applies to the environmental aspects that are identified and influenced by the firm, as the standard does not state any specific environmental performance criteria. The ISO 14001 standard is appropriate for any organisation that either wants to implement, maintain or improve an

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environmental management system. The standard was developed by the International Organization for Standardization.

The ISO 14001 enables the organisation to build and operate an environmental management system. Further, it provides a tool for environmental performance, facilitates reductions in emissions and waste as well as complying to environmental legal requirements (DNV, ISO 1400 Flyer 2010). This standard can be implemented into a complete range of business sectors and industries.

In order to get this recognition, the company must prepare for certification by carrying out the following measures:

- 1) Perform internal audits or contract a third party to make a preliminary assessment.
- 2) Identify environmental aspects as well as applicable legal requirements.
- 3) Establish objectives, targets and improvement programmes (DNV, ISO 1400 Flyer 2010).

After completion of these steps, the firm is controlled and accredited by an independent verifier (e.g. Det Norske Veritas (DNV)) if it satisfies the predetermined environmental measures.

#### ***2.4 Comments on the three certificates***

When examining the three standards one must take into consideration their different origin. Miljøfyrtårn is the Norwegian standard, EMAS is recognised within the EU and EEA, whereas ISO 14001:2004 is globally recognised.

The ISO certificate may be more recognized than the other two certificates in our analysis. The International Organisation for Standardisation offers several different management systems and when the firm is accredited with one of the ISO certificates, the costs of achieving an additional certificate is quite low (compared with the costs of implementing the first). In our sample most of the firms hold an ISO 14001 certificate. From our sample, we discover that the EMAS is the less frequently used certificate for Norwegian firms.

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Furthermore, it is important to consider the costs and benefits when implementing a green certificate. The benefits originate from increased resource productivity, reductions in waste and reductions in future environmental liabilities. The costs come from the implementation and operation of a new management system. Hence, development of an environmental policy may lead to improved firm performance if the benefits exceed the costs.

### **3.0 Literature review**

There exist few studies in the financial literature on environmental investments and firm performance of firms that holds environmental certificates. Most of the papers and articles concerning environmental performance, study listed firms within the United States. To our knowledge there exist no published papers on environmental standards and financial performance based on non-listed firms and accounting-numbers. The most relevant papers for our study are presented.

#### **3.1 *Fisher-Vanden and Thorburn (2008)***

A recent study to examine how shareholders value environmental responsible investments is the article ‘Voluntary corporate environmental initiatives and shareholder wealth’ by Fisher-Vanden and Thorburn (2008). Fisher-Vanden and Thorburn (2008) claim that several studies document a positive relationship between environmental performance and accounting profitability measures. They found no causality between environmental standards and firm performance, by looking at the share price reaction when information about adapting to environmental standards was released in the market. In their study they used a sample of 157 US publicly traded firms and reached a conclusion that for the average firm, it does not pay to be green.

#### **3.2 *Jacobs, Singhal and Subramanian (2008)***

Another relevant paper is ‘An empirical investigation of environmental performance and the market value of the firm’ by Jacobs, Singhal and Subramanian (2008). They analyze the value effects of environmental performance by measuring the stock market reactions associated with announcements of environmental performance, known as event studies. The study is divided into corporate environmental initiatives (CEIs) taken by the firm and environmental awards and certifications (EACs) given to the firm. They find that ISO 14001 certifications are associated with significant positive market reactions. In general they find the market to be selective in reacting to announcements of environmental performance (Jacobs, Singhal and Subramanian 2008).

### **3.3 *Porter and Van der Linde (1995)***

Porter and Van der Linde (1995) looked at environmental regulations and a firm's competitiveness. When adapting to an environmental standard, the firm may gain increased resource productivity, first-mover advantages and quality improvement. In general, they state that adapting to environmental standards stimulates innovation and as a result improves competitiveness for the firms that adopt these standards. This can be seen in connection with today's environmental certificates, in which companies that choose to apply for the certificates might get a competitive advantage.

### **3.4 *Klassen and McLaughlin (1996)***

In the paper 'The Impact of Environmental Management on Firm Performance' Klassen and McLaughlin investigate the benefits and market response to sustained environmental management efforts, signalled to the public through firm-specific environmental events. They imply financial event methodology, based on the Efficient Market Hypothesis, to control for general market movements, correct for firm size, and to infer causality. Further, this methodology was used to estimate the significance of the abnormal returns associated with the events. Their results showed significant positive abnormal returns followed by positive environmental events and significant negative returns for environmental crisis.

### **3.5 *Cohen, Fenn and Konar (1997)***

The paper 'Environmental and financial performance: are they related?' by Cohen, Fenn and Konar (1997) reports on the environmental performance of the Standard and Poor's 500 companies. In this article there are constructed two industry-balanced portfolios and they compare both accounting returns and market returns of the 'high polluter' and the 'low polluter' portfolio. In addition, the paper examines the stock market's reaction to new information regarding the environmental performance of individual firms, and it provides an analysis of which comes first – good financial performance or good environmental performance. Their results show that there is neither a penalty for investing in a green portfolio nor a positive return from green investments.

### **3.6 *Dodd and Warner (1983)***

In order to estimate the significance of share price movements connected to proxy fights for seats on the board of directors, Dodd and Warner employ the Patell Z-test in 'On Corporate Governance, A study of Proxy Contests'. The market model is used to compute the abnormal return and the Patell Z-statistic is used to test the average standardised cumulative abnormal return. The advantage of the Patell Z-statistic is that it is a standardisation procedure that allows the cross-sectional distribution of cumulative residuals to be compared to a unit normal.

### **3.7 *Bryson, Dorsett and Purdon (2002)***

The report 'The use of Propensity Score Matching in the Evaluation of Active Labour Market Policies' gives an insightful understanding of the relevance of propensity score matching to evaluation research. The authors describe how statistical matching through the use of propensity scores can be used to construct the counterfactual. Moreover, the paper focuses on labour market policy evaluation and whether changes in policy and introduction of new programmes, influence outcomes such as employment and earnings for those subject to the policy change.

### **3.8 *Marinelli (2008)***

One relevant study on outstanding performance is the study 'Persistence of Outstanding Performance and Shareholder Value Among Diversified Firms'. Here Marinelli studies the impact of past performance, efficient integral capital markets and relatedness of business segments. He investigates the relationship between diversification and performance, to determine whether diversification strategy creates or destroys value. In order to compare firm performance based on different industry specific performance, he employs the performance indicator outstanding performance.

## 4.0 Hypothesis

We investigate whether a firm's commitment to a voluntary environmental programme affects stock returns or firm performance for listed and non-listed firms respectively. A voluntary environmental programme is adhering to one of the three certificates: 'Miljøfyrtårn', EMAS or ISO14001:2004. As both listed and non-listed firms are investigated, the analysis of these is separated. Company stock returns are compared to the OBX index whereas firm performance is measured by ROE and ROA to comparable firms.

### 4.1 *Listed firms*

The null-hypothesis and the alternative hypothesis for the listed firms are:

$H_0$  : Announcement of an environmental certificate has no effect on stock returns.

$H_A$  : Announcement of an environmental certificate has a significant positive effect on stock returns.

The announcement of an environmental certificate is the day of announcement of an environmental certificate. The effect of implementing an environmental certificate on stock returns, is found by estimating abnormal returns and cumulative abnormal returns.

### 4.2 *Non-listed firms*

The null-hypothesis and the alternative hypothesis for the non-listed firms are:

$H_0$  : Accreditation of an environmental certificate has no effect on firm performance.

$H_A$  : Accreditation of an environmental certificate has a significant positive effect on firm performance.

Firm performance is Return-on-Equity and Return-on-Assets; and is measured by outstanding performance.

## **5.0 Data**

Our sample comprises the largest listed firms and non-listed firms in Norway. The listed and non-listed firms are different in terms of valuation. Listed firms are measured by market value whereas non-listed firms are measured by book value. Consequently, we separate the analysis of the two groups of firms.

The listed firms in our research include firms listed on Oslo Stock Exchange that hold green certificates, all identified in December 2008. In order to analyse the largest non-listed firms with a green certificate in Norway, we examine the list 'The 500 largest companies in Norway' (2008).

### **5.1 Sample selection**

To identify firms that hold green certificates we review miljoindex.no. The firms need to hold either Miljøfyrtårn, EMAS or ISO14001:2004 in order to be included in our sample.

In our total sample, before making any corrections, listed firms that hold a green certificate count 27 whereas non-listed firms count 103. In order to have a consistent sample, some corrections concerning both groups of firms are made.

Concerning the listed firms, firms are excluded when:

- quarterly and yearly earnings- and dividends announcements are released
- there are unavailable stock returns
- certificate belongs to a subsidiary
- publications of important contracts are released

Concerning the non-listed firms, firms are excluded when:

- there are unavailable accounting numbers
- certificate belongs to a subsidiary

Furthermore, we examine only the initial certificate when a firm has more than one certificate. The first certificate is assumed to have the greatest impact on excess returns and outstanding performance. Thus, when a firm is accredited e.g. its second or third certificate, the main impact is expected to be absorbed earlier. Hence, this effect is not expected to be significant when the company gets a

renewal of an old certificate, or gets additional green certificates. Accordingly, when announcing the first certificate, the firm is expected to be perceived as a firm that cares for the environment. Hence, this effect is not expected to be significant when the company gets a renewal of an old certificate, or gets additional green certificates.

After the corrections of the total sample, firms with a green certificate comprise 17 listed and 64 non-listed firms. All firms with a green certificate are certified in the time span from 1994-2008, hence this is the sample period.

Consolidated numbers are used in the study. We control for firms that have certificates in their subsidiaries and not in their parent company.

## **5.2 *Listed firms***

Listed firms are defined as firms listed on the Oslo Stock Exchange. The OBX-index is used as a benchmark for listed firms, accordingly the market return is based on this index. The OBX-index is a value-weighted index and entails the 25 most liquid companies on the Oslo Stock Exchange, ranked by sales for the last six months in December 2008 (Oslo Børs 2009). Share prices and the OBX share-index are downloaded from Datastream.

Event study methodology requires that announcements affecting the stock price in the event period have to be considered. Quarterly and yearly reports of earnings and dividends are accounted for as well as publications of important contracts. Subsequently companies with conflicting news are excluded from the sample. In order to control for this we review the company's homepage and Newsweb.no for announcements. Additionally, when there is no available information on stock returns, the firm is excluded from the sample. Furthermore we exclude certified firms that are not listed during the estimation period. Firms that are excluded from the sample are listed in Table 1B. Table 1A shows the sample of listed firms which counts 17.

### 5.3 *Non-listed firms*

Non-listed firms are defined as privately held firms. Financial information about the non-listed firms is collected from the CCGR database provided to us by Department of Financial Economics at the Norwegian School of Management BI. The CCGR database comprises all active Norwegian firms with limited liability in the period of 1994-2008 (Berzins, Bøhren and Rydland 2008). The database contains 77 000 non-listed firms and 125 listed firms per year. The access to the CCGR database of non-listed firms makes our study unique by Norwegian standards. Table 2A shows the sample of non-listed firms with at least one green certificate, which counts 64 firms.

The control group for the non-listed firms are found in the CCGR database. In order to create a valid control group, we use propensity score matching and the nearest neighbour method. This is done to discover firms with similar characteristics. For each non-listed firm the control group contains five matching firms.

We exclude some firms from our sample due to the nature of the CCGR database. As we use accounting numbers to find outstanding performance, there were no data on 2009 available when initiating our study. Thus firms certified in 2009 are excluded. Additionally, we experience some firms in the database to have missing values, these firms are also excluded. The list containing the listed firms can be seen in Table 2B.

Moreover, the overall sample period has many missing values, therefore we also investigate a sub-period which may have higher consistency in the data. The sub-period is the period from 2001 to 2007, in which 2002 is excluded. 2002 is excluded due to many missing values in the industry variable. From 2001 to 2007 (excl. 2002) it is possible to observe the firms based on the same characteristics, i.e. the independent variables net profit ratio, solvency, debt-equity ratio and industry. When the firms are measured on the same conditional variables, the CIA is not violated. The results from the sub-period 2001 to 2007 (excl. 2002) can be seen in Table 8A and Table 8B.

Furthermore, data is checked for bivariate correlation between the independent variables used in the logit regression (described in section 6.2.1). Correlation is controlled for by using the Pearson's correlation coefficient. The Pearson correlation calculates to which extent there exists a linear relationship between independent variables (Meyers, Gamst and Guarino 2006). The independent variables solvency and net profit ratio show a high correlation of 0,858, significant on the 1%-level.

Moreover, as the net profit ratio is the result of operations plus interest costs on total revenues whereas solvency is equity on total assets, they do not measure the same and thus we do not exclude them from the regression. Additionally, the variables solvency and debt-to-equity show a correlation of 0,371 and is significant at the 1%-level using Pearson's correlation. Furthermore, the debt-to-equity ratio and net profit ratio shows a correlation of 0,097, at a 1%-significance level. Moreover, the correlation between solvency and debt-to-equity; and the debt-to-equity ratio and net profit ratio, is not so severe that the variables are excluded from the sample.

The remaining independent variables show no sign of critical correlations. All correlations are displayed in Figure 1.

		<i>RD/Sales</i>	<i>Assets/Sales</i>	<i>Net profit ratio</i>	<i>Solvency</i>	<i>Debt/Equity</i>
<i>RD/Sales</i>	<i>Pearson Correlation</i>	1	-0,15	0,07	-0,012	-0,020
	<i>Sig. (2-tailed)</i>		0,695	0,064	0,758	0,618
<i>Assets/Sales</i>	<i>Pearson Correlation</i>	-0,15	1	0,020	0,005	0,001
	<i>Sig. (2-tailed)</i>	0,695		0,591	0,899	0,975
<i>Net profit ratio</i>	<i>Pearson Correlation</i>	0,07	0,020	1	0,858**	0,097**
	<i>Sig. (2-tailed)</i>	0,064	0,591		0,000	0,000
<i>Solvency</i>	<i>Pearson Correlation</i>	-0,012	0,005	0,858**	1	0,371**
	<i>Sig. (2-tailed)</i>	0,758	0,899	0,000		0,000
<i>Debt/Equity</i>	<i>Pearson Correlation</i>	-0,020	0,001	0,097**	0,371**	1
	<i>Sig. (2-tailed)</i>	0,618	0,975	0,000	0,000	

*Figure 1: Correlations table of the independent variables used in the logit regression to compute the propensity scores. \*\* indicates significance at the 1%-level.*

## **6.0 Methodology**

To examine the listed and non-listed firms we employ two different methodologies. For the listed firms we employ the market model, i.e. the Capital Assets Pricing Model (CAPM). The non-listed firms are examined by measuring the outstanding performance of the accounting numbers.

We employ the same methodology as Fisher-Vanden and Thorburn (2008) and Klassen and McLaughlin (1996). According to Brown and Warner (1985), various methods can be used to estimate statistical significance of the change caused by an event. Hence, event study methodology and following the market model is employed in the study.

Few studies cover non-listed firms and the increase in firm value related to announcements of committing to green initiatives. We employ the method used by Marinelli (2008) for the non-listed firms. Following we measure the outstanding performance for the ROE and ROA, in order to control for firm performance.

### **6.1 *Listed firms***

#### **6.1.1 *Announcement abnormal returns***

Event study methodology is employed to examine the valuation effect of the announcement of an environmental certificate, thus we estimate the abnormal announcement returns for the listed firms.

According to semi-strong form of the Efficient Market Hypothesis, the net present value of the expected costs and revenues associated with the environmental standards will instantly be absorbed in the stock price when the news are made public (Klassen and McLaughlin 1996). To measure the abnormal stock returns focus is on the day the new information reaches the market. The announcement returns provide a natural experiment for asking how the stock market values the news about the environmental standards (Fisher-Vanden and Thorburn 2008).

Employing the same methodology as Fisher-Vanden and Thorburn (2008) and Klassen and McLaughlin (1996), the market model measures the abnormal return for firm  $i$  at day  $t$ .

The measured abnormal return of firm  $i$  is based on the estimate of the residual for a single event day  $t$  as:

$$AR_{it} = R_{it} - \alpha_i - \beta_i R_{mt}$$

where  $AR_{it}$  is the abnormal return of firm  $i$  at time  $t$ ,  $R_{it}$  is the return of firm  $i$  at time  $t$ ,  $R_{mt}$  is the market return at time  $t$ ,  $\alpha_i$  is the constant term for firm  $i$  and  $\beta_i$  is the slope of the characteristic return of firm  $i$  (Klassen and McLaughlin 1996).

Moreover,  $\alpha_i$  and  $\beta_i$  are the coefficients from the single-factor market model:

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

over the estimation period, respectively from -96 through -6 days before the event day. However, for the firm Byggma the regressed parameters in the market model are estimated from -73 through -6, as it was listed on the Oslo Stock Exchange 74 days before the announcement.

The parameters in the market model  $\alpha_i$  and  $\beta_i$  are estimated by using ordinary least squares (OLS). OLS is the most common method used to fit a regression line to the data. This involves taking the vertical distance between a point and the line, then square it and following minimise the sum of the squares drawn from the points to the line (Brooks 2008).

The estimation period and event window are displayed in Figure 2.

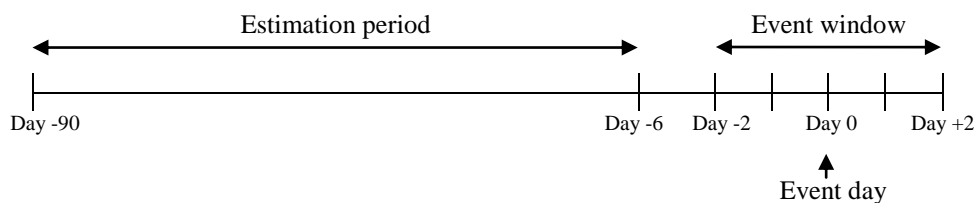


Figure 2: Time framework for the event study

The announcement day is called Day 0. One time period is defined as a single day when the stock market is in operation.

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The event windows examined are:

- Day -1 to Day +1
- Day -2 to Day +2
- Day -1 to Day +2
- Day -2 to Day +1
- Day 0 to Day +2
- Day -2 to Day 0

Moreover, the event period is the period in which the security prices are examined. The event periods including several event days capture the potential price effects of information leakages and the impact of announcements after market closing on Day 0. This increases the robustness of the test compared to measuring returns over long windows, where all daily returns enter with equal weight (Fisher-Vanden and Thorburn 2008).

To test the significance of the estimated abnormal returns over an event window containing several time periods, the abnormal return is accumulated. The cumulative abnormal return (CAR) for firm  $i$  over e.g. the event window using Day -1 to Day +1, is given by:

$$CAR_{-1,1} = \sum_{t=-1}^1 AR_{it}$$

The average cumulative abnormal return (ACAR) across the  $N$  sample firms is:

$$ACAR_{-1,1} = \frac{1}{N} \sum_{t=-1}^1 AR_{it}$$

When the company perform better than the market the expected value of the average cumulative abnormal return is expected to be positive.

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*The Patell Z-statistic:*

The Patell Z-test is used to examine the statistical significance of the abnormal returns. Furthermore, the Patell Z examines the statistical significance of the average cumulative abnormal return between any two dates. We employ a procedure similar to the one used by Dodd and Warner (1983).

For each security  $i$ , the prediction error  $PE_{it}$  (the abnormal return) for each of the days in the study is standardised by the cumulative prediction error  $SPE_{it}$  (the standardised cumulative abnormal return):

$$SPE_{it} = \frac{PE_{it}}{s_{it}}$$

where

$$s_{it} = \left\{ s_i^2 \left( 1 + \frac{1}{L_i} + \frac{(R_{mt} - \overline{R_m})^2}{\sum_{t=1}^{L_i} (R_{mt} - \overline{R_m})^2} \right) \right\}^{1/2}, L_i \leq 90$$

The parameters in the equation represent the following:

- $s_i^2$  estimated residual variance from the market model regression for security  $i$
- $\overline{R_m}$  average market return over the  $L_i$  days used for the regression
- $R_{mt}$  return to the market index at day  $t$
- $L_i$  estimation period in the regression

For each security  $i$  the SPE for each of the days ( $d_{2i} - d_{1i} + 1$ ) in the event period under study, is summed to form a standardised cumulative prediction error  $W_i$ :

$$W_i = \sum_{t=d_{1i}}^{t=d_{2i}} SPE_{it} * \frac{1}{\sqrt{d_{2i} - d_{1i} + 1}}$$

As  $L_i$  is large (90 days),  $W_i$  is assumed to be distributed unit normal.

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In order to test the significance of the average normalised cumulative prediction errors, they are multiplied by the square root of the number of securities:

$$Z = \bar{W}_i * \sqrt{N}$$

where

$$\bar{W}_i = \frac{1}{N} * \sum_{i=1}^N W_i$$

Following, we assume that the standardised cumulative prediction errors (standardised cumulative returns) are independent across securities. Thus, if the expected value of the SPE is equal to zero, the Patell Z-statistic will be distributed unit normal for the assumed unit normal  $W_i$ 's.

The advantage of the Patell standardisation procedure is that it allows the entire cross-sectional distribution of cumulative abnormal returns to be compared to a unit normal distribution.

## **6.2 Non-listed firms**

Non-listed companies count for 2-4 times the listed companies, no matter which magnitude being used in the Norwegian economy (Berzins and Bøhren 2009). In Norway the majority of the largest firms are private and not listed on the Oslo Stock Exchange.

### *6.2.1 Propensity score matching*

In order to compute the firm benchmarks ( $ROE_{NN,t}$  and  $ROA_{NN,t}$ ) for the non-listed firms we use propensity score matching. This method was introduced by Rosenbaum and Rubin in 1983. Propensity scores are the conditional probability of selection into a specific treatment programme, given by a vector of observed covariates (Rosenbaum and Rubin 1983). Further, adjustment for the propensity score is sufficient to remove bias resulting from all the observed covariates.

The method of propensity score matching is used to deal with the selection bias problem. The selection problem concerns the matter that participants are more likely to participate in a voluntary programme; and following on average perform

better than the non-participants. Participants are firms holding environmental certificates, whereas non-participants are firms without environmental certificates. In order to attain a valid estimation of participation, the selection problem must be accounted for. It is important to notice that firms with certifications are different from firms without certificates. Propensity score matching is a way to deal with the selection bias problem.

The fundamental idea in propensity score matching is to find a large group of firms that is similar to the participants in all relevant pre-treatment characteristics (Caliendo and Kopeinig 2005). In order to estimate the propensity scores, we run a logit regression. We compare all the certified firms to a large group of non-certified firms, with the similar characteristics as they all are among the largest firms in Norway (The 500 largest companies in Norway).

The key assumption behind propensity score matching is that selection into a programme can be explained purely in terms of observable characteristics (Bryson, Dorsett and Purdon 2002). This is known as the Conditional Independence Assumption. In this study selection into a programme is accreditation of a green certification. The Conditional Independence Assumption requires that all the independent variables in the logit regression influence both participation and outcome. However, this assumption is violated if not all variables that influences outcome and participation are included in the estimation of the propensity score.

Only one outcome is observed and this outcome is known as the factual outcome (Bryson, Dorsett and Purdon 2002). The counterfactual outcome is the outcome if the firm holding a certificate not participate and when the non-certified firm participate. The firm's obtainment of a green certificate is participation, while Return-on-Equity (ROE) and Return-on-Assets (ROA) are the outcome. We study the firms' outcome (i.e. ROE and ROA) of those which obtain a green certificate contrary to those without a green certification.

There are some advantages connected to the method of propensity score matching. When introducing this method we aim to solve the selection-bias problem. This problem arises as the sample comprises firms holding green certificates and also

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firms without these green certificates. Further, an advantage with propensity score matching is the assumption concerning no need of the constant additive treatment effects across firms. Additionally matching does not require assumptions about the functional form of the outcome equation, thus it is nonparametric.

Contrary, there are some disadvantages when employing propensity score matching as it is a non-experimental method. First, it makes the Conditional Independence Assumption of random assignment, to ensure that treated and non-treated populations are similar on both observable and unobservable characteristics (Bryson, Dorsett and Purdon 2002). Second, propensity score matching only estimate treatment effects that have support for the treated individuals among the non-treated population.

We use different independent variables in each year due to data problems originating from the CCGR database. The independent variables are the following:

- 1) Net Profit Ratio
- 2) Solvency
- 3) Debt-to-Equity Ratio
- 4) R&D-to-Sales
- 5) Assets-to-Sales
- 6) Industry

The independent variables examine the economical situation of the firm by accounting ratios. Ratios stemming from the accounting numbers are used as independent variables, as ratios express the magnitude of numbers relative to each other. Consequently, we use key financial figures, as they depict the state of the firm in a reasonable manner. Accordingly, the net profit ratio is the result of operations plus interest costs on total revenues. Solvency is equity on total assets. The debt-to-equity ratio is firm debt to equity. R&D-to-sales are the costs of research and development on sales. Assets-to-sales are total assets to sales. Lastly, industry is the industry code which is defined as a categorical variable. The influence of the independent variables on participation and outcome are described in Table 3.

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According to Bryson, Dorsett and Purdon (2002) cases of missing data can be excluded, hence we eliminate the respective independent variables from the estimation that are largely influenced by missing data. The complete table of the independent variable used in each year, are displayed in Table 3.

Further, we recognise the certification of the firms as a single treatment. The logit model is employed to compute the propensity scores, as the probit and logit model usually provide the same results (Bryson, Dorsett and Purdon 2002). The logit regression including all the independent variables is:

$$L_i = \beta_1 + \beta_2 \text{Net Profit Ratio}_i + \beta_3 \text{Solvency}_i + \beta_4 (\text{Debt}_i / \text{Equity}_i) \\ + \beta_5 (\text{R\&D}_i / \text{Sales}_i) + \beta_6 (\text{Assets}_i / \text{Sales}_i) + \beta_7 \text{Industry}_i + u_i$$

The dependent variable  $L_i$  is the predicted probabilities for whether firm  $i$  is certified or not, hence this is the propensity score. The independent variables of firm  $i$  affects both participation and outcome.

*Nearest neighbour matching:*

There exists several methods to construct a comparison group (i.e. a firm benchmark) from the non-treatment group, we use the method of nearest neighbour. The companies included in the respective benchmarks are elected by the nearest neighbour (NN) method. This method involves taking each treated firm in turn and identify the non-treated firm with the closest propensity score (Bryson, Dorsett and Purdon 2002).

Furthermore, there exist several variants of NN matching; we use NN matching with replacement. This entails that untreated firms, i.e. firms without certification, can be used several times as a match. Our sample consists of many comparable untreated firms, thus five companies are selected by the NN method to get more accurate estimates (also known as oversampling), all firms are uniformly weighted (Caliendo and Kopeinig 2005). Allowing for replacement increases the average quality of matching, and thus it involves a trade-off between reduced variance and increased bias (Caliendo and Kopeinig 2005).

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The resulting match from the NN method is the best possible achievement, in that the bias across the treatment and comparison group is minimised (Bryson, Dorsett and Purdon 2002). Following the method can give highly adaptive behaviour of the firms that are matched.

### 6.2.2 Outstanding performance

In order to analyse firm performance, we use a performance indicator which indicates outstanding performance. Outstanding performance is the same as performance above industry average. This approach was also used by Frederico Marinelli (2008). To identify whether the sample firms depart from ‘normal’ financial performance during the period of study, we compare them to a benchmark of control firms determined by propensity score matching. Outstanding performance is determined by:

$$OROA_{it} = ROA_{it} - ROA_{NN,t}$$

where  $ROA_{it}$  represents the ROA of firm  $i$  during period  $t$ . Further  $ROA_{NN,t}$  represents the mean of benchmark firms during period  $t$ , found by using PSM with the nearest neighbour matching method. In order to compute the  $ROA_{NN,t}$  benchmark, we use five firms with several comparable measures.

The same logic is employed when comparing the ROE of the firms to the industry benchmark.

$$OROE_{it} = ROE_{it} - ROE_{NN,t}$$

Where  $ROE_{it}$  represents the ROE of firm  $i$  during period  $t$ . Further  $ROE_{NN,t}$  represents the mean of benchmark firms during period  $t$ , found by using PSM with the nearest neighbour matching method. In order to compute the  $ROE_{NN,t}$  benchmark, five firms with several comparable measures are selected. The announcement year of the environmental certification, is called Year 0. Furthermore, performance in Year 1 is measured to account for the time delay of an environmental certification until the accreditation is absorbed by the accounting numbers.

### 6.3 *Significance tests*

To test the results of the models we use both parametric and nonparametric tests, thereby we increase the robustness of the results. Parametric tests tend to under-reject the null hypothesis as the forecasting window grows, whereas nonparametric tests generally are more robust in these circumstances (Kolari and Pynnonen 2008). An advantage with nonparametric tests is that they do not require scores of the outcome variable to be normally distributed (Warner 2008). Further, when considering event study methodologies, Brown and Warner (1985) concluded that parametric tests are preferred as non-normality of daily returns has no obvious impact on event study methodologies.

#### 6.3.1 *Tests for the abnormal returns*

The Patell Z test controls for positive significance of the ACAR in the forecasting windows. The method provided by Patell allows the market variation over the estimation period to differ from the forecasting period (Mishra 2005). The Patell Z-statistic is a test statistic for the mean normalised cumulative prediction error (Patell 1976). To compute the Z-statistic we apply the steps as employed by Dodd and Warner (1983):

- 1) Each security-specific cumulative prediction error is standardised
- 2) Each normalised cumulative prediction error is assumed to be unit normally distributed
- 3) Mean normalised cumulative prediction errors are multiplied by the square root of the number of securities

The Patell Z-statistic is reported at a 1% ( $p \leq 0,01$ ) and a 5% ( $p \leq 0,05$ ) significance level.

The binomial test is based on the difference between two measures rather than quantitative measures (Siegel and Castellan 1988). The test enables us to determine whether it is more likely to experience positive returns in the forecasting period. For the likelihood parameter  $p$ , we use the standard probability value of 0,5 ( $p=0,5$ ) in the one-sided binomial test. The significance is reported at a 1% ( $p \leq 0,01$ ) and a 5% ( $p \leq 0,05$ ) significance level.

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### 6.3.2 *Tests for outstanding performance*

We apply the nonparametric one-sample Chi-square test on the non-listed results. The Chi-square test is used to test whether there is any relation between a green certificate and a positive OROE and OROA. The test is indicated at a 1% ( $p < 0,01$ ) and a 5% ( $p < 0,05$ ) significance level.

Furthermore, the one-sample t-test tests whether holding an environmental certificate influences firm performance. More specific the test examines if the financial performance (i.e. OROE and OROA) is significantly positive. The test examines the difference between companies with an environmental certificate and matching firms without an environmental certificate. The t-test was also employed by Cohen, Fenn and Konar (1997) to measure the significance of the ROE and ROA, in order to examine financial performance in relation to environmental performance. The one-sided test is reported at a 1% ( $p \leq 0,01$ ) and a 5% ( $p \leq 0,05$ ) significance level.

## 7.0 Results

Our study comprises Norwegian firms that hold at least one out of the three environmental certificates; Miljøfyrtårn, EMAS or ISO14001. The results are presented separately for the listed and non-listed firms. First we present the results of our analysis and then a discussion of the results is given.

### 7.1 Listed firms

#### 7.1.1 Presentation of results

The average abnormal return at the day of announcement, Day 0, is 0,89 % and significant at the 5 %-level. Moreover, Day -1 and Day +2 show positive results of 0,63 % and 1,47 % respectively. In contrast, Day -2 and Day +1 show negative results of -3,77 % and -0,19 % respectively. The average abnormal returns except for Day 0, show no significance. The results of the average abnormal returns are displayed in Figure 3, whereas the complete set of results is shown in Table 4.

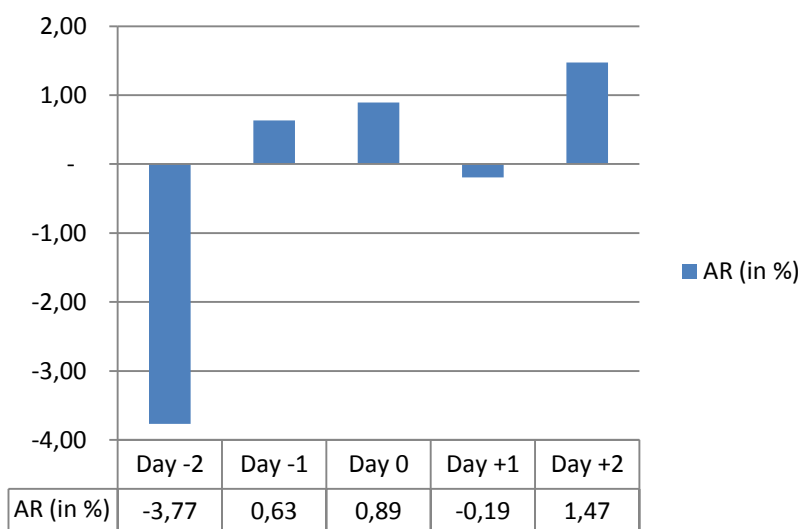


Figure 3: The graph presents the abnormal returns for all firms in each event day.

The average cumulative abnormal returns for  $ACAR_{-1,+1}$  and  $ACAR_{-2,+2}$  show results of 1,33 % and -0,96% respectively.  $ACAR_{-1,+1}$  is significant at the 5 %-level. Furthermore we investigate several event windows in order to discover a trend for the event period. The  $ACAR_{-1,+2}$  and  $ACAR_{0,+2}$  show positive results of 2,80 % and 2,17 % respectively. In contrast  $ACAR_{-2,+1}$  and  $ACAR_{-2,0}$  show negative results of -2,44 % and -2,24 % respectively. The remaining event windows, other than  $ACAR_{-1,+1}$ , show no significance. A complete set of results

over the event windows are shown in Table 4. The results of the ACAR across all event windows are displayed in Figure 4.

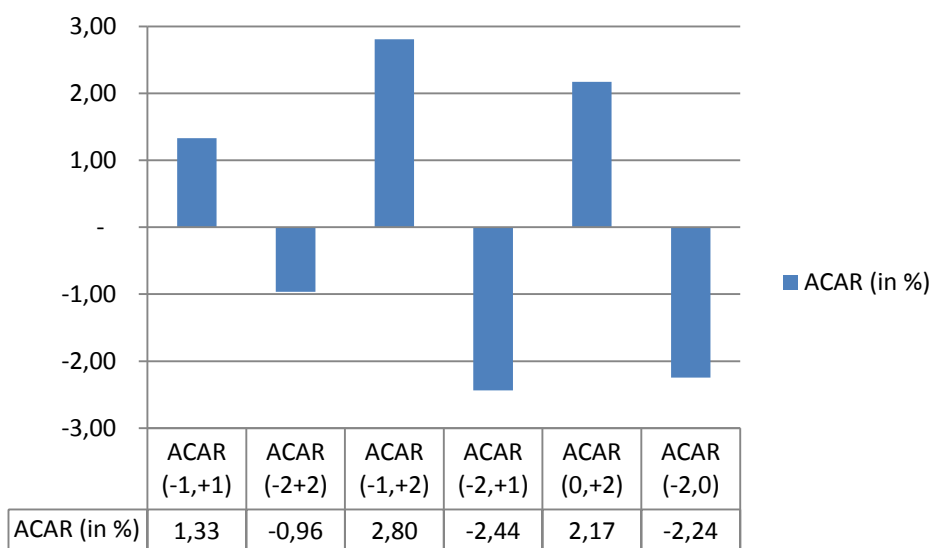


Figure 4: The graph presents the average cumulative abnormal returns for all firms in each event day.

Furthermore we investigate the frequency of the positive to negative CARs. We find a majority of positive CARs in the windows -2 to +2, -1 to +2 and 0 to +2. However, the ratios of the CARs show no significance in either of the event windows.

### 7.1.2 Discussion of results

The abnormal returns show no significant trend throughout the event period. We discuss the influence announcement of a green certificate has on stock returns, based on our findings.

Average abnormal returns in the event period, show mixed results. From the findings it is difficult to discover a clear pattern related to the reaction to announcement of green certificates. At the event day, Day 0, a positive significant result of 0,89 % is observed. This indicates a positive perception in the market, due to announcement of a green certificate on Day 0. Accordingly, this supports our hypothesis that announcement of a green certificate has a positive influence on stock returns.

Moreover, the results of the average abnormal returns for the other days in the event period show no significant returns. We discover a large negative value two

days prior to the announcement and also a small negative value on the following day. Furthermore, there are positive values in the day before and two days after the announcement. At Day -1 the positive returns may be explained by information leakage from the announcement of the certificate. Contrary the large negative value in Day -2 is difficult to explain. Accordingly, our results give no clear picture of the effect of announcement on stock returns.

In event study methodology it is common to investigate the event windows -1 to +1 and -2 to +2. First we examine the respective windows, and subsequent we discuss the other event windows under study.

When examining the windows -1 to +1 and -2 to +2, we find the event window -1 to +1 to have a positive significant return. This supports the hypothesis that announcement of a green certificate has a positive impact on stock returns. Moreover, in the event window -2 to +2 we obtain a negative return that is not significant. Thus, the wider window might weaken the results that announcement of a green certificate has a positive effect on stock returns.

Furthermore, as the results from the traditional windows (-1 to +1 and -2 to +2) show no clear trend, we also examine the windows -1 to +2, -2 to +1, 0 to +2 and -2 to 0. Only the windows 0 to +2 and -2 to 0 show significant positive and negative results respectively. The remaining windows show both positive and negative returns, thus there is difficult to indicate a trend in the results. When Day -2 is excluded from the event window, the ACAR results show positive results in all event windows. Contrary, when Day -2 is included in the event period results are negative.

Regarding the cumulative abnormal returns and the frequency of the positive and negative returns, we find dispersed results that are not significant. This indicates whether or not firms obtain positive abnormal returns in the specific event windows. We observe that the significant positive and negative returns for the windows 0 to +2 and -2 to 0 respectively, correspond with the ACARs for the same event windows. This supports our findings of the significant ACARs in that the ACARs give a positive and negative return in the corresponding event windows. Moreover, in the event window -1 to +1, the findings from the CAR

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ratio does not support the significant positive result of the ACAR. This may weaken the result of positive stock returns based upon announcement of a green certificate.

The distribution of the abnormal returns is diverse and varies across the event days in being positive and negative. There may be many reasons why the findings do not provide any clear trend and accordingly it is difficult to find a pattern in the abnormal returns, which can be related to the announcement of a green certificate. The validity may suffer from a small sample size, consisting of 17 firms listed on Oslo Stock Exchange holding a green certificate. Moreover, the event study results might be disturbed by conflicting news. There is no standard procedure for excluding conflicting news, other than excluding news which might have a large impact on the stock price.

Furthermore, our findings on listed firms support earlier studies, as the results are diffuse and give no clear indication of firm behaviour related to environmental certifications. It is difficult to find an explanation of the mixed returns, as there is no clear relationship between environmental certifications and positive stock returns.

## **7.2 *Non-listed firms***

### *7.2.1 Presentation of results*

The outstanding financial performance of the ROE and ROA in both year 0 and year 1 are not significantly positive.

Furthermore, the outstanding performance for both ROE and ROA in year 0, i.e. the year of the certification, shows more positive than negative values. The OROE in year 0 has 32 positive and 25 negative values, whereas OROA has 30 positive and 27 negative values. However, we find no significant values from the Chi-square test for a positive relation between a green certificate and firm performance. The findings are shown in Table 5A.

Moreover in year 1, i.e. the year following the certification, there are more negative than positive values of both OROE and OROA. The OROE in year 1 has

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22 positive and 31 negative values, whereas the OROA has 21 positive and 32 negative values. Similar to year 0, the results are not significant.

We also examine the sub-period 2001 to 2007 (excluding year 2002), in order to investigate whether we obtain more consistent results when the estimation is based on the same independent variables in the logit regression. Year 2002 is excluded as this year has many missing values in the industry variable. The findings from the sub-period are shown in Table 5B.

The OROE in year 0 for the sub-period, i.e. the year of the certification, shows more positive than negative values. Moreover, OROE in year 1, in addition to OROA in year 0 and 1 show a majority of negative values. The OROE in year 0 has 22 positive and 14 negative values, whereas OROA has 16 positive and 20 negative values. We find no significant results for a positive relation between a green certificate and firm performance.

Furthermore in year 1, i.e. the year following the certification, there are more negative than positive values of both OROE and OROA. The OROE in year 1 has 17 positive and 19 negative values, whereas the ROA has 11 positive and 25 negative values. Only OROA shows significant results at the 5 %-level.

### *7.2.2 Discussion of results*

Based on the findings from the non-listed firms, we discuss the influence announcement of a green certificate has on firm performance.

The OROE and OROA show more positive than negative values in Year 0, contrary there is a majority of negative values in year 1. These findings are in contrast to the alternative hypothesis, that accreditation of an environmental certificate may positively influence the accounting numbers. The OROE and OROA show no significant results in both years.

Furthermore, when considering the sub-period 2001-2007 (excl. 2002) we discover no significance or higher consistency in the data. Thus, when using the same variables in the study, it does not support our hypothesis that accreditation

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of an environmental certificate has a significant positive effect on firm performance.

The accounting measures are influenced by many factors, and this might weaken the validity. The yearly accounting numbers are influenced by ‘events’ which have an influence on the performance of the firm, and consequently the ROE and ROA. The effect from the green certificate may be affected by the other events that also influence firm performance, measured by OROE and OROA. Moreover, the gain from a green certificate may not have a major impact on the accounting numbers as the numbers are infiltrated by other events. These events may have a disturbing effect on firm performance. Accordingly, announcement of certifications are incorporated in the accounting numbers and might not yield outstanding firm performance in the year after announcement.

Furthermore, market forces may have impact on the firm performance. Examples of matters that may have an impact on financial performance are the interest rate, consumer price index and government policy. These factors might influence the OROE and OROA such that the profit from implementation may not provide significant results.

Moreover, the costs and benefits of implementing a green certificate might lead to improved firm performance if the benefits exceed the costs. The costs come from the implementation and operation of a new management system. The benefits originate from increased resource productivity, reductions in waste and reductions in future environmental liabilities. Even though some costs are related to implementing and taking measures in being environmental friendly, they are necessarily not that high. Overall the total costs of adhering to an environmental certificate may be quite small and thus do not affect firm performance negatively. This can be related to a Net Present Value (NPV) analysis, where costs and revenues are identified to enter into an economical profitable project. Hence, implementing an environmental certificate may generate costs, but in the long term give advantages in terms of a positive feedback in society and among customers.

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The results show that the implementation of a green certificate does not hurt or help the firm's financial performance, when it is measured by OROE and OROA. Consequently, the firm performance will not be influenced positively by the implementation of a certificate. Hence, the firm performance of firms which implement a green certificate might not be significantly different compared to the benchmark firms.

## **8.0 Conclusion**

The thesis examines the financial impact of implementing one out of three green certificates, in the largest listed and non-listed firms in Norway. Out of the 500 largest companies in Norway, 130 companies hold at least one out of the three environmental certificates and 27 of these are listed companies. Based on our selection criteria, the total sample comprises 17 listed and 64 non-listed firms. The stock returns from the listed firms were controlled for abnormal returns in the event windows. Moreover, the outstanding performance was computed for year 0 and year 1 for the non-listed firms. The hypotheses examine whether green certificates have a significant positive effect on firm performance, measured by stock returns and outstanding performance for listed and non-listed firms respectively.

From the examination of the listed firms we find dispersed results and consequently we cannot reject the null hypothesis. Moreover, the results show several interesting findings. On the announcement day, positive significant average abnormal return of 0,89 % is found. This might signalise a positive perception in the market. Further, we find the event window -1 to +1 to have a significant positive return of 1,33%, whereas the event window -2 to +2 shows a negative return of -0,96%.

For the non-listed firms we examine two samples. First, we investigate the sample including all years. The results show no positive significant outstanding returns. The analysis of the sub-period from year 2001 to 2007 (excl. 2002), shows no positive significant outstanding performance. We find no significant relation between accreditation of an environmental certificate and outstanding performance from either of the samples. Hence, the null hypothesis for the non-listed firms cannot be rejected.

The main conclusion for both listed and non-listed firms is that it does not pay to be green. The two null hypotheses cannot be rejected, as the influence of an environmental certificate does not have a significant positive effect on firm performance.

These findings do not provide investors with incentives to do ERIs, given that investors are encouraged to make environmental responsible investments in order to achieve only financial gains. This is consistent with earlier studies, which are dispersed and find it difficult to relate environmental performance to financial performance. Subsequent, investors who carry out environmental responsible investments may experience positive feedback when doing business.

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## 10.0 Attachments

**Table 1A: Listed firms with certificates included in the sample**

There are 17 listed firms in the sample.

<i>Company</i>	<i>Date certified</i>		
	<i>Miljøfyrtårn</i>	<i>EMAS</i>	<i>ISO 14001:2004</i>
AF Gruppen ASA			04.12.2000
Atea ASA			04.06.2009
Byggma ASA			16.12.1997
Data Respons ASA			01.01.2008
DOF ASA			24.06.2002
Domstein ASA			21.08.2008
Eidesvik Offshore ASA			12.12.2006
Eltek ASA			14.06.2007
Farstad Shipping ASA			29.03.2006
Kitron ASA			28.11.2000
Marine Harvest ASA			15.08.2008
Nexus Floating Production Ltd.			27.12.2007
Norske skogindustrier ASA (hovedkontor)			19.01.2000
Q-free ASA			19.08.2005
Rieber & Søn ASA			04.12.2003
Storebrand ASA	18.11.2009		
Subsea 7 Norway NUF			18.04.2006

**Table 1B: Listed firms with certificates excluded from the sample**

Firms with environmental certificates that are excluded from the sample can be seen below. Exclusion of firms is based on: quarterly and yearly earnings- and dividends announcements, publication of important contracts and additionally when no information on stock returns is available.

<i>Company</i>	<i>Miljøfyrtårn</i>	<i>Date certified</i>	
		<i>EMAS</i>	<i>ISO 14001:2004</i>
Acergy S.A.			24.11.06
Aker Seafoods ASA	21.02.2007		
Bergen Group ASA			24.03.06
BW Offshore Ltd.			13.03.06
DnB Nor ASA	24.04.01 (Kristiansand)		
	24.06.03 (Fredrikstad)		
	16.06.03 (Tønsberg)		
	11.09.03 (Hamar)		
	10.02.04 (Ålesund)		
	11.05.04 (Bergen)		
	12.05.05 (Tromsø)		
	19.04.07 (Oslo Kirkegata)		
	19.04.07 (Oslo Kongesgt.)		
	12.12.07 (Trondheim)		
	21.12.07 (Drammen)		
	21.08.08 (Lillehammer)		
	12.01.09 (Skien)		
	07.05.09 (Lillestrøm)		
	03.07.09 (Sandefjord)		
	08.09.09 (Arendal)		
	31.03.09 (Kirkenes)		
	12.10.09 (Førde)		
Havila Shipping ASA			03.07.07
Infratek ASA	07.03.07		
Norsk Hydro ASA		21.09.98*	27.05.99(Alu.Roll.Holmest.) 29.07.99 (Alu.Vækerø) 07.10.99 (Alu.Roll.Håvik) 24.01.00 (Alu.Struc.Raufoss) 07.02.03 (Alu.Pro. Magnor)* 09.02.04 (Alu.Pro. Raufoss)
Norske			09.06.97 (Halden)
Skogindustrier ASA			06.07.05 (Skogn)
Yara International ASA			06.02.02 (Porsgrunn) 13.08.07 (Glomfjord)

*Table 1B cont.: Listed firms with certificates excluded from the sample*

<i>Company</i>	<i>Reason why the firms are excluded from the sample</i>
Acergy S.A.	Attained two big contracts on 22.11.06 and 24.11.06.
Aker Seafoods ASA	Report Q4 2007, improvement in all divisions.
Bergen Group ASA	Listed on OSEBX June 2008 and certified 24.03.2006.
BW Offshore Ltd.	No data on stock returns available.
DnB Nor ASA	Only certified in subsidiaries.
Havila Shipping ASA	Sale of vessel (02.07.07) and renewal of charter contract (03.07.07).
Infratek ASA	No data on stock returns available. Listed on OSEBX 05.12.2007.
Norsk Hydro ASA	Only certified in subsidiaries.
Norske	Only certified in subsidiaries.
Skogindustrier ASA	Only certified in subsidiaries.
Yara International ASA	Only certified in subsidiaries. Listed on OSEBX 06.02.2002.

**Table 2A: Non-listed firms with certificates included in the sample**

There are 64 non-listed firms in the sample.

<i>Company</i>	<i>Date certified</i>		
	<i>Miljøfyrtårn</i>	<i>EMAS</i>	<i>ISO 14001:2004</i>
ABB AS			30.07.06
AS Norske Shell AS	18.11.98		
Acergy Norway AS			24.11.06
Adecco Norway AS			23.06.94
Aller Media AS	21.04.08		
Baker Hughes Norway AS			20.10.00
Beerenberg Corp AS			25.10.02
Bilia Personbil AS			07.07.06
Boliden Odda AS			18.08.03
Brødr. Sunde AS			01.03.03
BW Offshore AS			14.03.05
Choice Hotels Scandinavia AS			12.12.08
Coca-Cola Drikker AS			30.04.04
Cubus AS (hovedkontor)	15.12.08		
DHL Express Norway AS			09.12.00
Draka Norsk Kabel AS			03.10.97
Elektroskandia Norge AS			12.01.99
Eni Norge AS			16.03.07
Eramet Norway AS			07.06.05
Fujitsu Technology Solutions AS			05.05.05
Gjensidige Forsikring BA	25.11.08		
Glamox ASA			14.10.02
Glava AS			23.12.98
Halliburton AS			27.12.01
Hamworthy Gas Systems AS			11.09.07
Helgelandskraft AS			03.12.08
Ineos Bamble AS			20.11.97
ISS Facility Services AS			14.02.07
Jotun AS			17.12.03
Kitron AS			28.11.00
Kollektivtransportproduksjon AS			27.04.07
Kongsberg Automotive AS			11.12.97
Kraft Foods Norge AS (hovedkontor)			06.10.96
M-I Swaco Norge AS			20.02.04
Nexans Norway AS			17.01.00
Norges Statsbaner AS			01.12.05

**Table 2A cont.: Non-listed firms with certificates included in the sample**

<i>Company</i>	<i>Date certified</i>		
	<i>Miljøfyrtårn</i>	<i>EMAS</i>	<i>ISO 14001:2004</i>
Norsk Medisinaldepot AS			23.06.08
North Cape Minerals AS			25.10.00
Oceaneering AS			25.11.04
Peterson Linerboard AS Moss			23.10.01
Pon Power AS			06.12.03
Ruukki Profiler AS			11.01.01
Sør-Norge Aluminium AS			20.10.97
Saint-Gobain Byggevarer AS			15.02.06
Scandinavian Business Seating AS		17.12.96	
Schenker AS			31.08.04
Siemens AG			03.05.99
Skanska Norge AS			13.06.05
Solar Norge AS			26.05.05
Sparebanken Hedmark (hovedkontor)	11.09.08		
Sparebanken Vest	15.12.08		
Spenncon AS			21.03.03
Statkraft SF Konsern			29.03.05
Statnett SF			15.02.06
Total E&P Norge AS		28.02.01	
Toyota Norge AS			27.11.06
Troms Kraft AS	14.12.01		
Vital Forsikring ASA	11.05.04		
Volvo Aero Norge AS			09.01.04
Volvo Maskin AS			27.11.98
Wallenius Wilhelmsen Logistics AS			20.12.00
Wartsila Norway AS (hovedkontor)			07.12.01
Würth Norge AS			05.05.04
YIT AS			27.06.01

**Table 2B: Non-listed firms with certificates excluded from the sample**

Firms with environmental certificates that are excluded from the sample can be seen below. Certified firms in 2009 are excluded as we use accounting numbers to find outstanding performance. Additionally there are some years in the database with no available accounting numbers, hence these firms are excluded.

<i>Company</i>	<i>Date certified</i>		
	<i>Miljøfyrtårn</i>	<i>EMAS</i>	<i>ISO 14001:2004</i>
Accenture AS			23.03.09
Ahlsell Norge AS	31.03.04		
Aibel AS			14.12.98
Alliance Healthcare Norge AS	12.07.06		
BN Bank ASA	13.12.09		
BP Norge AS			15.08.97
Capgemini Norge AS	07.05.09		
Coop Nord BA	23.02.09		
Coop Norge Handel AS	19.05.09		
Coop Trondheim og Omegn BA	24.06.09		
	19.06.09		
Den Norske Stats Husbank	23.06.06		
Elkem AS			21.12.90
			01.12.09
Fesil AS			11.01.00
			01.02.01
Handicare AS	23.10.09		
Helgeland Sparebank Region Nord	20.01.09		
Ica Norge AS	2009		
Kappahl	17.10.02		
	03.03.06		
	28.01.09		
	18.02.09		
	16.03.09		
	05.06.09		
	17.07.09		
	03.09.09		
Kommunalbanken AS	16.03.09		
LeasePlan Norge AS			28.06.07
Lindex AS	18.02.09		
	22.04.09		
	29.04.09		
	06.05.09		
	18.05.09		

**Table 2B cont.: Non-listed firms with certificates excluded from the sample**

<i>Company</i>	<i>Date certified</i>		
	<i>Miljøfyrtårn</i>	<i>EMAS</i>	<i>ISO 14001:2004</i>
Lindex AS	19.06.09		
	02.07.09		
Nordea Bank Norge ASA	12.12.01		
Nord-Trøndelag Elektrisitetsverk Holding AS (hovedkontor)			03.08.09
Norges Råfisklag	22.06.09		
Norsk Scania AS (hovedkontor)			23.02.09
NTE Energi AS			03.08.09
Plantasjen ASA	08.05.08		
	06.07.09		
Posten Norge AS	09.09.09		
Protan AS			12.11.97
Reinertsen AS			01.12.09
Rolls-Royce Marine AS			17.04.02
			25.09.02
			27.06.03
			01.12.03
			20.02.04
SCA Hygiene Products AS (hovedkontor)	24.04.09		
Skretting AS			08.06.99
Sparebanken Sogn og Fjordane	20.04.09		
Sparebanken Sør (hovedkontor)	18.06.09		
Star Tour AS			17.11.09
Statsbygg			01.11.06
Tollpost Globe AS			03.12.99
Vecto Gray Scandinavia AS			14.12.98
Viken Skog BA			30.11.98

*Table 2B cont.: Non-listed firms with certificates excluded from the sample*

<i>Company</i>	<i>Reason why the firms are excluded from the sample</i>
Accenture AS	No accounting numbers available.
Ahlsell Norge AS	No accounting numbers available.
Aibel AS	Only accounting numbers from 2002-2008 available.
Alliance Healthcare Norge AS	No accounting numbers for 2006 available.
BN Bank ASA	No accounting numbers available.
BP Norge AS	Only accounting numbers from 1999-2008 available.
Capgemini Norge AS	No accounting numbers available.
Coop Nord BA	No accounting numbers available.
Den Norske Stats Husbank	No accounting numbers available.
Elkem AS	Only certified in subsidiaries.
Fesil AS	Only certified in subsidiaries.
Handicare AS	No accounting numbers available.
Helgeland Sparebank Region Nord	No accounting numbers available.
Ica Norge AS	Only certified in subsidiaries.
Kappahl	Only certified in subsidiaries.
Kommunalbanken AS	No accounting numbers available.
LeasePlan Norge AS	No accounting numbers for 2007 available.
Lindex AS	Only certified in subsidiaries.
Nordea Bank Norge ASA	No accounting numbers available.
Nord-Trøndelag Elektrisitetsverk	No accounting numbers available.
Holding AS (hovedkontor)	No accounting numbers available.
Norges Råfisklag	No accounting numbers available.
Norsk Scania AS (hovedkontor)	No accounting numbers available.
NTE Energi AS	No accounting numbers available.
Plantasjen ASA	Only certified in subsidiaries.
Posten Norge AS	No accounting numbers available.
Protan AS	Only accounting numbers from 2002-2008 available.
Reinertsen AS	No accounting numbers available.
Rolls-Royce Marine AS	Only certified in subsidiaries.
SCA Hygiene Products AS (hovedkontor)	No accounting numbers available.
Skretting AS	Only accounting numbers from 2005-2008 available.
Sparebanken Sogn og Fjordane	No accounting numbers available.
Sparebanken Sør (hovedkontor)	No accounting numbers available.
Star Tour AS	No accounting numbers available.
Statsbygg	No accounting numbers available.
Tollpost Globe AS	Only accounting numbers from 2001-2008 available.
Vecto Gray Scandinavia AS	Only accounting numbers for 2007 available.
Viken Skog BA	No accounting numbers available.

**Table 3: Calculation of propensity scores**

In order to compute the propensity scores to find a proper firm benchmark, we use different independent variables. We were unable to find propensity scores based on the same independent variables for all years, thus the corresponding independent variables for each year can be seen below.

<i>Year</i>	<i>Independent variables</i>
1994	Net profit ratio, solvency, debt-equity ratio
1996	Net profit ratio, solvency, debt-equity ratio
1997	Solvency, debt-equity ratio
1998	R&D-to-Sales, Assets-to-Sales
1999	R&D-to-Sales, Assets-to-Sales, industry
2000	Solvency, debt-equity ratio, industry
2001	Net profit ratio, solvency, debt-equity ratio, industry
2002	Net profit ratio, solvency, debt-equity ratio
2003	Net profit ratio, solvency, debt-equity ratio, industry, R&D-to-Sales, Assets-to-Sales
2004	Net profit ratio, solvency, debt-equity ratio, industry
2005	Net profit ratio, solvency, debt-equity ratio, industry
2006	Net profit ratio, solvency, debt-equity ratio, industry, R&D-to-Sales, Assets-to-Sales
2007	Net profit ratio, solvency, debt-equity ratio, industry, R&D-to-Sales, Assets-to-Sales
2008	Net profit ratio, R&D-to-Sales, Assets-to-Sales

<i>Indep.variable</i>	<i>Reasons for inclusion in the logit regression</i>	
Net profit ratio	<i>Participation</i>	The net profit ratio influences the firm when making environmental investments.
	<i>Outcome</i>	The net profit ratio has a direct impact on ROE and ROA.
Solvency	<i>Participation</i>	Financial stability may induce environmental investments.
	<i>Outcome</i>	Impact on ROE.
Debt-equity ratio	<i>Participation</i>	Debt limits the free cash flow.
	<i>Outcome</i>	Impact on ROA.
R&D-to-Sales	<i>Participation</i>	High spending on R&D may indicate focus on environmental investments.
	<i>Outcome</i>	Impact on ROA.
Assets-to-Sales	<i>Participation</i>	Growth may influence focus on environmental issues.
	<i>Outcome</i>	Impact on ROA.
Industry	<i>Participation</i>	Firm industry may influence focus on environmental issues.
	<i>Outcome</i>	Impact on ROE and ROA.

**Table 4: Announcement abnormal return estimates for the sample firms**

The measured abnormal return of firm  $i$  is estimated for a single event day  $t$  as:

$AR_{it} = R_{it} - \alpha_i - \beta_i R_{mt}$ , where  $AR_{it}$  is the abnormal return of firm  $i$  at time  $t$ ,  $R_{it}$  is the return of firm  $i$  at time  $t$ ,  $R_{mt}$  is the market return at time  $t$ ,  $\alpha_i$  is the constant term for firm  $i$  and  $\beta_i$  is the slope of the characteristic return of firm  $i$ . \*\* and \* indicate significance at the 1% and 5% level respectively, using the Patell Z test for abnormal returns and the one-sample binomial test for the sign ratio.

<i>All firms</i>	
<b><u>Average daily AR (in%)</u></b>	
Day -2	-3,77
Day -1	0,63
Day 0	0,89 *
Day +1	-0,19
Day +2	1,47
<b><u>Window: -1 to +1</u></b>	
Average cumulative abnormal return ACAR <sub>1,1</sub> (in%)	1,33 *
(Patell Z)	-1,682
Ratio of positive to negative CAR <sub>1,1</sub>	8:9
(One-sample binomial test)	0,50
<b><u>Window: -2 to +2</u></b>	
Average cumulative abnormal return ACAR <sub>2,2</sub> (in%)	-0,96
(Patell Z)	-1,303
Ratio of positive to negative CAR <sub>2,2</sub>	9:8
(One-sample binomial test)	0,50
<b><u>Window: -1 to +2</u></b>	
Average cumulative abnormal return ACAR <sub>1,2</sub> (in%)	2,80
(Patell Z)	-1,457
Ratio of positive to negative CAR <sub>1,2</sub>	10:7
(One-sample binomial test)	0,31
<b><u>Window: -2 to +1</u></b>	
Average cumulative abnormal return ACAR <sub>2,1</sub> (in%)	-2,44
(Patell Z)	-1,457
Ratio of positive to negative CAR <sub>2,1</sub>	8:9
(One-sample binomial test)	0,5
<b><u>Window: 0 to +2</u></b>	
Average cumulative abnormal return ACAR <sub>0,2</sub> (in%)	2,17 *
(Patell Z)	-1,682
Ratio of positive to negative CAR <sub>0,2</sub>	11:6
(One-sample binomial test)	0,17
<b><u>Window: -2 to 0</u></b>	
Average cumulative abnormal return ACAR <sub>2,0</sub> (in%)	-2,24 *
(Patell Z)	-1,682
Ratio of positive to negative CAR <sub>2,0</sub>	7:10
(One-sample binomial test)	0,31

**Table 5A: Outstanding performance for 1994-2008**

Outstanding performance is the same as performance above industry average,  $OROA_{it} = ROA_{it} - ROA_{NN,t}$  where  $ROA_{it}$  represents the ROA of firm  $i$  during period  $t$ . Further  $ROA_{NN,t}$  represents the mean of benchmark firms during period  $t$ , found by using PSM with the nearest neighbour matching method. In order to compute the  $ROA_{NN,t}$  benchmark, we use five firms with several comparable measures. The same logic is employed when comparing the ROE of the firms with the industry benchmark, in that  $OROE_{it} = ROE_{it} - ROE_{NN,t}$ . \*\* and \* indicate significance at the 1% and 5% level respectively.

	<i>Year 0</i>	<i>Year +1</i>
One-sample t-test on OROE <i>p-value (one-sided)</i>	0,183 (0,428)	-0,122 (0,452)
One-sample t-test on OROA <i>p-value (one-sided)</i>	0,710 (0,241)	0,241 (0,405)
Positive to negative OROE <i>Chi-square statistic</i> <i>p-value (one-sided)</i>	32:25 0,86 0,354	22:31 1,528 0,216
Positive to negative OROA <i>Chi-square statistic</i> <i>p-value (one-sided)</i>	30:27 0,158 0,691	21:32 2,283 0,131

**Table 5B: Outstanding performance for 2001-2007 (excl. 2002)**

The overall sample period has many missing values, thus we investigate the period from 2001 to 2007, where 2002 is excluded. 2002 is excluded due to many missing values in the variable describing the industry. From 2001 to 2007 (excl. 2002) it is possible to observe the firms based on the same characteristics, i.e. the independent variables net profit ratio, solvency, debt-equity ratio and industry. \*\* and \* indicate significance at the 1% and 5% level respectively.

	<i>Year 0</i>	<i>Year +1</i>
One-sample t-test on OROE <i>p-value (one-sided)</i>	0,854 (0,199)	-0,064 (0,475)
One-sample t-test on OROA <i>p-value (one-sided)</i>	0,447 (0,329)	-1,202 (0,119)
Positive to negative OROE <i>Chi-square statistic</i> <i>p-value (one-sided)</i>	22:14 1,778 (0,182)	17:19 0,111 (0,739)
Positive to negative OROA <i>Chi-square statistic</i> <i>p-value (one-sided)</i>	16:20 0,444 (0,505)	11:25 5,444 (0,020)*

**Table 6A: Abnormal returns for listed firms**

<i>Company</i>	<i>AR -2</i>	<i>AR -1</i>	<i>AR 0</i>	<i>AR +1</i>	<i>AR +2</i>
AF Gruppen ASA	-0,0413	0,0060	-0,0475	0,0123	0,0041
Atea ASA	-0,0166	0,0148	-0,0127	0,0153	0,0036
Byggma ASA	0,0258	-0,0130	0,0010	0,0015	-0,0247
Data Respons ASA	-0,4016	0,0030	0,0123	-0,0166	0,0071
DOF ASA	-0,0218	-0,0191	0,0007	0,0029	0,0149
Domstein ASA	-0,1008	0,0735	-0,0106	-0,0071	0,0907
Eidesvik Offshore ASA	0,0004	0,0005	0,1569	-0,0023	0,0225
Eltek ASA	-0,0168	-0,0290	0,0054	-0,0153	0,0218
Farstad Shipping ASA	0,0303	0,0302	0,0063	-0,0203	-0,0274
Kitron ASA	-0,0492	0,0082	-0,0112	-0,0016	0,0380
Marine Harvest ASA	-0,0485	0,0079	0,0121	-0,0291	0,0609
Nexus Floating Production Ltd.	-0,0000	0,0303	0,0000	-0,0074	0,0002
Norske skogindustrier ASA (hovedkontor)	-0,0114	-0,0007	-0,0097	0,0068	0,0017
Q-free ASA	-0,0073	0,0233	0,0019	0,0154	0,0088
Rieber & Søn ASA	-0,0009	0,0005	0,0029	0,0101	0,0038
Storebrand ASA	0,0044	-0,0115	-0,0033	-0,0074	-0,0078
Subsea 7 Norway NUF	0,0148	-0,0172	0,0471	0,0099	0,0324

**Table 6B: Cumulative abnormal returns for listed firms**

<i>Company</i>	<i>CAR</i> <i>-1,+1</i>	<i>CAR</i> <i>-2,+2</i>	<i>CAR</i> <i>-1,+2</i>	<i>CAR</i> <i>-2,+1</i>	<i>CAR</i> <i>0,+2</i>	<i>CAR</i> <i>-2,0</i>
AF Gruppen ASA	-0,0292	-0,0664	-0,0251	-0,0705	-0,0311	-0,0828
Atea ASA	0,0173	0,0044	0,0210	0,0007	0,0062	-0,0146
Byggma ASA	-0,0105	-0,0095	-0,0353	0,0153	-0,0222	0,0138
Data Respons ASA	0,0013	-0,3958	0,0058	-0,4029	0,0028	-0,3862
DOF ASA	-0,0155	-0,0224	-0,0006	-0,0373	0,0185	-0,0402
Domstein ASA	0,0558	0,0457	0,1465	-0,0450	0,0730	-0,0379
Eidesvik Offshore ASA	0,1553	0,3124	0,3119	0,1557	0,3113	0,1582
Eltek ASA	-0,0389	-0,0339	-0,0171	-0,0557	0,0119	-0,0405
Farstad Shipping ASA	0,0162	0,0190	-0,0112	0,0465	-0,0414	0,0667
Kitron ASA	-0,0046	-0,0158	0,0333	-0,0538	0,0252	-0,0522
Marine Harvest ASA	-0,0091	0,0032	0,0517	-0,0576	0,0438	-0,0285
Nexus Floating Production Ltd.	0,0229	0,0232	0,0232	0,0229	-0,0071	0,0303
Norske skogindustrier ASA	-0,0036	-0,0132	-0,0018	-0,0149	-0,0012	-0,0217
Q-free ASA	0,0406	0,0421	0,0493	0,0333	0,0261	0,0179
Rieber & Søn ASA	0,0135	0,0163	0,0173	0,0126	0,0168	0,0024
Storebrand ASA	-0,0222	-0,0256	-0,0300	-0,0178	-0,0185	-0,0104
Subsea 7 Norway NUF	0,0397	0,0870	0,0722	0,0545	0,0894	0,0446

**Table 7A: Outstanding performance and ROE for non-listed firms, 1994-2008**

Outstanding performance is the difference between the firm's ROE and the ROE of the comparing firms;  $OROE_{it} = ROE_{it} - ROE_{NN,t}$ . NN is the mean of benchmarking firms found by using PSM and nearest neighbour.

<i>Company name</i>	<b>t</b>			<b>t+1</b>		
	$ROE_{jit}$	$ROE_{NNt}$	$OROE_{it}$	$ROE_{jit+1}$	$ROE_{NN,t+1}$	$OROE_{it+1}$
ABB AS	14,37	22,70	- 8,33	18,99	51,35	-32,36
AS Norske Shell AS		3,38			0,41	
Aceryg Norway AS	72,74	-2,36	75,10	80,82	-40,72	121,54
Adecco Norway AS				122,10	43,35	78,75
Aller Media AS	1,81	2,57	-0,76			
Baker Hughes Norway AS	-42,99	30,28	-73,27	-41,90	34,09	-75,99
Beerenberg Corp AS	22,58	-9,75	32,33	14,73	-1,23	15,96
Bilia Personbil AS	-23,94	38,77	-62,71	-35,83	32,12	-67,95
Boliden Odda AS	-11,64	-4,79	-6,85	-15,97	-6,06	-9,91
Brødr. Sunde AS	8,47	28,56	-20,09	25,78	28,49	-2,71
BW Offshore AS	26,87	-0,10	26,97	64,50	-4,78	69,28
Choice Hotels Scandinavia AS	0,83					
Coca-Cola Drikker AS	-0,25	5,80	-6,05	-0,22	7,71	-7,93
Cubus AS (hovedkontor)	3,98	3,60	0,38			
DHL Express Norway AS	-144,97	3,71	-148,68	-551,53	15,22	-566,75
Draka Norsk Kabel AS	24,39	17,33	7,06	32,53	9,80	22,73
Elektroskandia Norge AS	-30,92	-41,93	11,01	-22,05	6,56	-28,61
Eni Norge AS	14,62	22,73	-8,11	1,25	3,91	-2,66
Eramet Norway AS	36,26	17,33	18,93	15,22	27,90	-12,68
Fujitsu Technology Solutions AS	13,75	8,91	4,84	-5,46	-2,81	-2,65
Gjensidige Forsikring BA	3,74					
Glamox ASA	-47,28	18,07	-65,35	-43,31	7,71	-51,02
Glava AS	2,56	16,40	-13,84	5,39	18,16	-12,77
Halliburton AS	23,74	1,93	21,81	4,80	0,18	4,62
Hamworthy Gas Systems AS	16,26	106,61	-90,35	2,39	3,24	-0,85
Helgelandskraft AS	6,94	3,08	3,86			
Ineos Bamble AS	15,21	17,39	-2,18	6,01	6,51	-0,50
ISS Facility Services AS	-2,73	51,77	-54,50	1,37	4,74	-3,37
Jotun AS	8,07	-4,79	12,86	10,90	-6,06	16,96
Kitron AS	3,10	-11,76	14,86	-60,56	-20,56	-40,00
Kollektivtransportproduksjon AS	-11,74	106,61	-118,35	4,64		
Kongsberg Automotive AS	-0,05	17,33	-17,38	-67,42	9,80	-77,22

**Table 7A cont.: OROE and ROE for non-listed firm, 1994-2008**

<b>Company name</b>	<b>t</b>			<b>t+1</b>		
	$ROE_{jit}$	$ROE_{NNt}$	$OROE_{it}$	$ROE_{jit+1}$	$ROE_{NN,t+1}$	$OROE_{it+1}$
Kraft Foods Norge AS (hovedk.)	57,91	47,36	10,55	19,02	33,98	-14,96
M-I Swaco Norge AS	3,60	-20,63	24,23	0,15	-9,79	9,94
Nexans Norway AS	0,28	-8,82	9,10	11,79	-188,63	200,42
Norges Statsbaner AS	0,16	16,90	-16,74	2,90	136,48	-133,58
Norsk Medisinaldepot AS	5,18	1,53	3,65			
North Cape Minerals AS	7,97	-68,52	76,49	6,65	-234,37	241,02
Oceaneering AS	-9,08	-9,85	0,77	-4,42	27,32	-31,74
Peterson Linerboard AS Moss	-18,79	-2,86	-15,93	-30,75	10,31	-41,06
Pon Power AS	26,07	8,33	17,74	33,61	24,42	9,19
Ruukki Profiler AS	-12,34	-1,34	-11,00	-52,15	9,37	-61,52
Sør-Norge Aluminium AS	27,25	16,20	11,05		4,70	
Saint-Gobain Byggevarer AS	52,92	16,89	36,03	70,34	18,75	51,59
Scandinavian Bus. Seating AS	36,88	21,03	15,85	32,13	32,19	-0,06
Schenker AS	40,52	8,81	31,71	9,57	-9,42	18,99
Siemens AG		29,20	-29,20	-32,16	-40,62	8,46
Skanska Norge AS	22,70	4,98	17,72	29,91	64,68	-34,77
Solar Norge AS	6,71	4,16	2,55	12,04	14,64	-2,60
Sparebanken Hedmark( hovedk.)	3,79					
Sparebanken Vest	0,55					
Spenncon AS	-23,76	-4,79	-18,97	-34,43	-6,06	-28,37
Statkraft SF Konsern	15,77	17,29	-1,52	19,37	25,85	-6,48
Statnett SF	-9,70	-7,58	-2,12	12,01	23,21	-11,20
Total E&P Norge AS	15,85	-11,81	27,66	29,07	-35,49	64,56
Toyota Norge AS	2,53	51,41	-48,88	3,37	40,83	-37,46
Troms Kraft AS	238,44	1,93	236,51	222,16	0,18	221,98
Vital Forsikring ASA	3,34	-57,44	60,78	3,98	-54,29	58,27
Volvo Aero Norge AS	18,25	-5,07	23,32	21,32	2,06	19,26
Volvo Maskin AS	5,99	20,49	-14,50	6,13	11,75	-5,62
Wallenius Wilh. Logistics AS	0,35	-0,60	0,95	0,95	-63,74	64,69
Wartsila Norway AS (hovedk.)	7,21	-6,46	13,67	3,36	-8,62	11,98
Würth Norge AS	12,62	-9,89	22,51	12,49	1,10	11,39
YIT AS	-16,73	-4,98	-11,75	25,96	-11,28	37,24

**Table 7B: Outstanding performance and ROA for non-listed firms, 1994-2008**

Outstanding performance is the difference between the firm's ROA and the ROA of the comparing firms;  $OROA_{it} = ROA_{jit} - ROA_{NNt}$ . NN = mean of benchmarking firms found by using PSM and nearest neighbour.

<b>Company name</b>	<b>t</b>			<b>t+1</b>		
	$ROA_{jit}$	$ROA_{NNt}$	$OROA_{it}$	$ROA_{jit+1}$	$ROA_{NN,t+1}$	$OROA_{it+1}$
ABB AS	10,92	10,95	-0,03	12,39	13,79	-1,40
AS Norske Shell AS		7,22			9,37	
Aceryg Norway AS	18,25	14,56	3,69	24,74	13,02	11,72
Adecco Norway AS	16,10			18,25	13,05	5,20
Aller Media AS	1,15	1,99	-0,84			
Baker Hughes Norway AS	4,37	20,32	-15,95	3,97	22,24	-18,27
Beerenberg Corp AS	16,98	3,05	13,93	14,99	3,62	11,37
Bilia Personbil AS	2,68	18,44	-15,76	1,86	23,71	-21,85
Boliden Odda AS	-1,45	-7,98	6,53	-3,04	7,46	-10,50
Brødr. Sunde AS	9,38	18,97	-9,59	13,98	18,59	-4,61
BW Offshore AS	11,31	8,26	3,05	15,61	6,51	9,10
Choice Hotels Scandinavia AS	1,86					
Coca-Cola Drikker AS	7,47	21,12	-13,65	6,93	16,93	-10,00
Cubus AS (hovedkontor)	1,35	1,29	0,06			
DHL Express Norway AS	-6,24	5,62	-11,86	-7,47	6,62	-14,09
Draka Norsk Kabel AS	12,34	12,71	-0,37	24,84	8,30	16,54
Elektroskandia Norge AS	-5,25	5,91	-11,16	-5,87	14,67	-20,54
Eni Norge AS	51,37	21,98	29,39	0,41	1,16	-0,75
Eramet Norway AS	31,83	15,41	16,42	17,96	20,57	-2,61
Fujitsu Technology Solutions AS	5,92	17,02	-11,10	4,46	13,74	-9,28
Gjensidige Forsikring BA	9,56					
Glamox ASA	-3,27	14,45	-17,72	-0,82	11,87	-12,69
Glava AS	9,21	-0,01	9,22	11,26	14,52	-3,26
Halliburton AS	34,24	10,75	23,49	1,73	10,38	-8,65
Hamworthy Gas Systems AS	3,93	28,37	-24,44	1,18	0,94	0,24
Helgelandskraft AS	1,52	1,12	0,40			
Ineos Bamble AS	16,07	15,68	0,39	2,37	0,99	1,38
ISS Facility Services AS	10,38	36,08	-25,70	0,73	0,92	-0,19
Jotun AS	10,48	-7,98	18,46	12,58	7,46	5,12
Kitron AS	8,23	7,37	0,86	-2,69	7,99	-10,68
Kollektivtransportproduksjon AS	4,93	28,37	-23,44	0,58		
Kongsberg Automotive AS	0,07	12,71	-12,64	-11,34	8,30	-19,64

**Table 7B cont.: OROA and ROA for non-listed firms, 1994-2008**

<b>Company name</b>	<b>t</b>			<b>t+1</b>		
	$ROA_{jit}$	$ROA_{NNt}$	$OROA_{it}$	$ROA_{jit+1}$	$ROA_{NN,t+1}$	$OROA_{it+1}$
Kraft Foods Norge AS (hovedk.)	15,16	15,42	-0,26	12,15	15,21	-3,06
M-I Swaco Norge AS	11,19	-1,16	12,35	8,08	4,00	4,08
Nexans Norway AS	0,38	-1,98	2,36	14,12	-42,66	56,78
Norges Statsbaner AS	7,21	28,49	-21,28	8,23	27,16	-18,93
Norsk Medisinaldepot AS	1,17	1,72	-0,55			
North Cape Minerals AS	20,48	-31,66	52,14	14,11	-84,23	98,34
Oceaneering AS	13,34	6,44	6,90	20,03	17,70	2,33
Peterson Linerboard AS Moss	6,61	8,43	-1,82	4,20	10,81	-6,61
Pon Power AS	10,88	8,09	2,79	11,92	11,98	-0,06
Ruukki Profiler AS	2,59	9,06	-6,47	-15,60	9,94	-25,54
Sør-Norge Aluminium AS	19,45	12,02	7,43		10,37	
Saint-Gobain Byggevarer AS	27,85	17,80	10,05	33,21	15,65	17,56
Scandinavian Bus. Seating AS	24,12	15,33	8,79	23,18	17,61	5,57
Schenker AS	11,41	21,79	-10,38	9,54	13,98	-4,44
Siemens AG		16,57		2,80	-5,44	8,24
Skanska Norge AS	11,12	6,10	5,02	7,71	15,55	-7,84
Solar Norge AS	10,41	12,56	-2,15	13,20	17,67	-4,47
Sparebanken Hedmark( hovedk.)	1,05					
Sparebanken Vest	1,02					
Spenncon AS	-2,49	-7,98	5,49	-5,44	7,46	-12,90
Statkraft SF Konsern	11,42	14,64	-3,22	15,72	18,32	-2,60
Statnett SF	4,45	7,88	-3,43	7,10	11,64	-4,54
Total E&P Norge AS	91,83	5,49	86,34	15,69	4,46	11,23
Toyota Norge AS	61,50	22,51	38,99	73,21	30,40	42,81
Troms Kraft AS	4,82	10,75	-5,93	3,80	10,38	-6,58
Vital Forsikring ASA	18,17	14,69	3,48	21,97	16,45	5,52
Volvo Aero Norge AS	13,03	9,13	3,90	19,09	10,04	9,05
Volvo Maskin AS	28,72	14,27	14,45	39,30	9,66	29,64
Wallenius Wilh. Logistics AS	8,74	8,25	0,49	-15,51	6,67	-22,18
Wartsila Norway AS (hovedk.)	12,84	8,03	4,81	-8,56	6,91	-15,47
Würth Norge AS	8,17	8,75	-0,58	10,35	10,03	0,32
YIT AS	4,53	7,59	-3,06	21,21	3,45	17,76

**Table 8A: OROE and ROE for non-listed firms, 2001-2008(excl.2002)**

Outstanding performance is the difference between the firm's ROE and the ROE of the comparing firms;  $OROE_{it} = ROE_{it} - ROE_{NN,t}$ . NN is the mean of benchmarking firms found by using PSM and nearest neighbour.

<b>Company name</b>	<b>t</b>			<b>t+1</b>		
	$ROE_{jit}$	$ROE_{NNt}$	$OROE_{it}$	$ROE_{jit+1}$	$ROE_{NN,t+1}$	$OROE_{it+1}$
ABB AS	14,37	13,69	0,68	18,99	14,87	4,12
Bilia Personbil AS	-23,94	46,02	-69,96	-35,83	49,11	-84,94
Boliden Odda AS	-11,64	-18,32	6,68	-15,97	-3,83	-12,14
Brødr. Sunde AS	8,47	42,63	-34,16	25,78	59,63	-33,85
BW Offshore AS	26,87	-0,10	26,97	64,50	-4,78	69,28
Coca-Cola Drikker AS	-0,25	5,80	-6,05	-0,22	7,71	-7,93
Eni Norge AS	14,62	28,60	-13,98	1,25	2,61	-1,36
Eramet Norway AS	36,26	17,33	18,93	15,22	27,90	-12,68
Fujitsu Technology Solutions AS	13,75	8,91	4,84	-5,46	-2,81	-2,65
Halliburton AS	23,74	1,93	21,81	4,80	0,18	4,62
Hamworthy Gas Systems AS	16,26	110,01	-93,75	2,39	4,51	-2,12
Ineos Bamble AS	15,21	-8,26	23,47	6,01	3,53	2,48
ISS Facility Services AS	-2,73	69,42	-72,15	1,37	5,80	-4,43
Jotun AS	8,07	-18,32	26,39	10,90	-3,83	14,73
Kollektivtransportproduksjon AS	-11,74	-74,96	63,22	4,64	3,09	1,55
M-I Swaco Norge AS	3,60	-20,63	24,23	0,15	-9,79	9,94
Norges Statsbaner AS	0,16	16,90	-16,74	2,90	136,48	-133,58
Oceaneering AS	-9,08	-9,85	0,77	-4,42	27,32	-31,74
Peterson Linerboard AS Moss	-18,79	-2,86	-15,93	-30,75	10,31	-41,06
Pon Power AS	26,07	12,41	13,66	33,61	17,99	15,62
Ruukki Profiler AS	-12,34	-1,34	-11,00	-52,15	9,37	-61,52
Saint-Gobain Byggevarer AS	52,92	24,63	28,29	70,34	16,64	53,70
Schenker AS	40,52	8,81	31,71	9,57	-9,42	18,99
Skanska Norge AS	22,70	4,98	17,72	29,91	64,68	-34,77
Solar Norge AS	6,71	4,16	2,55	12,04	14,64	-2,60
Spenncon AS	-23,76	-5,02	-18,74	-34,43	0,89	-35,32
Statkraft SF Konsern	15,77	17,29	-1,52	19,37	25,85	-6,48
Statnett SF	-9,70	5,03	-14,73	12,01	17,50	-5,49
Total E&P Norge AS	29,07	-35,36	64,43	29,54	10,67	18,87
Toyota Norge AS	2,53	80,75	-78,22	3,37	83,93	-80,56

**Table 8A cont.: OROE and ROE for non-listed firms, 2001-2008(excl.2002)**

<b>Company name</b>	<b>t</b>			<b>t+1</b>		
	$ROE_{jit}$	$ROE_{NNt}$	$OROE_{it}$	$ROE_{jit+1}$	$ROE_{NN,t+1}$	$OROE_{it+1}$
Troms Kraft AS	238,44	1,93	236,51	222,16	0,18	221,98
Vital Forsikring ASA	3,34	-57,44	60,78	3,98	-54,29	58,27
Volvo Aero Norge AS	18,25	-5,07	23,32	21,32	2,06	19,26
Wartsila Norway AS (hovedk.)	7,21	-6,46	13,67	3,36	-8,62	11,98
Würth Norge AS	12,62	-9,89	22,51	12,49	1,10	11,39
YIT AS	-16,73	-4,98	-11,75	25,96	-11,28	37,24

**Table 8B: OROA and ROA for non-listed firms, 2001-2008(excl.2002)**

Outstanding performance is the difference between the firm's ROE and the ROE of the comparing firms;  $OROA_{it} = ROA_{it} - ROA_{NN,t}$ . NN is the mean of benchmarking firms found by using PSM and nearest neighbour.

<b>Company name</b>	<b>t</b>			<b>t+1</b>		
	$ROA_{jit}$	$ROA_{NNt}$	$OROA_{it}$	$ROA_{jit+1}$	$ROA_{NN,t+1}$	$OROA_{it+1}$
ABB AS	10,92	11,67	-0,75	12,39	12,40	-0,01
Bilia Personbil AS	2,68	17,08	-14,40	1,86	23,52	-21,66
Boliden Odda AS	-1,45	1,48	-2,93	-3,04	7,58	-10,62
Brødr. Sunde AS	9,38	23,64	-14,26	13,98	24,30	-10,32
BW Offshore AS	11,31	8,26	3,05	15,61	6,51	9,10
Coca-Cola Drikker AS	7,47	21,12	-13,65	6,93	16,93	-10,00
Eni Norge AS	51,37	21,21	30,16	0,41	1,18	-0,77
Eramet Norway AS	31,83	15,41	16,42	17,96	20,57	-2,61
Fujitsu Technology Solutions AS	5,92	17,02	-11,10	4,46	13,74	-9,28
Halliburton AS	34,24	10,75	23,49	1,73	10,38	-8,65
Hamworthy Gas Systems AS	3,93	28,08	-24,15	1,18	1,56	-0,38
Ineos Bamble AS	16,07	7,39	8,68	2,37	1,05	1,32
ISS Facility Services AS	10,38	31,13	-20,75	0,73	0,90	-0,17
Jotun AS	10,48	1,48	9,00	12,58	7,58	5,00
Kollektivtransportproduksjon AS	4,93	5,38	-0,45	0,58	0,88	-0,30
M-I Swaco Norge AS	11,19	-1,16	12,35	8,08	4,00	4,08
Norges Statsbaner AS	7,21	28,49	-21,28	8,23	27,16	-18,93
Oceaneering AS	13,34	6,44	6,90	20,03	17,70	2,33
Peterson Linerboard AS Moss	6,61	8,43	-1,82	4,20	10,81	-6,61
Pon Power AS	10,88	10,08	0,80	11,92	13,41	-1,49
Ruukki Profiler AS	2,59	9,06	-6,47	-15,60	9,94	-25,54
Saint-Gobain Byggevarer AS	27,85	12,14	15,71	33,21	11,46	21,75
Schenker AS	11,41	21,79	-10,38	9,54	13,98	-4,44
Skanska Norge AS	11,12	6,10	5,02	7,71	15,55	-7,84
Solar Norge AS	10,41	12,56	-2,15	13,20	17,67	-4,47
Spenncon AS	-2,49	6,67	-9,16	-5,44	9,16	-14,60
Statkraft SF Konsern	11,42	14,64	-3,22	15,72	18,32	-2,60
Statnett SF	4,45	8,81	-4,36	7,10	17,76	-10,66
Total E&P Norge AS	15,69	-11,21	26,90	-9,17	9,09	-18,26
Toyota Norge AS	61,50	23,09	38,41	73,21	29,69	43,52

**Table 8B cont.: OROA and ROA for non-listed firms, 2001-2008(excl.2002)**

<b>Company name</b>	<b>t</b>			<b>t+1</b>		
	$ROA_{jit}$	$ROA_{NNt}$	$OROA_{it}$	$ROA_{jit+1}$	$ROA_{NN,t+1}$	$OROA_{it+1}$
Troms Kraft AS	4,82	10,75	-5,93	3,80	10,38	-6,58
Vital Forsikring ASA	18,17	14,69	3,48	21,97	16,45	5,52
Volvo Aero Norge AS	13,03	9,13	3,90	19,09	10,04	9,05
Wartsila Norway AS (hovedk.)	12,84	8,03	4,81	-8,56	6,91	-15,47
Würth Norge AS	8,17	8,75	-0,58	10,35	10,03	0,32
YIT AS	4,53	7,59	-3,06	21,21	3,45	17,76

**Table 9: Medians and means for non-listed firms**

The median and mean of the Return-on-Equity and Return-on-Assets are for the non-listed firms in the overall sample (1994-2008) are presented in this table.

		<i>Year 0</i>	<i>Year +1</i>
ROE <sub>it</sub>	Mean	8,63	0,03
	Median	5,18	5,70
ROE <sub>NN,t</sub>	Mean	8,73	0,88
	Median	3,71	6,51
OROE <sub>it</sub>	Mean	0,09	-0,88
	Median	1,75	-2,65
ROA <sub>it</sub>	Mean	12,21	9,71
	Median	9,47	8,89
ROA <sub>NN,t</sub>	Mean	10,39	8,69
	Median	10,75	10,38
OROA <sub>it</sub>	Mean	2,38	1,24
	Median	0,39	-2,60

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# **Does it pay to be “green”?**

**Preliminary thesis report**

**GRA 19002**

*Study programme:*

**Master of Science in Business and Economics**

***Major in Finance***

*Date of submission:*

January 15<sup>th</sup>, 2010

*Supervisor:*

Bogdan Stacescu

*Study place:*

BI Norwegian School of Management Oslo

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## Introduction to the research topic

Environmental issues have become a widely discussed topic in society. Firms put emphasis on environmental matters and many have taken action in order to fulfil environmental standards. Many of these standards are still not obligatory by law, but can be seen as a positive action taken by the firm as they can be regarded norms set by the community. This focus has resulted in attention to social responsible investments (SRI), which seek to maximize both financial returns as well as social goods. With this emphasis, we find it interesting to investigate the topic further. If it turns out “green” companies have an advantage related to firm or market value when announcements of being accredited an environmental certificate are published, this may trigger investors to invest in companies that have a green profile.

One of the highest recognition until now concerning environmental issues can be regarded the Nobel Peace Prize given to Al Gore Jr. in 2007. This shows the importance environment has for sustainability and growth; and accordingly the affect it has on business. In addition the United Nations climate change conference in Copenhagen, December 2009, put emphasis and focus on the environment when doing business.

As a result of this attention, SRIs with environmental focus have increased the last years and accordingly some investors have changed or broadened their focus. One example is the American investor Warren Buffett, which fairly recently made investments that have a more environmental focus than earlier. He invested in the Chinese company BDY, a car manufacturer selling electric cars, and in the Burlington Northern Santa Fe Railway that transports all kinds of goods <sup>1</sup>. By making these investments he wants to make a contribution to a more environmental friendly transportation. Warren Buffet states that “a train replaces 280 trucks on the road. It emits far less into the atmosphere that’s damaging than trucking, and it moves.” He also states that “it is the most environmental friendly way of moving goods in the country” <sup>2</sup>. In addition, a Norwegian investor with a high emphasis on the environment is Petter Stordalen, the majority owner of Choice Hotels Scandinavia. Choice Hotels Scandinavia has just finished a process of certifying all its hotels to the ISO14001:2004 standard. This affects other

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companies within the same industry and sets a standard for other companies to follow<sup>3</sup>.

The financial crisis the world experienced with its outburst at the end of 2008 influenced economies all over the world in a large scale. Companies experienced difficulties in getting renewed loans from credit institutions, due to a dried up credit market mostly known as a credit crunch. In such circumstances emphasis on SRIs with focus on the environment will normally decrease, as firms experience lower profitability. On top of this the costs of implementing the environmental standards will finally induce a low incentive to do SRIs.

Why is it that companies want to do SRIs and accordingly implement environmental standards into their management systems? Having an environmental certificate is an indication of being environmental responsible and that the company want to focus on this area. How can it then be profitable in economical terms other than it is good for society? One reason is that to some extent, there exists environmental legislation that forces the company to take on measures in being environmental friendly. When fulfilling environmental standards you often need to do more than environmental legislation requires, since legislation is often set as a minimum of what is expected from the company. Porter and Van der Linde (1995) looked at environmental regulations and a firm's competitiveness. When adapting to an environmental standard, the firm may gain increased resource productivity, first-mover advantages and quality improvement. In general, they state that adapting to environmental standards stimulates innovation and as a result improves competitiveness for the firms that adopt these standards. We think this can be seen in connection with today's environmental certificates, in which companies that choose to apply for the certificates might get a competitive advantage.

Jacobs, Singhal and Subramanian (2008) found that ISO 14001 certifications among US firms are associated with a significant positive market reaction. Fisher-Vanden and Thorburn (2008) on the other hand found that voluntary commitment to an environmental standard or programme induced a negative, significant cumulative abnormal stock return (CAR). In carbon intensive industries however, they found that the price decline was smaller. Currently in our sample, we observe

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no connection between adapting to standards and in which industry the company belongs to. Therefore our sample consist of very diverse industries, consequently we will not focus on certain industries in our research.

### *Existing literature*

Even though it is a frequently discussed topic, there exists little in the financial literature on this matter; both recently published and historically. Most of the papers and articles found study the US economy and accordingly US firms. We have not found any papers studying Norwegian firms regarding our topic of interest. Moreover, most of the research in this field has been done on public listed firms. In Norway the majority of the largest firms are private and not listed on the Oslo Stock Exchange (OSEBX). Consequently, we found this an interesting matter to investigate further.

A recent study to examine how shareholders value environmental responsible investments is the article “Voluntary corporate environmental initiatives and shareholder wealth” by Fisher-Vanden and Thorburn (2008). Fisher-Vanden and Thorburn (2008) claim that several studies document a positive relationship between environmental performance and accounting profitability measures. They found no causality between environmental standards and firm performance, by looking at the share price reaction when information about adapting to such standards was released in the market. In their study they used a sample of 157 US publicly traded firms and reached a conclusion that for the average firm, it does not pay to be green. This article is a motivation to investigate the topic further.

Another relevant paper is “An empirical investigation of environmental performance and the market value of the firm” by Jacobs et al. (2008). They analyze the value effects of environmental performance by measuring the stock market reactions associated with announcements of environmental performance, known as event studies. The study is divided into corporate environmental initiatives (CEIs) taken by the firm and environmental awards and certifications (EACs) given to the firm. They find that ISO 14001 certifications are associated with significant positive market reactions. In general they find the market to be selective in reacting to announcements of environmental performance (Jacobs et al. 2008).

Additionally, the paper “Environmental and financial performance: are they related?” by Cohen, Fenn and Konar (1997) reports on the environmental performance of the Standard and Poor’s 500 companies. In this article there are constructed two industry-balanced portfolios and they compare both accounting returns and market returns of the “high polluter” and the “low polluter” portfolio. Moreover, the paper also examines the stock market reactions to new information on the environmental performance of individual firms; and it provides a preliminary analysis of which comes first – good financial performance or good environmental performance. Their results show that there is neither a “penalty” for investing in the “green” portfolio, nor a positive return from green investing.

The studies that exist on value effects of environmental performance are executed mostly on listed firms within the US. The articles above are good examples of this. As mentioned above, we have not found any relevant studies performed in the Norwegian economy, thus it is an interesting topic to investigate further. In Norway the focus on environmental friendly initiatives is high; therefore we find it interesting to see if this has any influence on a firm’s performance. Moreover, we have access to the CCGR database provided by the Department of Financial Economics at the Norwegian School of Management BI, which has a vast sample of data from all firms in Norway; both listed and non-listed firms. The research made by Fisher-Vanden and Thorburn (2008) in the US, which is a much larger market than Norway, used a sample of 157 publicly traded firms. Consequently, we find that our sample size has a decent size, since we expect it to be between 100-120 listed and non-listed firms in total. Finally, we find it exciting to do research with Norwegian numbers, as the relation of environmental standards on firm performance not has been studied as far as we know in Norway.

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## Research question and objective of the thesis

The research question that we want to investigate in our master thesis is:

*What is the relationship between adapting an environmental standard and firm performance?*

Environmental focus related to daily operations in business has increased the last years, accordingly we want to investigate if this has any influence on financial firm performance. We will use environmental standards in order to quantify and measure this in our paper. A firm's concern for the environment may improve the image of the firm. In that way the image may have positive effects on firm performance and shareholder value, if the consumers acknowledge the environmental friendly image.

In order to link environmental standards to financial firm performance, we will examine how firms having at least one out of three environmental standards perform compared to uncertified firms. We will explore companies that either possess a certain environmental certification or that fulfil one or more environmental standards. We will use three out of these certifications and standards in our research: "Miljøfyrtårn" recognized in Norway, EMAS recognised within the European Union (EU) and European Economic Area (EEA); and finally ISO14001:2004 that is recognized globally.

### ***Miljøfyrtårn:***

First, we consider the Norwegian certificate "Miljøfyrtårn". This certification is a national programme for environmental certification, supported and recommended by the Ministry of the Environment <sup>4</sup>. The certification is handled by "Stiftelsen Miljøfyrtårn", which manage the organization and financing of the certifications. In order to be awarded the certificate "Miljøfyrtårn", the company actively must fulfil environmental measures and accomplish these. The certification is made by local governments, which count 430 anno 2009 <sup>5</sup>.

We consider this certificate an appropriate measure for companies with a green profile, since this is a national certification system. The purpose of this

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certification is to increase the environmental performance both in private and public companies. Emphasis of the certificate is first of all being put on small- and medium size companies as well as public agencies. This certification helps companies to focus on environmental friendly measures in their daily operations, by fulfilling certain standards dependent on their industry<sup>6</sup>. Focus is on the working environment within the company, procurement, disposal, energy use, transport and emissions, which all are analysed in an environmental analysis. As the certificate is given to the organization as a whole, the entire organization is influenced and has to take actions in improving their environmental performance. Companies being given the certificate are allowed to call themselves a “Miljøfyrtårn”, as they fulfil certain standards set by the foundation “Stiftelsen Miljøfyrtårn”. The certification helps companies to run their business both efficient and environmental friendly.

***EMAS:***

Second, we consider the European Eco-Management and Audit Scheme (EMAS). This standard was developed by the EU, originally for companies in the industrial sector within the EU and EEA. Presently it is applicable for all companies independent of industry sector within the EU and EEA. EMAS is a voluntary management tool to report and improve environmental performance, beyond environmental regulations set by governments. The standard is developed to help the firm conduct an environmental review, establish an effective environmental management system and audit; as well as provide a statement of the environmental performance<sup>7</sup>.

In order for a company to be EMAS accredited, it has to take active action and perform some predetermined activities. Initially it has to develop an environmental policy that describes the company's overall aims and principles with respect to the environment. Furthermore, it has to make an initial environmental review, which is an analysis of how the company affect the environment. Further it has to develop an environmental programme that states concrete and specific targets regarding their environmental policy. More, the company must establish an environmental management system with operating procedures and controls; where responsibilities, operational procedures, training and communication systems are set. Further it has to carry out an internal

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environmental audit in which to assess the management system. Then the company have to review its management system once more, before they finally develop the environmental statement addressed to the company's stakeholders. After having performed these tasks, the company assign an independent verifier to certify the organisation's environmental policy and its environmental management system<sup>8</sup>. The environmental audit and statement must accordingly comply with the EMAS rules before the company can be recognized as an accredited EMAS company.

***ISO 14001:2004:***

Third, we consider the international environmental certification ISO 14001:2004 as an appropriate standard for our research. The ISO 14001 is an environmental management system that enables an organisation to develop and implement a policy and specific objectives about significant environmental aspects<sup>9</sup>. This certification applies to the environmental aspects, which the organisation identifies and is able to influence, as the standard does not state any specific environmental performance criteria. The ISO 14001 standard is appropriate for any organisation that either want to implement, maintain or improve an environmental management system.

The standard enables the organisation to build and operate an environmental management system, provide a tool for environmental performance, facilitate reductions in emissions and waste; and comply with environmental legal requirements<sup>10</sup>. This standard can be implemented into a complete range of business sectors and industries. It is a universal standard, which makes it so applicable for companies to use. In order to get this recognition, the company must prepare for certification by taking active measures to fulfil the requirements of this standard. This includes identifying environmental aspects as well as applicable legal requirements. In addition, the company must establish objectives, targets and improvement programmes<sup>11</sup>. Before the certification starts, the company must either perform internal audits that should identify potential gaps or contrary contract a third party to make a preliminary assessment. After taken on these measures to become an accredited ISO 14001 company, the certification must be performed and accredited by a certification body (i.e. Det Norske Veritas (DNV)).

The hotel chain Choice Hotels Scandinavia with its head office in Oslo, Norway, has just been accredited as a certified ISO14001 company. It has through a long process of training employees and leaders on all levels, adapted to this environmental management standard. Concrete measures that have been undertaken is a 20% decrease in the energy consumption since 2003, guarantees of buying energy from only renewable energy sources and serving of ecological breakfasts. In addition Choice Hotels Scandinavia has come to an agreement with the Rainforest Foundation Norway, in which guest by staying one night in a Choice hotel preserve 100 m<sup>2</sup> of the rainforest for one year<sup>12</sup>.

The objective of our thesis is to investigate if announcements of having an environmental certificate influence firm performance. We want to study the Norwegian corporate environment.

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## **A plan for data collection and thesis progression**

### ***Research methodology***

The hypothesis we want to examine is:

$H_0$  : Announcement of certification of an environmental certificate will have no effect on the firm performance.

$H_A$  : Announcement of certification from an environmental certificate will have a significant positive effect on the firm performance.

We want to investigate whether a firm's commitment to a voluntary environmental program affects the performance or not. Consequently we will examine both listed and non-listed firms.

The performance of the firms will be compared to the industry average in order to find a proper benchmark, in which we compare the green profiled firms to the control group. Because we both investigate listed and non-listed firms, we want to separate the comparison of these. Finally, we will compare listed and non-listed firms to a common factor benchmark.

Our benchmark for firms listed on the OSEBX will be the OBX-index. The OBX-index entails the 25 most liquid companies on the OSEBX, ranked by sales the last six months<sup>13</sup>. We recognize this as a proper benchmark for the listed firms. Moreover, the listed firms will also be compared with their stock returns and if they have abnormal announcement stock returns.

The net present value of the expected costs and revenues associated with the environmental standards will instantly be absorbed in the stock price by the investors when the news are made public, according to semi-strong form of the Efficient Market Hypothesis (Klassen and McLaughlin 1996). Further, other events may take place at the same time as the firm gets the environmental certificate that may reinforce or mask the abnormal return. Examples are quarterly reports of earnings and publications of important contract entries. To measure the abnormal stock returns we focus on the day the new information reach the market.

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Then the announcement returns provide a natural experiment for asking how the stock market values the news about the environmental standards (Fisher-Vanden and Thorburn 2008).

We choose to look at share price which is the most common metric used (Peloza 2009). The share price is a popular measure for several reasons. First, it is easy for the firm to observe its performance over time. Second, it is a standard by which companies can compare their performance with other firms. Third, the share price is easy attainable information, and can be helpful to analyses of performance of initiatives, which might be expected to generate some competitive advantage in the market place (Peloza 2009). To estimate the market values impact of the announcement of environmental certificates, for public firms, we use event studies. One potential weakness of the event study methodology is that the market may either over- or underestimates the impact of any event on financial performance (Klassen and McLaughlin 1996).

Regarding the non-listed firms we will use an industry average for firms within the same industry sector. The benchmark firms have to have approximately the same size as the firm being compared. To compare non-listed firms with the industry average we use the accounting measures return-on-assets (ROA) and return-on-equity (ROE). We include three measures that are commonly used in the analysis of financial performance as controls (King and Lenox 2001). These measures include 1) the firm's size, 2) the degree of which the firm is leveraged, and 3) the R&D intensity.

Employing the same methodology as Klassen and McLaughlin (1996) and Fisher-Vanden and Thorburn (2008) the Market Model will measure the abnormal return for firm  $i$  at day  $t$ . The measured abnormal return of firm  $i$  is based on the estimate of the residual for a single event day  $t$  as

$$AR_{it} = R_{it} - \alpha_i - \beta_i R_{mt},$$

where  $AR_{it}$  is the abnormal return of firm  $i$  at time  $t$ ,  $R_{it}$  is the return of firm  $i$  at time  $t$ ,  $R_{mt}$  is the market return at time  $t$ ,  $\alpha_i$  is a constant term for firm  $i$ , and  $\beta_i$  is

slope of the characteristic return of firm  $i$  (Klassen and McLaughlin; 1996).  $\alpha_i$  and  $\beta_i$  are the coefficients from the single-factor market model;

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

over the determined estimation period, e.g. days -256 through -6.  $\alpha_i$  and  $\beta_i$  are to be estimated by using ordinary least squares (OLS) which is a consistent estimation procedure under general conditions, according to MacKinlay (1997). The day that the announcement is released (the event day) is called Day 0. The accounting-based measures for the particular year the firm got its certification, will be called Year 0.

Moreover one time period will be defined as a single day when the stock market was in operation. The days will be termed the event period (for example Day -1 to Day +1), and the estimation period will be between 100 and 150 days. Concerning the private firms, one time period will be defined as one year and the estimation period will be between three to five years. In addition we will require a minimum level of return observations when estimating the market model. When the event period consists of more than one time period the cumulative abnormal return (CAR) for firm  $i$  over the event window day, e.g. using Day -1 to Day +1, is given by:

$$CAR_{-1,1} = \sum_{t=-1}^1 AR_{it}$$

The average cumulative abnormal return (ACAR) across the  $N$  sample firms is:

$$ACAR_{-1,1} = \frac{1}{N} \sum_{t=-1}^1 AR_{it}$$

The regression results for the stock prices can get stronger validity by extending the event window. For example the event window may be extended from Day -2, to capture possible information leakage, to Day +2 to include the impact of announcements made after market closing at the event day or updates of stock prices. Furthermore, the sample firms will be studied for news or financial reports in the event period that may have an influence on the estimation results.

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In general, accounting measures demonstrates how efficiently a firm uses its assets to generate value. Due to this, these measures are often used over the long term, or to value initiatives that are expected to create value in short term (Peloza 2009). According to Peloza (2009) ROE and ROA are frequently used, consequently we will use these measures. The data will be collected from the CCGR database. A brief discussion of the measures follows:

Return on Assets (ROA): measures the efficiency of assets in producing income (Cohen et. al). The measure gives an idea of how efficient the firm uses its assets to generate earnings. Companies' ROA vary substantially and will often be highly dependent on the industry.

Return on Equity (ROE): measures the performance of the firm relative to the shareholders investment (Cohen et. al). With a high ROE the firm is more likely to generate cash internally.

From our knowledge, no earlier studies in this field have examined non-listed firms. To identify whether the sample firms depart from the "normal" financial performance during the period of study, we will compare them with control firms with approximately the same size and within the same industry, as mentioned above. Moreover, there are problems with using accounting-based measures. Accounting returns include depreciation and inventory costs which affect the accurate reporting of earnings, also asset values are recorded historically (Pandya and Rao 1998).

In order to compare performance of firms, we will use a performance indicator which indicates outstanding performance. This approach was also used by Frederico Marinelli (2008) when he investigated the persistence of outstanding performance and shareholder value among diversified firms. Outstanding performance is the same as performance above industry average.

$$OROA_{it} = ROA_{jit} - ROA_{jt}$$

Where  $ROA_{jit}$  represents the ROA of industry  $j$  of firm  $i$  during period  $t$ , and  $ROA_{jt}$  represents the ROA of the respective industry  $j$  during period  $t$ . In order to

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compute a benchmark  $ROA_{jt}$  we will use between five and ten firms from the same industry and with several comparable measures. The comparable measures will also be acquired from the CCGR database.

The same logic is employed when comparing the ROE of the firms with the industry benchmark.

$$OROE_{it} = ROE_{jit} - ROE_{jt}$$

Where  $ROE_{jit}$  represents the ROE of industry  $j$  of firm  $i$  during period  $t$ , and  $ROE_{jt}$  represents the ROE of the respective industry  $j$  during period  $t$ . In order to compute a benchmark  $ROE_{jt}$ , we will use between five and ten firms from the same industry, and with several comparable measures.

It is important to control for financial leverage when using the performance measure ROE. Financial leverage is the use of financing other than common equity, for instance by using debt or preferred stock, to magnify operating results (Hill and Stone 1980). As ROE is a measure calculated from historical accounting numbers, leverage needs to be taken into account when using ROE. It is important to notice that ROE both can be expensed and capitalized. In the world of Modigliani and Miller, where no capital market frictions exists and there is symmetric access to credit markets; the cost of equity rises with leverage since the risk to equity rises <sup>14</sup>. Consequently, an increase in leverage will induce an increase in ROE.

### ***Data collection***

In the research paper Fisher-Vanden and Thorburn (2008) we observe the different environmental standards impact on financial firm performance. As data on this matter is recently collected and Norway is a relatively small economy concerning the number of firms, it may be a challenge to get a large enough sample size using only listed firms. For that reason we include both listed and non-listed firms in our sample, such that we will have a scientifically large enough sample in our research. Another reason for including non-listed firms is that non-listed companies count for 2-4 times the listed companies, no matter which magnitude being used in the Norwegian economy (Berzins and Bøhren 2009).

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We define listed firms as firms that are listed on the OSEBX. Contrary, non-listed firms are firms that are not listed and which accordingly are private firms.

Norwegian companies are defined as companies that are located and have their headquarters in Norway, but not necessarily have Norwegian owners. They can also be companies that are listed on the OSEBX but have their headquarters in another country.

In our research we will focus on the largest companies in Norway either listed or non-listed firms, which was stated above. In order to do this for the listed firms, we will search through the list of all firms listed on the OSEBX and consequently choose the ones fulfilling one or more of the environmental standards. In addition for the non-listed firms, we will use the list of “The 500 largest companies in Norway” to single out only the largest firms in Norway in our sample<sup>15</sup>. As only the numbers for 2008 is available we will use the ratings from 2008. The selected firms also have to carry out at least one of the environmental standards. Moreover, most of the firms in our data sample are non-listed firms. Consequently, our data sample is much broader and more representative compared to the samples used in other studies of environmental performance and firm performance, where only listed firms are studied. After having selected the relevant firms for our sample, we use the CCGR database.

A rough estimate of the sample size indicates that we currently have 25 listed and 50 non-listed firms that have implemented environmental standards. The sample of the non-listed firms is expected to be larger than currently, when we investigate the topic further. We expect to have a total sample of about 100-120 firms. We think this sample size is sufficient in order for us to perform our study. When we compare our sample size to Fisher-Vanden and Thorburns (2008), they have a sample size of 157 US publicly traded firms. Moreover, the US market and economy is much larger compared to Norway.

### *Causality*

A critical issue is the direction of causality. The existence of a relationship between variables does not prove causality or the direction of influence (Gujarati and Porter 2009). There may be two severe problems connected with causality. The first problem may be that there is reverse causality. Related to empirical

growth, one can seldom be sure whether the variables expected to cause growth actually do so, or themselves are caused by growth<sup>16</sup>. In our case, this means that the firm's application and obtainment of a green certificate might rely upon the firm's performance. This problem will be addressed when we match the firms with green certificates with resemble firms of same size and performance. Then we hopefully will be able to observe if the firms that receive green certificates, have performed better than the benchmark firms after obtainment of the certificate.

The second problem connected with causality may be that there is a third unobserved variable, which influence both the firm performance and the application and obtainment of a green certificate. This is known as an instrumental variable (IV). IVs, although highly correlated with the original X variables, are uncorrelated with the equation and measurement error terms. If such a proxy can be found, one can obtain a consistent estimate of  $\beta$ . It is important to notice that finding proper IVs are much easier said than done (Gujarati and Porter 2009).

Klassen and McLaughlin (1996) address the problem with a general theoretical model linking environmental management to financial performance. Several pathways are proposed that link investments in environmentally compatible products, processes, and management systems, to greater corporate profits, either through market revenue or cost savings. Moreover, they empirically test the overall linkage using financial event methodology and archival data of firm-level environmental performance. The perceived effect of environmental performance on future financial firm performance, is estimated from the change in market valuation. Further, they do cross-sectional analysis of firms exhibiting strong environmental performance.

In our paper we will try to link green certificates to financial firm performance. Investing in environmental certificates might help the firm to increase its market revenue or cost savings. Furthermore, the overall linkage will be tested using financial event methodology and data of when the firms got the environmental certificate(s). The perceived effect of the certificates on future financial firm performance, will be estimated through the change in the market value. Concerning the non-listed firms, as mentioned, the firms with green certificates

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will be compared to a benchmark. The perceived effect of the certificates on the past financial firm performance will be estimated by taking the outstanding performance above industry average.

***Thesis progression***

We will work continuously with our thesis from now and until we can experience the final result. Even though the date of submission set by the Norwegian School of Management BI is September 1<sup>st</sup> 2010, we want to finish our thesis within June 2010; thus we will work hard to accomplish this time frame.

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