Universitetet i Stavanger

**DET SAMFUNNSVITENSKAPELIGE FAKULTET,**
**HANDELSHØGSKOLEN VED UIS**

# MASTEROPPGAVE

| STUDIEPROGRAM: Master of Science in Business Administration | OPPGAVEN ER SKREVET INNEN FØLGENDE SPESIALISERINGSRETNING: Economic Analysis<br><br>ER OPPGAVEN KONFIDENSIELL?<br>(**NB**! Bruk rødt skjema ved konfidensiell oppgave) |
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TITTEL: Verdsetter investorer grønne initiativer? En studie av ISO 14001 sertifisering og utstedelse av grønne obligasjoner

ENGELSK TITTEL: Do Investors Value Green Initiatives? A Study of the ISO 14001 Certification and the Issuance of Green Bonds


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OPPGAVEN ER MOTTATT I TO – 2 – INNBUNDNE EKSEMPLARER

Stavanger, ……/…… 2016 Underskrift administrasjon:……

# Abstract

The aim of this thesis is to explain the impact on stock prices for publicly traded firms from certifying to the ISO 14001 standard. Through the event study methodology, we study 28 firms listed in Norway or Sweden who certified to the standard within the period 1999-2014. We conduct both a univariate and cross-sectional analysis, and find that there are no overall effects on stock prices from certifying to the standard. Further, we investigate if the issuance of green bonds acts as a signal of environmental commitment from the firms to the investors. Again we apply the event study methodology for 16 European firms who issued green bonds in the period 2013-2015, and find that issuance of green bonds does not affect the stock prices.

According to our results, we propose two different explanations: 1) Investors do not see the certification nor the issuance of green bonds as an initiative that creates or destroys value for the firm. 2) Investors are not united in their evaluation of the initiatives, which leads to no overall effect.

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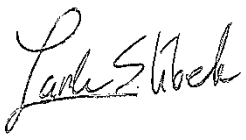
# Preface

This thesis was written during the spring of 2016, as a finalization of our MSc in Business Administration at the University of Stavanger Business School. Our motivation for this thesis has been to contribute to a field that has been investigated for decades, but still divides some of the most prominent scholars. The relationship between the environment and economics is a topic that only increases in relevance as time passes on, and in our own opinion will be extremely relevant in the coming years.

The process of writing this thesis has thought us a lot about how to systematically approach a question within the framework of economic research. This semester has proven to be perhaps the most challenging one, but also the most rewarding one as we now have gotten the possibility to apply knowledge from previous courses to a real world problem.

We would like to express our utmost gratitude towards our supervisor, Associate Professor Gorm Kipperberg. His ability to make us look at the problem at hand from different angels has proven to be crucial for the writing of this thesis.

*Stavanger - June 2016*



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# 1. Introduction

There is a growing concern regarding the industrial effects on the environment. We are no longer asking questions about whether or not we are influencing our global environment, but rather how we can stop the trend of global warming, or better yet - reverse it. For this reason, firms are facing more and more rigorous governmental regulations on a yearly basis. One way firms have managed to circumvent laws and regulations has been to extend their business to parts of the world with few or non-existing environmental regulations. In this fashion, the bottom line can be improved without breaking the law, but this way of conducting business is clearly not sustainable and it shows us how firms can react to regulations that might not be in their best interest regarding profit maximization.

However, the last couple of decades have brought up increased attention towards corporate social responsibility (CSR). With increased stakeholder pressure to improve the environmental performance in addition to maintain the financial performance, firms need to consider ways of integrating the environmental aspect into their businesses while limiting any negative consequences for shareholder wealth.

Balancing the relationship between profit maximization and environmental performance is a topic widely discussed in the academic literature. The consensus in the first studies was that firms should only initiate environmental investments as long as it was in order to increase profits through lowered environmentally related costs. This was the prevailing view for quite some time before new convincing studies argued that environmental investments could actually provide socially responsible firms with a comparative advantage, and thus increased profits.

More recent empirical studies have investigated the effects environmental performance and management has on financial performance. In the academic literature, research has shown to propose both negative, positive and no correlation between environmental and financial performance. Despite the numerous studies on the topic, a consensus is yet to be reached.

## 1.1. Objective and research question

We aim to provide further understanding of the relationship between environmental management and financial performance by looking at changes in Norwegian and Swedish firms' stock prices from acquiring an ISO 14001 certificate. We phrase our research question as follow:

*Does ISO 14001 certification affect stock prices for Norwegian and Swedish firms, and is there any differences between effects in the two countries?*

We conduct our study using the event study methodology. We isolate the events, being the certifications, calculate cumulative abnormal return and run statistical analysis in order to investigate if there exists a causal relationship.

In addition, we conduct a separate study using the issuance of green bond as an environmental signal providing us with the additional research question:

*Does the issuance of green bonds affect stock prices for European firms?*

This analysis is threated separately, and discussed in full in chapter 7.

## 1.2. Structure of Thesis

This thesis is structured in the following way. Chapter 2 provides the theoretical background. Chapter 3 reviews the current literature on the topic and presents our hypothesis. In chapter 4 we present our methodology, and in chapter 5 we describe our dataset and sample. The results are presented in chapter 6. Chapter 7 covers the analysis of green bonds, while chapter 8 summarizes our concluding remarks.

# 2. Theoretical Background

In neoclassical economic theory, the sole objective of a firm is to maximize its profits. As Friedman (1970) eloquently puts it "there is one and only one social responsibility of business—to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game…", Friedman (1970, p. 133). If we translate "the game" as the 1970's regulations, then a firm should comply with these regulations but nothing beyond as this will reduce profitability of the firm. This view has obviously changed since the 1970s, but it was not until the 1990s that two different views were presented, namely the Porter Hypothesis and the natural-resource-based view of the firm.

## 2.1. The Porter Hypothesis

The traditional view among economists was that environmental regulations and protection imposes an additional cost to the firm. The Porter Hypothesis, originally proposed by Michael E. Porter in 1991 and later elaborated by Porter and van der Linde (1995) states that strict environmental regulations do not necessarily hinder competitive advantage against rival firms. In fact, such regulations can induce efficiency and stimulate innovations that would improve commercial competitiveness. Compared to more lax regulations, stringent regulations can produce greater innovation offsets. While relatively lax regulations can be dealt with by secondary solutions and often without innovation, more stringent regulations force the company to pay greater attention to discharges and emissions, and compliance would require solutions that are more fundamental. Even though the compliance cost may rise with the strictness of the regulations, the potential for innovation offsets may grow at an even faster speed. In that way, the net cost of compliance may be turned into a net benefit.

Furthermore, Porter and van der Linde (1995) argue that firms that are "going green" could experience a first-mover advantage. Innovations and new sustainable products can open up new market segments, especially in international markets.

## 2.2. The Natural-Resource-Based View of the Firm

A second view that arose in the mid-1990s was the natural-resource-based view of the firm, proposed by Hart (1995). This view is considered an extension upon resource-based theory, and can be summarized as a theory of competitive advantage based upon a firm's relationship to the

natural environment. The framework consists of three interrelated strategies, namely pollution prevention, product stewardship and sustainable development. Hart argues that the constraints and challenges posed by the natural environment will be one of the most important drivers of new resources and capability development for firms. Through pollution prevention, companies can obtain significant savings, which relative to competitors can result in a cost advantage. This may also lead to increased productivity and efficiency, because less waste would mean a higher degree of utilization of inputs, which in turn results in cost reductions for raw materials and waste disposal. Compliance and liability costs may also be reduced when emissions are cut well below the required levels. Hence, the outcome of a pollution preventing strategy will be overall cost reductions and increased profitability for the firm.

Furthermore, Hart argues that firms in developed markets will want to minimize the life-cycle environmental costs of their product systems, and that several objectives can be achieved by product stewardship. Firms can exit environmentally harmful businesses, reduce liability by redesigning their product systems and develop new products with lower life-cycle costs. In addition to pollution prevention and product stewardship, firms could pursue a sustainable development strategy. This involves both extensive investment and a long-term commitment to market development. It is unlikely that this strategy would increase profits in the short term, but it might raise the future expectations of a firm's economic performance. According to Hart, this natural-resource-based view and the interconnection between the three strategies could indeed lead to a sustained competitive advantage in the long term.

## 2.3. Environmental Policies

While Porter and van der Linde (1995) see the advantages from strict regulations, and Hart (1995) identifies strategies that could lead to a sustained competitive advantage, Prakash (2000) examines the process of environmental policymaking within firms. He classifies the different policies along two attributes, whether they meet or exceed a firm's profit criteria and whether or not they are required by law. Hence, four different types of policies are identified. Type 1 (not required by law and meet or exceed the profit criteria); Type 2 (not required by law and do not meet the profit criteria); Type 3 (required by law and meet or exceed the profit criteria); Type 4 (required by law and do not meet the profit criteria). Since Type 3 and Type 4 policies are required by law, it is easy to understand why firms have to adopt them. Type 1 policies are also

easily understood, as they are in line with profit-maximizing theory and the theories presented by Porter and van der Linde (1995) and Hart (1995) above.

However, it is more difficult to understand why firms would adopt Type 2 policies. This question is of particular interest to our research, as the adoption of an ISO14001 environmental management system not necessarily have shown to be profitable, Cañón-de-Francia and Garcés-Ayerbe (2009) and Paulraj and de Jong (2011). Prakash (2000) points to two sets of explanations why firms would adopt such policies. The first being strategic reasons with potential for economic benefits in the long term. Indeed, Morrow and Rondinelli (2002) find that one of key motivation for adopting an ISO 14001 certification is to develop a competitive advantage, especially among firms in the United States and Europe. Firms could also take part in shaping environmental regulations and in that way obtain first-mover advantages. The second set of explanations stems from sociological institutional theory and stakeholder theory, and focus on non-profit objectives. Institutional theory suggest that a firm's sole objective is not only profit maximization, but also takes external pressure for legitimacy from social institutions into account. In light of this theory, firms would respond to pressure from external institutions by adopting Type 2 policies. In contrast to Friedman's view of firms' social responsibility, stakeholder theory suggest that firms should take into account the preferences of multiple shareholders when designing their policies. This is in line with the findings of Fisher-Vanden and Thorburn (2011) that firms are joining voluntary environmental programs because of pressures from shareholder activists, not because such membership would increase firm value.

## 2.4. CSR from Investors' Perspective

Chatterji et al. (2009) propose four motivations why investors should care about corporate social responsibility (CSR). The first motivation is based on the belief that superior social or environmental performance will lead to better financial performance. The reasoning behind this belief is that the company will attract socially responsible consumers, reduce the threat of regulations, improve their reputation with consumers and reduce external concerns from nongovernmental organizations and activists. The second motivation is associated with deontological investors, who seek to avoid investments in socially or environmentally irresponsible companies because they do not wish to earn profits from unethical or undesirable actions from firms. They care about past performance because they want to make sure that the

current profits was not earned due to past unethical behavior, and they also care about current management in order to avoid future actions that would result in tainted future profits. The third motivation refers to consequentialist investors, who seek to direct their investments to reward socially responsible firms and to provide an incentive for firms with lagging social performance to improve. Their intention is to help responsible firms grow, and reduce the market share and raise the cost of capital for socially and environmentally irresponsible firms. They rely on accurate information about past performance in order to ensure which firms to appropriately reward and punish. The fourth and final motivation corresponds to expressive investors, who base their identity partly on their investments and associations with good causes. Thus, they seek to invest in companies with a perception of being socially and environmentally responsible.

# 3. Literature Review

Initially, firms designed environmental policies as reactions to regulatory requirements, Cordeiro and Sarkis (1997). As the debate of whether environmental initiatives was in the best interest of the firms or of the environment (or both), the main objective in CSR research became finding the connection between CSR and corporate financial performance (CFP), Lee (2008). More specifically, the connection between environmental performance and financial performance. There have been several studies trying to capture the effect of different environmental initiatives on a specter of economic and financial variables. Studies on the topic are mainly within the methodology of regression analysis, event studies and portfolio analysis. However, despite numerous studies, there seems to be no conclusive results to help us understand the total effects of environmental initiatives on financial performance.

## 3.1. Regression Analysis

Within the regression analysis studies, reports of positive correlation between environmental and financial performance are predominant (e.g. Nakamura 2011; Hart and Ahuja 1996; Russo and Fouts 1997; Wahba 2008; Guenster et al. 2011), but there are also some reports of mixed results which confirm the lack of consensus on the topic (e.g Aupperle et al. 1985; Ziegler et al. 2007). Reasons for these contradicting results are not fully understood, but as Fisher-Vanden and Thorburn (2011) discuss, there seems to be empirical evidence for positive correlation between environmental and financial performance in the cases where environmental investments are made in response to compliance, liability or regulatory threats. This means that an investor does not necessarily see the firm's investment as profitable in itself, at least not in the short run, but as the appropriate response when facing higher costs from not complying with regulations. Though immediate negative returns could disincentivise firms from making these types of investments, Cordeiro and Sarkis (1997) showed that environmental investments should be looked upon as similar to R&D or TQM approaches, with short-term penalties that are more than recovered by the long-term gains from the investment. This is in line with the results from Nakamura (2011) and Hart and Ahuja (1996), who found that environmental investments increase firm performance in the long term, not the short term[1].

[1] Hart and Ahuja (1996) found positive influence on operating performance (ROS and ROA) within the following year, but financial performance (ROE) was not affected until after this.

Cormier et al. (1993) conducted a regression analysis on 74 Canadian firms over the period of 1986 – 1988, and found that a firm's pollution record had an effect on the market value of the firm. The better (worse) the record, the smaller (greater) the potential liabilities would be in order to decrease stock market value. These results support the study of Hart and Ahuja (1996) and was further supported by Russo and Fouts (1997) who stated that enhanced profitability came as a result of high levels of environmental performance after studying 243 firms who were assigned environmental ratings by the Franklin Research and Development Corporation. Later, both the studies of Konar and Cohen (2001) and King and Lenox (2001), which studied firms within the manufacturing sector, came to the conclusion that poor environmental performance have a negative effect on financial performance[2].

The results from these studies give managers good reasons to consider environmental initiatives. However, as Bansal and Hunter (2003) suggest, the early adopters of the ISO 14001 standard, did so to reinforce an already present environmental legitimacy, not to reorient the firms' environmental strategy. They further question the reach of this certification, as their results imply no fundamental change in firm behavior regarding the environment, only improving the existing ones. Also, suggestions of no relationship between CSR and financial performance was earlier presented by Aupperle et al. (1985) which could further disincentivise managers from applying costly EMSs. Support for the negative relationship between CSR and financial performance was published by Ziegler et al. (2007), but they, on the other hand, also found evidence for positive relationship between environmental and financial performance. Even with some results explaining a negative correlation between environmental and financial performance, most later regression analyses such as Telle (2006), Wahba (2008) and Nakamura (2011) all suggest that firms will experience positive effects on economic performance, firm value and firm performance respectively, by improving their environmental performance.

[2] Konar and Cohen (2001) used Toxic Release Inventory for chemicals (TRI88) and pending environmental lawsuits as variables, while King and Lenox (2001) used total, relative and industry emission figures.

| Study | Sample | Environmental management variables | Environmental performance variables | Financial performance variables | Main analysis | Major findings |
|---|---|---|---|---|---|---|
| Aupperle et al. (1985) | 117 firm statements on CSR | CSR defined by four components: economic, ethical, legal and discretionary | | ROA | Regression analysis | No relationship between social responsibility and financial performance. |
| Cormier et al. (1993) | 74 Canadian firms over the period 1986-1988 | | Computed pollution performance index with respect to government environmental regulations | Market value of the firm | Regression analysis | The worse (better) a firm's pollution record, the greater (smaller) the amount of potential liability reducing its stock market valuation. Weakly supportive results of a premium (discount) in the stock market valuation of firms that meet (do not meet) environmental regulations. |
| Hart and Ahuja (1996) | 127 US firms in SIC listed in S&P 500 with SIC codes below 500 | | Emission reductions based on TRI from the IRRC Corporate Environmental Profile data | ROA, ROE, ROS | Regression analysis | Activities of pollution prevention have a positive effect on financial performance within one or two years. ROE takes longer to be influenced. |
| Russo and Fouts (1997) | 243 firms assigned environmental ratings by the Franklin Research and Development Corporation (FRDC) | | FRDC rating (1-5, 5 being best) | ROA | Regression analysis | High levels of environmental performance is associated with enhanced profitability, and the relationship is strengthened as industry growth rises. |

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|---|---|---|---|---|---|---|
| Konar and Cohen (2001) | 321 firms (mostly from the manufacturing sector) | | TRI88 and the number of environmental lawsuits pending against the firm (LAW89) | Tobin's q | Regression analysis | Poor environmental performance has a significant negative effect on financial performance. The effect is more pronounced for toxic chemical disclosures than for lawsuits |
| King and Lenox (2001) | 652 US manufacturing firms | | Total emissions, relative emissions, industry emissions | Tobin's q | Regression analysis | Total emissions are related with superior financial performance. Firms with lower emissions in their industries tend to perform better financially. |
| Bansal and Hunter (2003) | 197 facilities of 90 firms (analysis is done at firm level) | ISO 14001 | | Strategic intensives (reinforce strategy or reorient strategy) | Regression analysis | Firms use ISO 14001 to reinforce their existing commitment to the natural environment and internationalization |
| Telle (2006) | Norwegian plants within four different risk classes and four different industries | | Emission of pollutants | Return on sales (ROS) | Regression analysis | Positive effect of environmental performance on economic performance (not significant when controlled for unobserved plant heterogeneity) |

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|---|---|---|---|---|---|---|
| Ziegler et al. (2007) | 212 European corporations | | Sustainability performance (measured as the average sustainability performance of the industry in which a corporation operates and as the relative sustainability performance of a corporation within a given industry) | Average monthly stock return | Regression analysis | The average environmental performance of the industry has a significantly positive effect on the average monthly stock return. Average social performance has a significantly negative effect on the stock performance. |
| Wahba (2008) | 156 Egyptian firms (84 with certification). 2003-2005 | ISO 14001 certification | | Firm's market value measured by Tobin's *q* | Correlation and regression analysis | ISO 14001 has a positive and significant impact on firm market value. |
| Nakamura (2011) | 3237 Japanese firms | | Value of environmental investments | Short-term and long-term ROA | Regression analysis | Environmental investments increase firm performance in the long-term, not short-term |
| Guenster et al. (2011) | US listed firms. Data set includes 154 firms at the end of December 1996 and 519 firms at the end of September 2004 | | Innovest's seven non-numerical eco-efficiency scores converted into numerical scores between zero and seven (seven being best) | Stock return, Tobin's q, ROA | Regression analysis | Eco-efficiency relates positively to operating performance and market value. |

***Table 1*** *- Regression analysis linking environmental and financial performance*

## 3.2. Portfolio Analysis

Portfolio analysis also provide mixed results on the link between environmental and financial performance. Where Cohen et al. (1997) found no positive return for green investments and Mollet and Ziegler (2014) found insignificant abnormal returns for firms in the US and Europe, the results from Derwall et al. (2005) show that portfolios containing firms with high environmental performance not only have positive returns, but also outperforms portfolios containing firms with low environmental performance. This is also consistent with the results of White (1996). In general, it is expected that funds containing environmentally friendly firms will underperform because of the inherent restrictions the fund manager faces when dealing with only a subset of the market portfolio. This was, however, not confirmed by the literature review of Ambec and Lanoie (2008), where eleven out of sixteen portfolio analysis reported no or insignificant differences between social responsible investment (SRI) funds and conventional ones, and the remaining five reporting that conventional funds were outperformed by SRI funds. One reason to why results vary from the expectations could be that portfolios are managed by human managers with different levels of skills. This would potentially have a large effect on the results of the studies. Another reason, one might argue, is that different studies use different performance measures. This was briefly discussed in White (1996) where studies that rely on the Toxic Release Inventory (TRI), published by the U.S Environmental Protection Agency (EPA), (e.g. Hart and Ahuja 1996), report positive correlation between environmental and financial performance, while studies using environmental mutual fund data produce opposite results. This theory was further strengthened by the Griffin and Mahon (1997) study on corporate social performance (CSP) and corporate financial performance (CFP), which concludes that a priori use of measures may actually predetermine the CSP/CFP outcome.

Another mentionable issue is the possibility of a two-way interaction between financial performance and environmental variables, as pointed out in the literature review of José et al. (2009). Most studies investigate the effects of environmental efforts on financial performance, but some studies also looked at the effects in the opposite direction. Wagner et al. (2002) found no evidence of effects in this direction, but Nakao et al. (2007) found that environmental management was affected by financial performance in Japanese firms. However, since we are looking at the effects of environmental initiatives on financial variables, we do not look further into these studies.

| Study | Sample | Environmental management variables | Environmental performance variables | Financial performance variables | Main analysis | Major findings |
|---|---|---|---|---|---|---|
| White (1996) | 6 US listed firms | Environmental reputation | | Jensen's alpha | Portfolio analysis | Significantly greater risk-adjusted returns for portfolios containing firms with above-average reputations for corporate environmental responsibility. |
| Cohen et al. (1997) | Companies on the SP500 | | Constructed to different portfolios based on nine different environmental performance variables. "Higher polluter" and "lower polluter". | ROA, ROE and return to shareholders | Portfolio analysis | There is no penalty for investing in the green portfolio, and no positive return for green investing. |
| Griffin and Mahon (1997) | Firms in the chemical industry | | TRI index, the Fortune reputation survey, the KLD index, corporate philanthropy | ROA, ROE, total assets, asset age, 5-year return on sales | Portfolio analysis | A priori use of measures may predetermine CSP/CFP relationship outcome |
| Mollet and Ziegler (2014) | US and European firms between 1998 and 2009 | | Constructed portfolios of firms that are sector leaders in terms of sustainability performance, based on corporate sustainability performance assessments by ZKG. | Risk-adjusted returns of different stock portfolios | Portfolio analysis | Insignificant AR for SRI in both US and Europe. Supports the view that SRI stocks are correctly prices by market participants |

***Table 2*** *- Portfolio analysis linking environmental and financial performance*

## 3.3. Event Studies

Event studies constitutes, as far as we can see, the biggest amount of environmental studies. Also here there are varying results, but a vast majority of the studies report significant market reactions to news concerning a firms environmental performance (e.g. Cañón-de-Francia and Garcés-Ayerbe 2009; Paulraj and de Jong 2011; Hamilton 1995; Klassen and McLaughlin 1996; Oberndorfer et al. 2013). The events used in the studies vary from inclusion of firms in certain indexes, release of environmental ratings, voluntary environmental programs to the implementation of environmental management systems.

In regards of publicly released news about firms environmental performance, Shane and Spicer (1983) show that firms, on average, experience relatively large negative abnormal returns, while the companies with the lowest pollution-control experience significantly larger negative abnormal returns than firms with high pollution-control. They conclude that the results follow changes in investors' perception of future cash flows. This implies that investors associate the news about high pollution figures with liabilities that ultimately can lead to increased costs for the firm. Hamilton (1995) then reported the same results using the TRI released by EPA. Interestingly, Fisher-Vanden and Thorburn (2011) then showed that firms who joined climate leaders and firms announcing specific goals for greenhouse gas (GHG) emissions reduction also experienced significant drops in stock price. In light of the results from Shane and Spicer (1983) and Hamilton (1995), this implies that investors do not like public announcements of high pollution numbers, but neither the implied costs of reducing the emissions. Further, Cañón-de-Francia and Garcés-Ayerbe (2009) showed that the announcement of ISO 14001 certification resulted in lowered shareholder wealth and stock price reduction, results that later was supported by Paulraj and de Jong (2011) who found similar results for 140 US firms. Oberndorfer et al. (2013) then looked at a more general environmental variable where German firms being included in the Dow Jones Sustainability Index World (DJSIW), experienced significant negative average cumulative abnormal returns. They suggest that, if the index is used as an indicator for the level of CSR, higher environmental or social performance is not sufficiently awarded.

While these results do not encourage environmental initiatives, there are also studies that imply that there are positive connections between environmental and financial performance. Market valuation increased after firms received environmental awards according to the results of Klassen

and McLaughlin (1996), while firms who experienced environmental crisis (such as gas leaks, chemical/oil spills or explosions) saw their market value decrease as a result. Environmental management systems have also been found to be valued by investors in the study published by Montabon et al. (2000) who, when looking at the ISO 14000 standards, found that certified EMSs have positive effects on the efficiency and effectiveness of the firms. Similar evidence was published by Ferron et al. (2012) who found that firms, on average, tend to be more profitable once ISO 14001 certified. A positive effect was also documented by Murguia and Lence (2015) when studying the effect of Newsweek's "Global 100 Ranking" (G100), concluding that a climb of one place on the ranking could result in an increased firm value of $11,4 million, on average. On the other hand, they did not find significant change in portfolio prices for the firms in the G100 at the release of the rankings. Neither did Jacobs et al. (2010) when studying the effects of firm announcements of corporate environmental initiatives (CEI) and environmental awards and certifications (EAC). However, a significant positive effect was found for certain sub categories of EAC and CEI including ISO 14001 certification, which contradict, to some degree, the conclusion that the ISO 1400-series and ISO 9000-series do not benefit the firms as reported by Aarts and Vos (2001).

Event studies that report no relationship between environmental and financial performance are fewer, but they still contribute to the range of different conclusions on the topic. Gilley et al. (2000) find no overall effects of announcements of environmental initiatives, while Wai Kong Cheung (2011) find no significant long-term effects when firms are included or excluded from the Dow Jones Sustainability World Index (DJSWI).

With these previous results in mind, it is clear that there is need for further research on the effects firms experience from different environmental initiatives. To our knowledge, there are no studies on the effects of ISO 14001 certification in the Nordic countries.

| Study | Sample | Environmental management variables | Environmental performance variables | Financial performance variables | Main analysis | Major findings |
|---|---|---|---|---|---|---|
| Shane and Spicer (1983) | 72 firms from different sectors | | Published reports from Council on Economic Priorities (CEP) about firms' environmental performance | Movements in share prices | Event study | Relatively large negative abnormal returns. Significantly larger negative abnormal returns for firms with low pollution-control performance rankings compared to firms with higher ranking. |
| Hamilton (1995) | 463 US firms | | Toxic Release Inventory (TRI) emissions | Abnormal Returns (stock price reaction) | Event study | Significant negative returns on the day of announcement TRI emissions data. |
| Klassen and McLaughlin (1996) | US firms with environmental awards and crisis | Environmental awards in the NEXIS database; chemical/oil spills, gas leaks or explosions | | Stock market returns | Event study | Environmental awards had a significant, positive effect on market valuation. Crises had a negative effect |
| Gilley et al. (2000) | 71 announcements of corporate environmental initiatives | Two types of environmental initiatives: 39 process-driven and 32 product-driven | | Stock returns | Event study | No overall significant effect of announced environmental initiatives. Significant negative effect of process-related announcements. No effect to product-related announcements |
| Aarts and Vos (2001) | 47 firms from New Zealand | ISO 14000-series and ISO 9000-series | | Stock return (CAR), Stock performance (benchmark: NZSE capital index) | Event analysis, ISO comparative index, certifying authority comparative index | ISO registration is not beneficial to firms' performance. The market value the process rather than the outcome of gaining registration. Choice of certifying authority affects financial performance. |

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|---|---|---|---|---|---|---|
| Cañón-de-Francia and Garcés-Ayerbe (2009) | 80 ISO 14001-certified plants of 34 Spanish firms | ISO 14001 certification | | Stock price (CAR) | Event study | Negative impact of certification on pioneer, middle-polluting and lower-sized firms. |
| Jacobs et al. (2010) | 780 announcements (417 CEI and 363 EAC announcements) spanning 340 unique firms. 2004-2006 | | Corporate Environmental Initiatives (CEIs).<br><br>Environmental Awards and Certifications (EAC) | Stock price (AR) | Event study | No significant results on reaction to CEIs or EAC. Significant result on certain subcategories of CEI and EAC, including ISO 14001 certification. |
| Wai Kong Cheung (2011) | 139 US firms between 2002 and 2008 | | Inclusion (exclusion) in the Dow Jones Sustainability World Index (DJSWI) | Stock returns and risk | Event Study | No significant long-term effects. Temporary increase (decrease) in stock returns on the day of the inclusion (exclusion) |
| Paulraj and de Jong (2011) | 140 US firms from 1996 to 2008. | ISO 14001 certification | | Stock price (AR) | Event study | Negative impact on stock performance and reduction of shareholder wealth. The negative impact is smaller for larger firms. |
| Fisher-Vanden and Thorburn (2011) | 117 US firms from 1993 to 2008 | | Joining voluntary environmental programs. Climate Leaders and CERES. | Stock return (CAR) | Event study | Significant drop in stock price for firms joining CL. An even larger drop for firms announcing a specific goal for the reduction of their GHG gas emissions. |
| Oberndorfer et al. (2013) | 51 German firms between 1999 and 2002 | | Inclusion in the Dow Jones STOXX Sustainability Index (DJSI STOXX) and the Dow Jones Sustainability World Index (DJSI World) | Stock performance | Event study | Strong negative effect of inclusion in the DJSI World. No significant effect for inclusion in the DJSI STOXX |

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|---|---|---|---|---|---|
| Murguia and Lence (2015) | Firms on Newsweek's "Global 100 Ranking", the G100. | The release of the ranking. Moving up one place on the rankings. | Abnormal return of the equal weight portfolio of all the firms in the G100. Abnormal stock return for each firm | Event study | The release of the ranking did not affect (statistically insignificant) the price of the portfolio for the firms in the G100. Moving up one place in the rankings increases the value of an average firm in the list by 11.4 million dollars. |

***Table 3*** *- Event studies linking environmental and financial performance*

## 3.4. Hypothesis

As the discussion of the effects of environmental performance on financial performance contain three different possible outcomes: no effect, positive effect or negative effect, we form two hypotheses based on previous literature:

*$H_{0A}$: An ISO 14001 certification has no effect on the stock price of the firm in question.*
*$H_{1A}$: An ISO 14001 certification has a positive or negative effect on the stock price of the firm in question.*

These hypotheses look for any overall effect from certifying firms with the ISO 14001 standard cross country. Further, we ask the question if there are any differences between the Norwegian and Swedish firms in regards of the effects. To investigate this, we form our second hypotheses as follow:

*$H_{0B}$: Stock market reaction following an announcement of ISO 14001 certification do not differ between Norwegian listed firms and Swedish listed firms.*
*$H_{1B}$: Stock market reaction following an announcement of ISO 14001 certification differs between Norwegian listed firms and Swedish listed firms.*

We will now elaborate on the methodology we use to test our hypotheses.

# 4. Methodology

In order to investigate the relationship between ISO 14001 certification and the market value of firms we employ the event study methodology. The idea of the event study is to examine the effect of a specific economic event on the value of firms, measured through the firms' stock price. This is consistent with the methodology used by Fisher-Vanden and Thorburn (2011) in their study of voluntary corporate environmental initiatives and Cañón-de-Francia and Garcés-Ayerbe (2009) in their study of the impact of ISO 14001 certification on Spanish firms.

According to MacKinlay (1997), the strength of the event study lies in the fact that security prices will immediately reflect the effects of the event, given that markets are rational and efficient. McWilliams and Siegel (1997) argue that security prices, compared to accounting measures such as profits, are less prone upon to insider manipulation. They are supposed to reflect the true value of firms. This is because the price of a security in general is assumed to represent the discounted value of all future cash flow and consider all relevant information.

The event study as it is known today was introduced in the classic paper by Fama et al. (1969). The methodology has not changes much and follows a general setup. The first steps involves defining the event of interest, selecting the firms to be included in the sample and defining the time period over which the security prices of the included firms will be examined, generally known as the event window. In order to appraise the impact of the event it is necessary to measure the abnormal return, which MacKinlay (1997) defines as "the actual ex post return of the security over the event window minus the normal return of the firm over the event window", MacKinlay (1997, p. 15). The normal return refers to the expected return in the absence of the event. Hence, the abnormal return for firm *i* at time *t* can be expressed as

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

where $AR_{it}$ is the abnormal return, $R_{it}$ is the actual return and $E(R_{it}|X_t)$ is the normal return conditional on information $X_t$. The time index *t* is measured in days.

## 4.1. Time Line for the Event Study

In an event study, it is necessary to identify the event date, and define the event window and the estimation window before being able to estimate normal performance. The time line appears in figure 1:

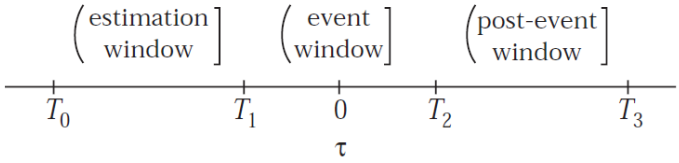


***Figure 1*** *- Time line for an event study (MacKinlay, 1997, p.20)*

The event date (t=0) is the day the event of interest is announced, and the market acquires knowledge of this new information. It is important that the event date is as accurate as possible. As pointed out by Strong (1992), it is likely that the accuracy of the event date is more important than using sophisticated models or statistical techniques. $T_0$ to $T_1$ represents the estimation window $L_1$; $T_1$ to $T_2$ represents the event window $L_2$, while $T_2$ to $T_3$ represents the post event window $L_3$.

In order to capture the effect of any information leakage or delay in the response of the stock market, it is common to expand the event window to a couple of days surrounding the event date, MacKinlay (1997). It is also important not to let the event window and the estimation window overlap.

## 4.2. Market Efficiency

As pointed out by McWilliams and Siegel (1997), one major underlying assumption concerning event studies is that markets are efficient. The efficient market hypothesis (EMH), summarized by Fama (1970), states that in an efficient market all available information is fully reflected in the security prices at any time.

There are three forms of market efficiency: weak form, semi-strong form and strong form. Weak form efficiency refers to markets where the share prices only reflect information about historical prices. In semi-strong efficient markets, all publicly available information is reflected in the share prices, while strong form efficiency refers to markets where both public and private information, such as insider information, is incorporated in the security prices.

## 4.3. Confounding Effects

Another critical assumption following from McWilliams and Siegel (1997) is that the effect from the event of interest is isolated from the effects of other events. There cannot be any other confounding effects influencing the event of interest during the event window. This refers to all news that could potentially have an impact on the stock price, such as dividend or earnings announcements, signing of a major contract, launching of a new product or changes of key executives. Including firms with such effects would indeed have the potential to cause biased results. It is more difficult to control for confounding effects in a longer event window, thus the assumption is more likely to hold when using a small event window.

## 4.4. Normal Performance

Before being able to measure the abnormal stock returns, we need a model to estimate normal performance. According to MacKinlay (1997) these models can be grouped into two categories; statistical and economic.

Statistical models rely on statistical assumptions about the behavior of stock returns, while economic models are based on assumptions regarding investors' behavior. The two most common statistical models are the constant mean return model and the market model. The constant mean return model, being perhaps the simplest model, assumes that the mean return for a given security is constant through time. The market model builds upon a linear relationship between the return for a security and the return from the market. A more thorough explanation of the market model will follow.

Regarding economic models, the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT) are commonly used, MacKinlay (1997). The CAPM is an equilibrium theory stating that the expected return for a given security is determined by the covariance between the market portfolio and the given asset, while the expected return for a given security in the APT is a linear combination of multiple risk factors.

### 4.4.1. The Market Model

The most commonly used model in event studies is the market model, considered an improvement over the constant mean return model, MacKinlay (1997). It is a single factor model and its linear specifications follows from the assumed joint normality of asset returns. The return

of any given asset is related to the return of the market portfolio. A detailed explanation of the estimation of the market model follows from McWilliams and Siegel (1997). It can be expresses as

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

$$E(\varepsilon_{it}) = 0 \quad and \quad var(\varepsilon_{it}) = \sigma_{\varepsilon_i}^2$$

where

$R_{it}$ = *the stock return of firm i at time t*

$\alpha_i$ = *the intercept term from the estimation period*

$\beta_i$ = *the correlation between the stock return and the market return for firm i during the estimation period*

$R_{mt}$ = *the market return at time t*

$\varepsilon_{it}$ = *the error term in the regression model for firm i at time t.*

From the above estimation, daily abnormal returns (AR) for firm *i* can be derived from the following equation:

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

where $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the estimated parameters from the regression of the market model using ordinary least squares (OLS) over the estimation window. Hence, the abnormal return for firm *i* is the difference between the actual return and the normal return predicted by the market model.

Under the null hypothesis, there will be a jointly normal distribution of the abnormal returns. They will have a zero conditional mean and a conditional variance equal to:

$$\sigma^2\left(\widehat{AR}_{it}\right) = \sigma_{\varepsilon_i}^2 + \frac{1}{L_1}\left[1 + \frac{(R_{mt} - \hat{\mu}_m)^2}{\hat{\sigma}_m^2}\right]$$

The first component of the variance term is the disturbance variance $\sigma_{\varepsilon_i}^2$ from the market model, while the second component is additional variance caused by the sampling error in the estimated parameters, $\hat{\alpha}_i$ and $\hat{\beta}_i$, from the market model. However, with a large estimation window, $L_1$, the

second term will approach zero and thus cancel out the sampling error. The variance of the abnormal return becomes

$$\sigma^2\left(\widehat{AR}_{it}\right) \approx \sigma_{\varepsilon_i}^2$$

which makes observations of abnormal return independent across time, MacKinlay (1997).

## 4.5. Aggregating Abnormal Returns

In order to draw overall inference on how the capital markets respond to the event of interest the abnormal returns can be aggregated across both time and securities. Hence, for a given sample of N securities, the estimated abnormal return $\widehat{AR}_{it}$ is aggregated for each day *t* within the event window to give us the average abnormal return (AAR), computed as

$$\widehat{AAR}_t = \frac{1}{N}\sum_{i=1}^{N} \widehat{AR}_{it}$$

Aggregation across time is done to obtain the cumulative abnormal return (CAR) for an individual security *i* within the event window [$T_1$, $T_2$], computed as

$$\widehat{CAR}_i(T_1, T_2) = \sum_{t=T_1}^{T_2} \widehat{AR}_{it}$$

Finally, the aggregation across both time and securities takes place to obtain the cumulative average abnormal return (CAAR) for all securities N across the event window, given by

$$\widehat{CAAR}(T_1, T_2) = \frac{1}{N}\sum_{i=1}^{N} \widehat{CAR}_i(T_1, T_2)$$

## 4.6. Testing for Significance

The next step involves testing for significance. First, we need to obtain the estimated variances. For large $L_1$, the variance of the average abnormal return is

$$var\left(\widehat{AAR}_t\right) = \frac{1}{N^2}\sum_{i=1}^{N} \sigma_{\varepsilon_i}^2$$

Further, the variance of the cumulative average abnormal is obtained by

$$var(\widehat{CAAR}(T_1, T_2)) = \sum_{t=T_1}^{T_2} var\left(\widehat{AAR_t}\right)$$

One can then draw inference about the cumulative abnormal return by assuming that

$$\widehat{CAAR}(T_1, T_2) \sim N[0, var(\widehat{CAAR}(T_1, T_2))]$$

to test the null hypothesis whether the abnormal returns are different from zero. Hence, the null hypothesis can be tested using the t-test suggested by MacKinlay (1997):

$$\theta_1 = \frac{\widehat{CAAR}(T_1, T_2)}{var(\widehat{CAAR}(T_1, T_2))^{1/2}} \sim N(0,1)$$

## 4.7. The Generalized Sign Test

The above test is a parametric test and the test statistic relies on the assumption of normally distributed abnormal returns. In order to trust the significance of the results for samples that are not normally distributed we also apply the Generalized Sign Test proposed by Cowan (1992). This non-parametric test examines whether the ratio of positive CARs in the event window exceeds the ratio that is expected, and does rely on any normality assumptions. The expected ratio is based on the ratio of positive abnormal returns in the estimation window, calculated as

$$\hat{p} = \frac{1}{n}\sum_{i=1}^{n}\frac{1}{L_1}\sum_{t=T_1}^{T_2} S_{it}$$

where

$$S_{it} = \begin{cases} 1 \; if \; AR_{it} > 0 \\ 0 \; otherwise \end{cases}$$

Defining *w* as the number of stocks for which the CAR is positive in the event window, the generalized sign test statistic is

$$Z_G = \frac{w - n\hat{p}}{\sqrt{n\hat{p}(1-\hat{p})}}$$

## 4.8. Regression Analysis

In an event study, the CAAR tells us whether there is an overall relationship between the event of interest and stock return of the sample as a whole. However, it does not tell us anything about the variation in the CAR among the different sample firms. Extending the analysis to a cross-sectional analysis including multiple regression with firm specific variables will allow us to do this, using CAR from the event window as the dependent variable.

We approach this by using weighted least squares (WLS) regressions, where the weight is the standard deviation of the residual from the market model. Because the market model used to estimate normal returns differs in explanatory power for each firm, the precision of the expected return during the event window will also vary. This implies that there is given more weight to more precise abnormal return estimates in the regressions, which is in line with the approach used by Fisher-Vanden and Thorburn (2011).

In order to obtain the best linear unbiased estimators from a cross-sectional regression a number of assumptions need to satisfied, Wooldridge (2014):

1. The model is linear in parameters and can be written as
$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k + u$$
where *u* is an unobserved disturbance term.
2. The sample is random with *n* observations.
3. No perfect collinearity. None of the independent variables is constant, and there are no exact linear relationship between any of the independent variables.
4. Zero conditional mean. The expected value of the disturbance term *u* is zero given any values of the independent variables:
$$E(u|x_1, x_2, \ldots, x_k) = 0$$
5. Homoskedasticity. The error term *u* has constant variance:
$$Var(u|x_1, x_2, \ldots, x_k) = \sigma^2$$
6. Normality. The error term *u* is independent of the explanatory variables and normally distributed with zero mean and variance $\sigma^2$: $u \sim Normal(0, \sigma^2)$.

In order to test for collinearity among the independent variables we look at the variance inflation factor (VIF). Wooldridge (2014) points to a common rule of thumb, saying that if the VIF is

above 10 then multicollinearity is a problem. To test for heteroskedasticity we employ the Breusch-Pagan Test, where the null hypothesis states that there is no heteroskedasticity. The normality assumption is tested with the Shapiro-Wilk W test for normal data.

# 5. Data

The following chapter presents our dataset and the sample selection.

## 5.1. ISO 14001

The ISO 14001 standard, or Environmental Management Systems – Specification With Guidance For Use, which is the formal name, is one of several different standards from the International Organization for Standardization (ISO) and one of several standards within the ISO 14000 series. All standards in the ISO 14000 series are related to environmental management and aims to provide tools for firms and organizations that want to manage their influence on the environment. The ISO 14001 standard was introduced in 1996 and has since then given firms guidelines for implementing environmental management systems or to improve existing ones.

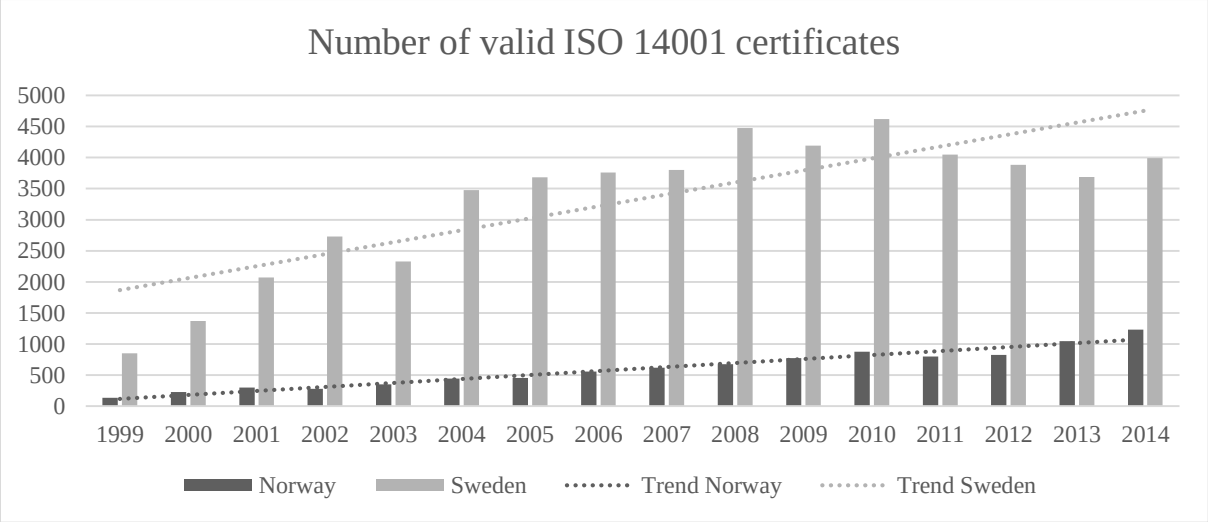


***Figure 2*** *– Number of ISO14001 certificates per country*

One of the reasons to why the ISO 14000 series was introduced was the fact that different EMSs already existed, and due to different ways of structuring the EMSs there was no easy way of comparing the environmental effects of the firms. By introducing a global standard, this was no longer a problem as long as the firms complied with it.

The firms are not certified by ISO itself, but by third-party organizations. These third-party organizations also conduct revisions of the firms' certifications as to secure the continued quality of the standard and to monitor that the firms' own environmental objectives are being met. The

standard in itself is reviewed every five years by ISO in order to keep it relevant for the market place and to maintain the compatibility with other ISO standards.

We chose the ISO 14001 standard because it is one of the most recognized standards when it comes to environmental initiatives and because it is increasingly adopted both in Norway and Sweden.

## 5.2. Sample Selection

The sample used in this study contains of 28 firms that obtained an ISO 14001 certification in the period 1999-2014. All firms are listed on either the Oslo Stock Exchange (Oslo Børs, OSEBX) or the Stockholm Stock Exchange (Stockholmsbörsen, OMX Stockholm). Initially, we started with 22 Norwegian firms and 26 Swedish firms, for a total of 48 firms.

The certification dates were obtained by finding the certificates for each firm. We searched through publicly available databases such as Kvalex.no and Certifiering.nu. Some of the firms had copies of the certificates published on their web sites and the rest provided certificates upon request. It was imperative to locate the certificates to specify the certification dates as accurate as possible. We eliminated four Swedish firms due to difficulties obtaining the certification date.

Then a thorough search for news about each company was conducted to rule out effects from confounding events. Newsweb from Oslo Børs and NASDAQ OMX Nordic's company news archive was used to find news published on the respective exchanges, while Google and Yahoo Finance was used to find other possible events for each of the 44 remaining firms in the two days prior and after the certification date. Four Norwegian and four Swedish firms were excluded from the sample due to news and events that occurred within the event window for each firm.

Further two firms were left out due to certificates that was valid only for subsidiaries. We do not include firms in the sample who are only certified for parts of its operations, as this is not a big enough commitment on the firms' behalf. This left us with 34 firms before we could gather stock data from Thomson Reuters Datastream, available from the library of the University of Stavanger. Of the 34 firms, six firms were omitted due to either lack of data in Datastream or lack of trading days in the event window, leaving us with our final sample of 28 firms.

## 5.3. Descriptive Statistics

Table 1 presents financial characteristics of the sample firms. We first notice that the Swedish firms in the sample are substantially larger compared to Norwegian firms in terms of market value of equity (MVE). The average MVE of Swedish firms are NOK 21,5 billion (median NOK 1,2 billion) while for Norwegian firms it is no more than NOK 3,2 billion (median NOK 1,6 billion). When looking at total sales we see that Swedish firms, on average, earn revenue of NOK 30,3 million (median NOK 2,5 million) compared to NOK 3,9 million (median NOK 1,1 million) for Norwegian firms. The same pattern continues as price-to-book ratio is also higher for Swedish firms with an average of 2,33 (median 1,6), which implies that these firms have higher growth options than the Norwegian firms whose average ratio is 2.

| | Whole sample | Norway | Sweden |
|---|---|---|---|
| ***Number of firms*** | 28 | 12 | 16 |
| ***Market value of equity (MVE, NOK billion)*** | | | |
| Mean MVE | 13,7 | 3,2 | 21,5 |
| Median MVE | 1,6 | 1,6 | 1,2 |
| ***Total sales (NOK million)*** | | | |
| Mean sales | 19 | 3,9 | 30,3 |
| Median sales | 1,6 | 1,1 | 2,5 |
| ***Price-to-book (PB) ratio*** | | | |
| Mean PB | 2,19 | 2,0 | 2,33 |
| Median PB | 1,5 | 1,36 | 1,6 |
| ***Book Value (BV, NOK billion)*** | | | |
| Mean BV | 8,3 | 2,2 | 13 |
| Median BV | 1,2 | 1,2 | 1,3 |
| ***Fraction of sample firms in the industry of*** | | | |
| Energy | 0,14 | 0,33 | |
| Information technology | 0,32 | 0,42 | 0,25 |
| Industrials | 0,21 | | 0,38 |
| Healthcare | 0,07 | | 0,13 |
| Materials | 0,11 | 0,17 | 0,06 |
| Consumer discretionary | 0,07 | | 0,13 |
| Financials | 0,04 | | 0,06 |
| Consumer staples | 0,04 | 0,08 | |

***Table 4*** *- Characteristics of the sample firms.*

When the final financial variable, book value (BV), is taken into account, with Swedish firms having an average BV of NOK 13 billion (median NOK 1,3 billion) compared to Norwegian firms with NOK 2,2 billion (median NOK 1,2 billion), it becomes evident that the Swedish firms on average are considerably larger firms. Looking at the median values, however, they show that the firms in the two countries are more similar in terms of size. The reason to the different results are a couple of Swedish firms who have, in the most extreme case, over 16 times higher MV than the largest Norwegian firm. The same goes for total sales and book value where the biggest Swedish firm is six and ten times as big the biggest Norwegian firm respectively.

## 5.4. Event Study Approach

In our approach to the event study, we have decided to use the market model. As index for the Norwegian firms, we use the Oslo Børs All Share Index (OSEAX), and for the Swedish firms we use the Stockholm All Share Index (SWSEALI). Both indexes were collected from Datastream. We have chosen a 250 days estimation window, which is approximately one trading year, ranging from $T_0$ = -253 to $T_1$ = -3. We have also chosen to analyze three different event windows. The longest event window being [-2, 2], a medium event window [-1, 1] and a short event window [0, 1]. This allows us to some extent to control for information leakage and a delayed response in the stock market. The estimation window and the event windows are in line with procedure of Fisher-Vanden and Thorburn (2011).

## 5.5. Sample Issues

The test proposed by MacKinlay (1997) in the methodology section relies upon the assumption of normally distributed stock returns. This is usually not a problem for large samples, but one needs to careful when doing event studies with a sample of less than 30 observations, McWilliams and Siegel (1997). In order to determine the normality of the distribution of CAR we apply the Shapiro-Wilk W test for normal data and the Skewness and Kurtosis test for normality. In both these tests, the null hypothesis states that the data is normally distributed. The results from the tests are presented in table 2.

| | | | Shapiro-Wilk W test for normal data | Skewness Kurtosis test for normality | | |
|---|---|---|---|---|---|---|
| *Sample* | *Event window* | *Observations* | *W* | *Skewness* | *Kurtosis* | *chi^2* |
| ***Whole sample*** | | | | | | |
| | [-2, 2] | 28 | 0.968 | 0.601 | 3.766 | 4.18 |
| | [-1, 1] | 28 | 0.924** | 0.984 | 3.893 | 6.61** |
| | [0, 1] | 28 | 0.952 | 0.781 | 3.615 | 4.90* |
| ***Sweden*** | | | | | | |
| | [-2, 2] | 16 | 0.985 | 0.086 | 2.805 | 0.22 |
| | [-1, 1] | 16 | 0.979 | 0.017 | 2.077 | 0.59 |
| | [0, 1] | 16 | 0.969 | -0.006 | 2.218 | 0.22 |
| ***Norway*** | | | | | | |
| | [-2, 2] | 12 | 0.907 | 1.0967 | 4.409 | 6.63** |
| | [-1, 1] | 12 | 0.872* | 0.983 | 2.903 | 3.96 |
| | [0, 1] | 12 | 0.808** | 1.716 | 5.871 | 11.33*** |

*** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

***Table 5*** *– Tests for normal distribution*

As we can see the normality assumption holds only for the event window [-2, 2] for the whole sample, and for the subsample of Swedish firms for all event windows. With this in mind, we cannot solely rely on the test statistic from the T-test, but we also need to consider the Generalized Sign Test when we interpret the significance of our results.

## 5.6. Variables in Cross-Sectional Analysis

In determining which explanatory variables to include in our cross-sectional analysis, we look to previous studies. We include a dummy variable for Swedish firms to further investigate if there is a difference in the CAR between Swedish and Norwegian firms. This variable takes the value of one if the firm is Swedish and zero if the company is Norwegian.

We include the market value of equity and total sales in order to see if the size of the firm can explain some of the variance in the abnormal returns. This "size effect", explored by Banz (1981), states that smaller firms, on average, tend to have higher risk adjusted returns than larger firms. We use the firms' market value at the event date measured in NOK billion, and total sales at the end of the certification year, measured in NOK million.

Further, we include the price-to-book (P/B) ratio. Fama and French (1995) find that firms with high price-to-book ratio experience higher returns than firms with low price-to-book ratio. In line with Fisher-Vanden and Thorburn (2011) we also include the price of crude oil. The argument being that firms that are environmentally friendly tend to benefit when the oil price is high, and firms that rely heavily on fossil fuel tend to suffer.

The correlation between the explanatory variables appears in table 3. There is low correlation among the variables, except for market value and total sales that show a 71 percent correlation.

| **Correlation matrix** | | | | |
|---|---|---|---|---|
| | *Market value* | *Total sales* | *PB-ratio* | *Oil price* |
| *Market value* | 1 | | | |
| *Total sales* | 0.7143 | 1 | | |
| *PB-ratio* | -0.0581 | -0.0912 | 1 | |
| *Oil price* | -0.0824 | 0.047 | 0.2122 | 1 |

***Table 6*** *- Correlation matrix*

Further, the variance inflation factor (VIF), and tests for normality and heteroskedasticity are shown in table 4. While a 71 percent correlation between two variables could seem somewhat problematic, the low VIF suggests otherwise.

| **Variance Inflation Factor** | | | | | |
|---|---|---|---|---|---|
| Variable | *Market value* | *Total sales* | *PB-ratio* | *Sweden dummy* | *Oil price* |
| VIF | 2.51 | 2.74 | 1.04 | 1.17 | 1.04 |

| **Shapiro-Wilk W test for normal data** | | | | | |
|---|---|---|---|---|---|
| *Regression* | N | W | V | z | P-value |
| *(1)* | 28 | 0.960 | 1.211 | 0.394 | 0.347 |
| *(2)* | 28 | 0.982 | 0.539 | -1.272 | 0.898 |
| *(3)* | 28 | 0.969 | 0.947 | -0.111 | 0.544 |

| **Breusch-Pagan test for heteroskedasticity** | | |
|---|---|---|
| *Regression* | Chi^2 | P-value |
| *(1)* | 3.18 | 0.6723 |
| *(2)* | 3.94 | 0.5582 |
| *(3)* | 8.08 | 0.1517 |

***Table 7*** *- Tests for WLS assumptions*

As we can see, all the WLS-assumptions seems to hold, and we can proceed with the analysis without doing any adjustments to our dataset.

# 6. Results

In this section we present the results of our study. We first present the results from the overall analysis and then the results from the cross-sectional analysis. Furthermore, we provide descriptive case-by-case analysis for our individually significant sample firms.

## 6.1. Results from Overall Analysis

The results from the overall analysis are presented in table 5.

| | **Whole sample** | **Sweden** | **Norway** |
|---|---|---|---|
| ***Event window [-2, 2]*** | | | |
| N | 28 | 16 | 12 |
| CAAR (%) | -0.274 | 0.158 | -0.850 |
| T-value | -0.359 | 0.249 | -0.542 |
| Positive/negative ratio | 11/17 | 7/9 | 4/8 |
| COWAN-Z | -1.088 | -0.465 | -1.125 |
| | | | |
| ***Event window [-1, 1]*** | | | |
| N | 28 | 16 | 12 |
| CAAR (%) | 0.281 | -0.027 | 0.693 |
| T-value | 0.547 | -0.059 | 0.673 |
| Positive/negative ratio | 15/13 | 8/8 | 7/5 |
| COWAN-Z | 0.424 | 0.035 | 0.608 |
| | | | |
| ***Event window [0, 1]*** | | | |
| N | 28 | 16 | 12 |
| CAAR (%) | -0.427 | -0.297 | -0.600 |
| T-value | -1.256 | -0.710 | -1.065 |
| Positive/negative ratio | 10/18 | 6/10 | 3/9 |
| COWAN-Z | -1.466 | -0.965 | -1.702 |

*** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10

***Table 8*** *- Results from overall analysis.*

For the longest event window [-2, 2] we experience an overall negative CAAR of -0.274 percent. The ratio also show a majority of negative announcement CARs. The results are made up of a small positive CAAR for the Swedish companies, while there is a relatively large negative CAAR for the Norwegian companies. However, the results prove not to be significant, neither for the overall CAAR nor for the ratio.

The results seem to be a bit contrary when we look at the medium length event window [-1, 1]. Here we find a positive overall CAAR of 0.281 percent for the whole sample, while there is small negative CAAR for the Swedish sample and a positive CAAR of 0.693 percent for the Norwegian sample. The ratio also shows a slight majority of positive announcement CARs. Again, the results prove not to be significant.

Looking at the shortest event window [0, 1] we find a negative CAAR for the whole sample as well as for Sweden and Norway. There is also a vast majority of negative announcement CARs. Although the critical values of the T-test and the Generalized Sign Test are higher than for the other event windows, the results are not significant even at a 10 percent level. In light of these results, we cannot reject the null hypothesis of zero abnormal return for any of the event windows.

## 6.2. Results from the Cross-Sectional Analysis

Results from the WLS regressions are listed in table 6. Regression (1) uses the CAR from the short event window [0, 1], regression (2) uses the CAR from the medium length event window [-1, 1] and regression (3) uses the CAR from the longest event window [-2, 2].

| | **Weighted Least Squares Regression** | | |
|---|---|---|---|
| *Independent variables* | *(1)* | *(2)* | *(3)* |
| Market value | 0.1346 (0.197) | 0.1419 (0.379) | 0.1764 (0.402) |
| Total sales | 0.0219 (0.864) | 0.0337 (0.866) | -0.0471 (0.857) |
| Price-to-Book | 0.0018 (0.310) | 0.0028 (0.307) | 0.0087** (0.023) |
| Sweden dummy | 0.0003 (0.954) | -0.0156* (0.091) | 0.0095 (0.419) |
| Crude oil price | 0.0000 (0.491) | 0.0005*** (0.005) | 0.0003 (0.111) |
| Intercept | 0.0139* (0.065) | -0.0222** (0.060) | -0.0509*** (0.002) |
| F-value of the model | 1.31 | 2.89** | 2.49** |
| Adjusted R-squared | 0.0541 | 0.2598 | 0.2166 |
| Number of cases, N | 28 | 28 | 28 |

*** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10. P-values in parenthesis.

***Table 9*** *- Results from WLS-regressions.*

In the second regression, the cumulative abnormal returns significantly increases with the crude oil price. This suggests that investors tend to value environmentally responsible firms more when the price of oil is high, which seems logical in the sense that firms that rely heavily on fossil fuels would see their costs significantly increase with a higher oil price. The coefficient of the

Sweden dummy is negative and statistically significant at a 10 percent level, suggesting that the announcement returns is significantly lower for Swedish firms than for Norwegian firms.

Looking at the third regression, we obtain a significant positive coefficient of the price-to-book ratio. This suggests that the announcement returns is higher for firms with a higher price-to-book ratio, generally viewed as growth firms. This contradicts with the results from Fisher-Vanden and Thorburn (2011) where firms with higher market-to-book ratio experienced a larger decline in their stock price.

Market value and total sales however, prove not to be significant in any of the regressions. Even when we rerun the regressions, excluding either one of the two variables, neither turn out to be significant. The size of the firm does not seem to influence the announcement returns.

## 6.3. Discussion of results

In the longest event window, we see that the Norwegian firms experience negative CAAR while Swedish firms experience positive CAAR. Although these results are statistically insignificant, they still point in the same direction as the findings of Cañón-de-Francia and Garcés-Ayerbe (2009) and Paulraj and de Jong (2011) in the respect that only smaller firms tend to experience negative effects from ISO 14001 certification. This, however, do not explain the opposite results for the medium and short event windows, which basically confirms the statistical insignificance of our results. The cross-sectional analysis also finds support that firm size does not matter.

The most straightforward explanation to these results is that there simply is no relationship between the environmental initiative of ISO 14001 certifications and firms' financial performance. Different interpretations of the results arise as to which assumptions we base our discussion on. Within efficient markets, we suggest that investors do not see any extra value added from the certification nor any significant costs. They have no interest in the announcement of firms ISO 14001 certification since firm managers will only initiate environmental policies that meet the profit criteria and they cannot generate residual returns since efficient markets are by definition unbeatable. Then, when looking at imperfect markets, the managers will initiate environmental policies that both meet and do not meet the profit criterion as a result of imperfect information. Due to our results, we suggest that the policies that meet the profit criteria

effectively cancel out the effects of the policies that do not meet the profit criteria, leaving no overall effect in total.

An alternative explanation is that investors cannot differentiate the policies from being a type 1 or type 2 policy. Some investors interpret the certification as a project that meets the profit criteria and some do not. For this reason, there will be competing forces in the stock price movements that ultimately yields no overall effects.

There is also the possibility of there being overall effects that we could not find in our study. We make the assumption that information is not publicly available before the event date, but we can never totally ignore the possibility of information leakage and/or the possibility that the event dates we use are not the exact date of information disclosure.

# 7. Signaling with Green Bonds

During the recent years, there have been a rapid growth within the issuance of green bonds. A green bond is a financial instrument with the same characteristics as a traditional bond, except that green bonds serve the purpose of funding environmentally friendly projects. The World Bank defines a green bond as "a debt security that is issued to raise capital specifically to support climate related or environmental projects", The World Bank (2015, p. 23). In 2007, the European Investment Bank (EIB) issued the first green bond. Since then, the market for green bonds has grown to a multibillion-dollar market, with about 134 billion USD in total issuance as of June 2016.

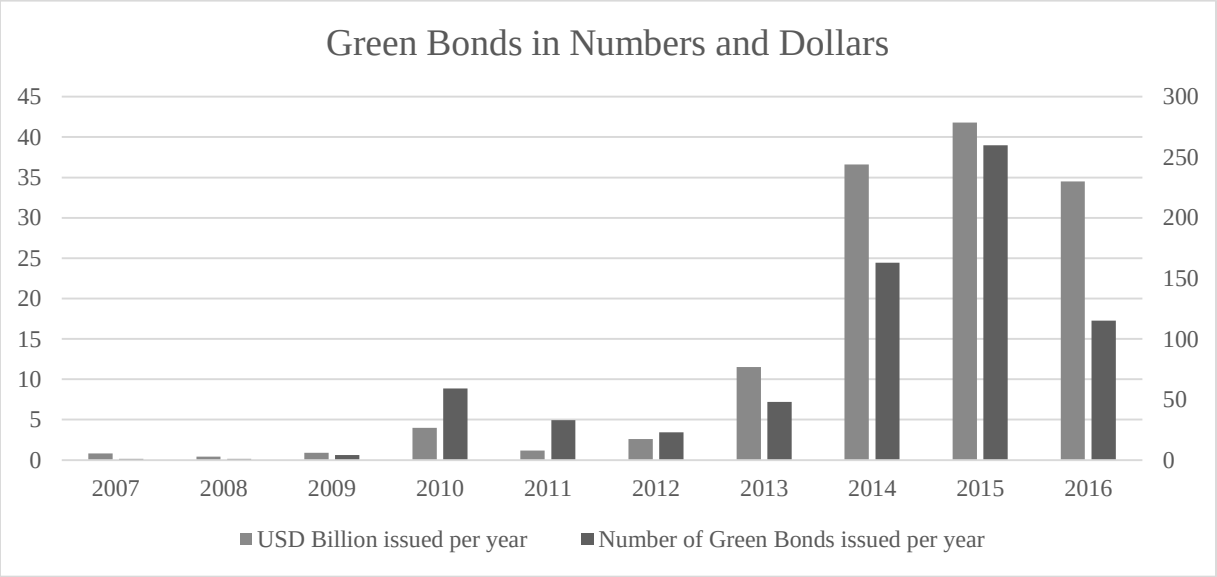


***Figure 3*** *- Number of green bonds and amount issued as of 24.06.2016*

While it was primarily governments, municipals and development banks issuing green bond the first years, corporate institutions have come along. There is no established or mandatory criteria that labels a bond green, but industry participants have developed a set of voluntary guidelines, namely The Green Bond Principles (GBP). The GBP is made up of four core elements, ICMA (2016):

1. Use of Proceeds
2. Process for Project Evaluation and Selection
3. Management of Proceeds
4. Reporting

The utilization of the proceeds of the bond for climate friendly projects should be described in the legal documentation for the security, and all projects should provide clear environmental benefits. The issuer should emphasize a process to determine how the projects fit within specified green categories. Issuers should keep up to date information on the use of proceeds. This information should be renewed annually until the allocation is complete. The GBP also recommend that issuers get an external review to ensure that the guidelines are being met.

While there have been no previous studies concerning the relationship between the issuance of green bonds and firm value, the theoretical background and the literature review in chapter 2 and 3 still applies. Trying to put a label on the issuance of green bonds within the category of environmental management or performance variables would be rather ambiguous. However, green bonds could be viewed as a strong environmental signal which allows the firm to reach different investors and further strengthen their environmental credibility, The World Bank (2015). Within the framework of Prakash (2000), the issuance of a green bond could be seen as a Type 1 policy, as firms would not fund environmentally friendly projects unless they ought to make a profit. We argue that it is fair to believe that a firm issuing a green bond sends a stronger environmental signal to market than the adoption of an ISO 14001 certification.

## 7.1. Methodology and Data

We employ the event study methodology as described in chapter 4. We have decided to analyze European firms that have issued green bonds. From Climate Bonds Initiative we identify 16 European publicly traded firms who have issued green bonds in the period from 2013 to 2015. When a firm have issued more than one green bond, we use the first green bond as we believe this would send the strongest signal to the market and thus experience a stronger stock market reaction than a second or third bond issuance. The event date used is the issuing date of the bond. Again, we use a 250 days estimation window and three different event windows, [-2, 2], [-1, 1] and [0, 1]. In the estimation of the market model, we use ten different market indexes, as we have data on companies listed on ten different stock exchanges. The indexes used are listed in the appendix. Index and stock data are collected from Datastream.

Descriptive statistics of the sample firms are found in table 7. The sample contains of relatively large firms, with a mean market value of 241,2 NOK billion and mean total sales of 276,9 NOK million.

| | Whole sample |
|---|---|
| ***Number of firms*** | 16 |
| ***Market value of equity (MVE, NOK billion)*** | |
| Mean MVE | 241.2 |
| Median MVE | 145.9 |
| ***Total sales (NOK million)*** | |
| Mean sales | 276.9 |
| Median sales | 118.5 |
| ***Price-to-book (PB) ratio*** | |
| Mean PB | 1.79 |
| Median PB | 1.15 |

***Table 10*** *- Descriptive statistics of green bonds sample*

As with our first dataset, we need to test the distribution of CAR for normality. The results appear in table 8. The normality assumption holds for the longest event window, but the two shorter event windows show evidence of non-normality, which again mean that we cannot fully trust the T-test, but also need to consider the Generalized Sign Test when interpreting the significance of our results.

| | | | **Shapiro-Wilk W test for normal data** | **Skewness Kurtosis test for normality** | | |
|---|---|---|---|---|---|---|
| *Sample* | *Event window* | *Observations* | *W* | *Skewness* | *Kurtosis* | *chi^2* |
| ***Whole sample*** | | | | | | |
| | [-2, 2] | 16 | 0.978 | 0.202 | 2.309 | 0.27 |
| | [-1, 1] | 16 | 0.903* | -0.673 | 4.305 | 4.97* |
| | [0, 1] | 16 | 0.836*** | 0.983 | 2.557 | 3.98 |

* p-value < 0.10; ** p-value < 0.05; *** p-value < 0.01

***Table 11*** *- Normality tests for green bonds sample*

## 7.2. Results and Discussion

The results from our analysis appear in table 9. We find a positive cumulative average abnormal return for the longest event window, while the CAAR is negative for the medium and short event window. However, the results prove not to be significant.

| | Event window [-2, 2] | Event window [-1, 1] | Event window [0, 1] |
|---|---|---|---|
| N | 16 | 16 | 16 |
| CAAR (%) | 0.223 | -0.003 | -0.057 |
| T-value | 0.403 | -0.007 | -0.173 |
| Positive/negative ratio | 9/7 | 6/10 | 5/11 |
| COWAN-Z | 0.343 | -1.158 | -1.659 |

* p-value < 0.10; ** p-value < 0.05; *** p-value < 0.01

***Table 12*** *- Results from green bonds sample*

In the two shorter event windows, there is a predominant ratio of negative announcement returns, but the COWAN-Z statistic suggest that neither the ratio is significant. In light of the results, we cannot reject the null hypothesis of zero abnormal return.

The most obvious reason to why there is no casual effect is that investors do not value the issuance of a green bond to be either positive or negative for the firm. Another explanation could be the case of information leakage. As there are several parties involved when issuing a bond, the risk for information leakage increases. The use of issuing date as the event date might also be problematic, as there might be some cases where the issuing and announcement date does not match.

# 8. Conclusion

The last decades have seen a number of studies attempting to conclude whether or not there is a connection between environmental and financial performance. Several different approaches and methodologies have been used to investigate the relationship, but no broad consensus has been reached. We conduct our study on Norwegian and Swedish firms as there is little or no research on the topic for Nordic countries. In that manner, we have tried to contribute to the literature by taking the well known methodology of the event study, and applying it to a sample consisting of firms that are not often studied in the context of this topic. By conducting an event study, we look at specific events and analyze the stock market reaction by calculating cumulative abnormal returns. Overall, we find no significant effects for the firms in our sample, which implies either that investors do not care about the certification, or that the lack of consensus between investors create opposite movements in stock prices that evens out the overall effects. In the cross-sectional analysis we find that Swedish firms experience significantly lower returns in the medium event window compared to Norwegian firms when announcing ISO 14001 certifications. Further, when looking at oil price, we see that investors tend to value environmentally friendly firms more when the price of crude oil is high. From our analysis of firms issuing green bonds, we conclude that investors neither value nor punish these firms.

## 8.1. Limitations, Implications and Further Research

This study's main limitation is the generalizability of the results due to a rather small sample. We have, however, conducted separate tests to secure the robustness of our results in order to secure the validity of our study. It would also have been ideal for us to include more variables in our cross-sectional analysis, e.g. CO2-emissions, in order to obtain a more thorough investigation of the variation in the announcement CARs. Unfortunately, we could only obtain this kind of data for six of our sample firms, which would serve little purpose.

According to our results, managers who seek to maximize shareholder wealth do not gain any beneficial advantages by certifying their firms to the ISO 14001 standard. This conclusion is both supported and in direct conflict with previous literature, but as these previous studies do not look at Norwegian and Swedish firms, we would like to see future studies on Nordic countries with larger sample sizes. While our study looks at the relationship between environmental and

financial performance in the very short run, future research could focus on the long run relationship, using different economic variables.

# References


Aarts, Frank Martin, and Ed Vos. 2001. 'The impact of ISO registration on New Zealand firms' performance: a financial perspective', *The TQM Magazine*, 13: 180-91.

Ambec, Stefan, and Paul Lanoie. 2008. 'Does it pay to be green?: a systematic overview.(Report)', *The Academy of Management Perspectives*, 22: 45.

Aupperle, Kenneth E., Archie B. Carroll, and John D. Hatfield. 1985. 'An Empirical Examination of the Relationship between Corporate Social Responsibility and Profitability', *The Academy of Management Journal*, 28: 446-63.

Bansal, Pratima, and Trevor Hunter. 2003. 'Strategic Explanations for the Early Adoption of ISO 14001', *Journal of Business Ethics*, 46: 289-99.

Banz, Rolf W. 1981. 'The relationship between return and market value of common stocks', *Journal of Financial Economics*, 9: 3-18.

Cañón-de-Francia, Joaquín, and Concepción Garcés-Ayerbe. 2009. 'ISO 14001 Environmental Certification: A Sign Valued by the Market?', *The Official Journal of the European Association of Environmental and Resource Economists*, 44: 245-62.

Chatterji, Aaron K., David I. Levine, and Michael W. Toffel. 2009. 'How Well Do Social Ratings Actually Measure Corporate Social Responsibility?', *Journal of Economics & Management Strategy*, 18: 125-69.

Cohen, M. A., S. A. Fenn, and S Konar. 1997. 'Environmental and Financial Performance: Are They Related?', *Working Paper Vanderbilt University*: 1-40.

Cordeiro, J. J., and J. Sarkis. 1997. 'Environmental proactivism and firm performance: evidence from security analyst earnings forecasts', *Business Strategy and the Environment*, 6: 104-14.

Cormier, Denis, Michel Magnan, and Bernard Morard. 1993. 'The impact of corporate pollution on market valuation: some empirical evidence', *Ecological Economics*, 8: 135-55.

Cowan, Arnold. 1992. 'Nonparametric event study tests', *Review of Quantitative Finance and Accounting*, 2: 343-58.

Derwall, Jeroen, Nadja Guenster, Rob Bauer, and Kees Koedijk. 2005. 'The eco-efficiency premium puzzle.(Author Abstract)', *Financial Analysts Journal*, 61: 51.

Fama, Eugene F. 1970. 'EFFICIENT CAPITAL MARKETS: A REVIEW OF THEORY AND EMPIRICAL WORK', *Journal of Finance*, 25: 383-417.

Fama, Eugene F., Lawrence Fisher, Michael C. Jensen, and Richard Roll. 1969. 'The Adjustment of Stock Prices to New Information', *International Economic Review*, 10: 1-21.

Fama, Eugene F., and Kenneth R. French. 1995. 'Size and Book-to-Market Factors in Earnings and Returns', *The Journal of Finance*, 50: 131-55.

Ferron, Renato Tognere, Bruno Funchal, Valcemiro Nossa, and Aridelmo J. C. Teixeira. 2012. 'Is ISO 14001 certification effective?: an experimental analysis of firm profitability', *BAR - Brazilian Administration Review*, 9: 78-94.

Fisher-Vanden, Karen, and Karin S. Thorburn. 2011. 'Voluntary corporate environmental initiatives and shareholder wealth', *Journal of Environmental Economics and Management*, 62: 430-45.

Friedman, M. 1970. 'A Friedman doctrine--: The Social Responsibility Of Business Is to Increase Its Profits A Friedman business doctrine.', *The New York Times Magazine.*

Gilley, K. Matthew, Dan L. Worrell, Wallace N. Davidson, and Abuzar El–Jelly. 2000. 'Corporate environmental initiatives and anticipated firm performance: the differential effects of process-driven versus product-driven greening initiatives', *Journal of Management*, 26: 1199-216.

Griffin, Jennifer J., and John F. Mahon. 1997. 'The corporate social performance and corporate financial performance debate: Twenty-five years of incomparable research', *Business and Society*, 36: 5-31.

Guenster, Nadja, Rob Bauer, Jeroen Derwall, and Kees Koedijk. 2011. 'The Economic Value of Corporate Eco-Efficiency', *European Financial Management*, 17: 679-704.

Hamilton, James T. 1995. 'Pollution as News: Media and Stock Market Reactions to the Toxics Release Inventory Data', *Journal of Environmental Economics and Management*, 28: 98-113.

Hart, Sl. 1995. "A NATURAL-RESOURCE-BASED VIEW OF THE FIRM." In *Acad. Manage. Rev.*, 986-1014.

Hart, Stuart L., and Gautam Ahuja. 1996. 'Does it pay to be green? An empirical examination of the relationship between emission reduction and firm performance', *Business Strategy and the Environment*, 5: 30-37.

ICMA. 2016. "Green Bond Principles." In.

Jacobs, Brian W., Vinod R. Singhal, and Ravi Subramanian. 2010. 'An empirical investigation of environmental performance and the market value of the firm', *Journal of Operations Management*, 28: 430-41.

José, F. Molina-Azorín, Claver-Cortés Enrique, D. López-Gamero Maria, and J. Tarí Juan. 2009. 'Green management and financial performance: a literature review', *Management Decision*, 47: 1080-100.

King, Andrew A., and Michael J. Lenox. 2001. 'Does It Really Pay to Be Green? An Empirical Study of Firm Environmental and Financial Performance: An Empirical Study of Firm Environmental and Financial Performance', *Journal of Industrial Ecology*, 5: 105-16.

Klassen, Robert D., and Curtis P. McLaughlin. 1996. 'The Impact of Environmental Management on Firm Performance', *Management Science*, 42: 1199-214.

Konar, Shameek, and Mark A. Cohen. 2001. 'Does the Market Value Environmental Performance?', *Review of Economics and Statistics*, 83: 281-89.

Lee, Min-dong Paul. 2008. 'A review of the theories of corporate social responsibility: Its evolutionary path and the road ahead', *International Journal of Management Reviews*, 10: 53-73.

MacKinlay, A. 1997. 'Event studies in economics and finance', *Journal of Economic Literature*, 35: 13-39.

McWilliams, Abagail, and Donald Siegel. 1997. 'Event Studies in Management Research: Theoretical and Empirical Issues', *The Academy of Management Journal*, 40: 626-57.

Mollet, Janick Christian, and Andreas Ziegler. 2014. 'Socially responsible investing and stock performance: New empirical evidence for the US and European stock markets', *Review of Financial Economics*, 23: 208-16.

Montabon, Frank, Steven A. Melnyk, Robert Sroufe, and Roger J. Calantone. 2000. 'ISO 14000: Assessing Its Perceived Impact on Corporate Performance', *Journal of Supply Chain Management*, 36: 4-16.

Morrow, David, and Dennis Rondinelli. 2002. 'Adopting Corporate Environmental Management Systems:: Motivations and Results of ISO 14001 and EMAS Certification', *European Management Journal*, 20: 159-71.

Murguia, Juan, and Sergio Lence. 2015. 'Investors' Reaction to Environmental Performance: A Global Perspective of the Newsweek 's "Green Rankings"', *The Official Journal of the European Association of Environmental and Resource Economists*, 60: 583-605.

Nakamura, Eri. 2011. 'Does environmental investment really contribute to firm performance?', *Eurasian Business Review*, 1: 91-111.

Nakao, Yuriko, Akihiro Amano, Kanichiro Matsumura, Kiminori Genba, and Makiko Nakano. 2007. 'Relationship between environmental performance and financial performance: an empirical analysis of japanese corporations', *Business Strategy and the Environment*, 16: 106-18.

Oberndorfer, Ulrich, Peter Schmidt, Marcus Wagner, and Andreas Ziegler. 2013. 'Does the stock market value the inclusion in a sustainability stock index? An event study analysis for German firms', *Journal of Environmental Economics and Management*, 66: 497-509.

Paulraj, Antony , and Pieter de Jong. 2011. 'The effect of ISO 14001 certification announcements on stock performance', *International Journal of Operations & Production Management*, 31: 765-88.

Porter, Michael E., and Claas van der Linde. 1995. 'Toward a New Conception of the Environment-Competitiveness Relationship', *Journal of Economic Perspectives*, 9: 97-118.

Prakash, Aseem. 2000. *Greening the Firm : The Politics of Corporate Environmentalism* (Cambridge : Cambridge University Press: Cambridge).

Russo, Michael V., and Paul A. Fouts. 1997. 'A resource-based perspective on corporate environmental performance and profitability.', *Academy of Management Journal*, 40: 534.

Shane, P. B., and B. H. Spicer. 1983. 'Market Response to Environmental Information Produced Outside the Firm', *Accounting Review*, 58: 521-36.

Strong, Norman. 1992. 'MODELLING ABNORMAL RETURNS: A REVIEW ARTICLE', *Journal of Business Finance & Accounting*, 19: 533-53.

Telle, Kjetil. 2006. '"It Pays to be Green" – A Premature Conclusion?', *Environmental and Resource Economics*, 35: 195-220.

The World Bank. 2015. "What Are Green Bonds?" In.

Wagner, Marcus, Nguyen Van Phu, Théophile Azomahou, and Walter Wehrmeyer. 2002. 'The relationship between the environmental and economic performance of firms: an empirical analysis of the European paper industry', *Corporate Social Responsibility and Environmental Management*, 9: 133-46.

Wahba, Hayam. 2008. 'Does the market value corporate environmental responsibility? An empirical examination', *Corporate Social Responsibility and Environmental Management*, 15: 89-99.

Wai Kong Cheung, Adrian. 2011. 'Do Stock Investors Value Corporate Sustainability? Evidence from an Event Study', *Journal of Business Ethics*, 99: 145-65.

White, M. 1996. 'Corporate environmental performance and shareholder value', *University of Virginia*.

Wooldridge, Jeffrey M. 2014. *Introduction to Econometrics* (Emily Chandauka).

Ziegler, Andreas, Michael Schröder, and Klaus Rennings. 2007. 'The effect of environmental and social performance on the stock performance of european corporations', *The Official Journal of the European Association of Environmental and Resource Economists*, 37: 661-80.

# Appendix A: List of Sample Firms with ISO 14001 Certification

| FIRMS OMITTED DUE TO LACK OF TRADING DATA | COUNTRY | CERTIFICATION DATE |
|---|---|---|
| AF GRUPPEN | NOR | 04.12.2000 |
| BYGGMA ASA | NOR | 16.12.1997 |
| NEXUS FLOATING PRODUCTION LTD. | NOR | 27.12.2007 |
| RIEBER & SØNN ASA | NOR | 04.12.2003 |
| DGC ONE | SWE | 18.03.2000 |
| HEXATRONIC GROUP | SWE | 18.10.2013 |
| | | |
| **FIRMS OMITTED DUE TO CONFOUNDING NEWS** | **Country** | **Certification date** |
| STATOIL ASA | NOR | 29.06.2006 |
| NORSK HYDRO ASA | NOR | 29.07.1999 |
| DATA RESPONSE ASA | NOR | 01.01.2008 |
| MARINE HARVEST ASA | NOR | 15.08.2008 |
| SWEDBANK AB | SWE | 11.03.2009 |
| SKANSKA INFRASTRUCTURE DEVELOPMENT AB | SWE | 29.12.2000 |
| FINGERPRINT CARDS AB | SWE | 19.11.2014 |
| KNOW IT AB | SWE | 26.05.2010 |
| | | |
| **FIRMS OMITTED DUE TO MISSING CERTIFICATION DATE** | **Country** | **Certification date** |
| SWEDISH MATCH AB | SWE | Not found |
| SECURITAS AB | SWE | Not found |
| SKF AB | SWE | Not found |
| SVENSKA CELLULOSA AB | SWE | Not found |
| | | |
| **FIRMS OMITTED DUE TO CERTIFICATIONS FOR ONLY SUBSIDIARIES** | **Country** | **Certification date** |
| DNB ASA | NOR | 08.05.2014 |
| HAVILA SHIPPING ASA | NOR | 03.07.2007 |
| | | |
| **FIRMS INCLUDED IN SAMPLE** | **Country** | **Certification date** |
| NORDIC SEMICONDUCTOR ASA | NOR | 12.12.2014 |
| ATEA ASA | NOR | 04.06.2009 |
| BORREGAARD ASA | NOR | 30.06.2015 |
| EIDESVIK OFFSHORE ASA | NOR | 12.12.2006 |

| | | |
|---|---|---|
| DOF ASA | NOR | 24.06.2002 |
| DOMSTEIN ASA | NOR | 21.08.2008 |
| ELTEK ASA | NOR | 14.06.2007 |
| FARSTAD SHIPPING ASA | NOR | 29.03.2006 |
| KITRON ASA | NOR | 28.11.2000 |
| NORSKE SKOGINDUSTRIER ASA | NOR | 19.01.2000 |
| Q-FREE ASA | NOR | 19.08.2005 |
| SUBSEA 7 NORWAY NUF | NOR | 18.04.2006 |
| LM ERICSSON TELEPHONE CO | SWE | 28.12.2004 |
| AUTOLIV SDB | SWE | 22.01.2008 |
| SAS AB | SWE | 20.09.2010 |
| B&B TOOLS AB | SWE | 25.06.2012 |
| BEIJER ELECTRONICS AB | SWE | 12.12.2002 |
| CELLAVISION AB | SWE | 19.12.2013 |
| CATENA AB | SWE | 02.07.2007 |
| DEDICARE AB | SWE | 09.06.2014 |
| ELECTROLUX AB | SWE | 11.12.2014 |
| EWORK SCANDINAVIA AB | SWE | 26.06.2012 |
| MALMBERGS ELEKTRISKA AB | SWE | 10.01.2010 |
| REJLERS AB | SWE | 07.06.2004 |
| ROTTNEROS AB | SWE | 27.06.2006 |
| SAAB AB | SWE | 10.09.2012 |
| SKANSKA AB | SWE | 04.12.2004 |
| ÅF AB | SWE | 17.11.2003 |

# Appendix B: List of Sample Firms with Issued Green Bonds

| FIRMS INCLUDED IN SAMPLE | DATE OF BOND ISSUANCE |
|---|---|
| ARISE | 16.04.2014 |
| CREDIT AGRICOLE | 30.01.2013 |
| DNB ASA | 17.02.2015 |
| GDF SUEZ | 12.05.2014 |
| HSBC | 03.12.2015 |
| IBERDROLA | 08.04.2014 |
| ING GROUP | 24.11.2015 |
| SCA | 25.03.2014 |
| SHANKS GROUP | 16.06.2015 |
| SKANSKA | 01.04.2014 |
| SOCIETE GENERALE | 25.11.2015 |
| UNIBAIL-RODAMCO | 26.02.2014 |
| UNILEVER | 26.03.2014 |
| VERBUND AG | 20.11.2014 |
| VESTAS | 11.03.2015 |
| WALLENSTAM | 25.03.2015 |

# Appendix C: Index for Green Bonds Sample

| INDEX |
| --- |
| SWSEALI – STOCKHOLM ALL SHARE INDEX |
| COSEASH – OMX COPENHAGEN ALL SHARE INDEX |
| AMSTEOE – AMX INDEX |
| FRCAC40 – FRANCE CAC 40 INDEX |
| FTSE100 – THE FINANCIAL TIMES STOCK EXCHANGE 100 INDEX |
| FTALLSH – THE FINANCIAL TIMES STOCK EXCHANGE ALL SHARE INDEX |
| LUXGENI – LUXEMBOURG SE GENERAL INDEX |
| OSLOOBX – OSLO OBX INDEX |
| ATXINDX – AUSTRIAN TRADED INDEX |
| MADRIDI – MADRID SE GENERAL INDEX |