Analysis of the relationship between ESG performance and financial performance of the Scandinavian companies.

Lappeenranta–Lahti University of Technology LUT

Master’s Programme in Strategic Finance, Master's thesis

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Examiner: Visiting researcher Tomáš Talášek

ABSTRACT

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This study investigates the relationship between the ESG performance of Scandinavian companies with their financial performance and aims to answer the question whether ESG performance has an impact on stock returns and stock price volatility.

Analysis is conducted using a set of multivariate linear regressions and covers 232 stock-listed companies from Denmark, Finland, Norway and Sweden. Using the data retrieved from Thomson Reuters Datastream, the relationship is analyzed both for Scandinavia overall and on a country level to estimate the similarities and differences among countries.

Results of the research are mixed but indicate the existence of a statistically significant negative relationship between ESG performance and explained variables, especially when additional financial explanatory variables are taken into consideration. Findings may be interesting for the investors considering Scandinavian companies to invest and aligning their decisions with sustainability aspects.

TIIVISTELMÄ

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Analyysi ESG- ja taloudellisen suorituskyvyn suhteesta Skandinaavisissa yrityksissä.

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Tämän tutkimuksen tavoitteena on tarkastella skandinaavisten yritysten ESG-suorituskyvyn suhdetta niiden taloudelliseen tulokseen ja tutkia, vaikuttaako ESG-suorituskyky osaketuottoihin ja osakehinnan volatiliteettiin.

Analyysi suoritetaan käyttämällä useita lineaarisia regressiomalleja, ja se kattaa 232 pörssiyhtiötä Tanskasta, Suomesta, Norjasta ja Ruotsista. Thomson Reuters Datastreamista saatujen tietojen avulla suhdetta analysoidaan sekä Skandinaviassa että maatasolla maiden yhtäläisyyksien ja erojen arvioimiseksi.

Tutkimuksen tulokset ovat ristiriitaisia, mutta ne osoittavat, että ESG:n suorituskyvyn ja selitettyjen muuttujien välillä on tilastollisesti merkitsevä negatiivinen suhde, erityisesti kun otetaan huomioon muita taloudellisia selittäviä muuttujia. Havainnot voivat olla mielenkiintoisia sijoittajille, jotka harkitsevat skandinaavisia yrityksiä sijoittamaan ja sovittamaan päätöksensä kestävän kehityksen näkökohtiin.

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08.06.2022

Espoo, Finland

Artur Vuorimaa

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1. Introduction

First mention about the ESG is dated back to the year 2004 when Kofi Annan, former UN Secretary General, invited over 50 financial institutions' CEOs to take part into the initiative of integrating ESG principles into the activity of financial markets. One year later two fundamental papers on ESG importance were published (Kell, 2018). The report named "Who Cares Wins", a joint initiative of key financial market players, stated that socially responsible behaviour is essential to compete successfully and aimed to increase the awareness of the market actors towards the corporate social responsibility (Knoepfel, 2004). According to Knoepfel, paying attention to ESG aspects leads not only to the increase of the shareholders' value by a proper risk management, but also to the significant contribution in the sustainable development of the society. Another paper is a UNEP/ Fi report, highlighting that despite the raising number of evidence that ESG issues influence the financial performance, those willing to actively take into consideration ESG social responsibility aspects face with resistance based a belief that institutional principals are legally prevented from making decisions based on ESG issues (UNEP Finance Initiative, 2005).

Abbreviation ESG stands for Environmental, Social and Governance factors. ESG criteria is a set of standards used by the investors to screen the sustainability and ethical impact of the company activity on society. ESG considers such topics as pollution and emissions from production, working conditions, corruption, and many others. However, terminology of ESG may significantly vary in different areas of emphasis. For example, Hedstrom (2018) define ESG term as *"building an ethical, resilient, sustainable, and transparent company that is aligned with the needs of society"*.

It is also necessary to explain the difference between corporate social responsibility (CSR) and ESG performance. Even though both ESG and CSR are associated with the impact of the company on the environment and society, CSR is a company's individual business model and ESG stands for the assessment criteria used by the investors. In the context of the thesis paper, ESG performance means how the CSR activity of a company is rated by a rating provider, namely the Refinitiv. ESG scores provided to the companies, according to the Refinitiv methodology, vary in range between 0 and 100.

Nowadays, growing interest towards the ESG theme is a proxy of increasing awareness of the ecological situation and human rights violation. According to the information provided by the Governance and Accountability Institute (2021), 92 % companies from the S&P 500 list published sustainability reports in 2020 in comparison to only 20 % in the year 2011. Considering Russell 1000, the percentage of the companies reporting on sustainability has grown from 65% to 70 % in the year 2020 comparing to the previous year. It is also worth mentioning that in the year 2020 about 35 % of all the professionally managed assets being under management worldwide were sustainable investments. This means that sustainability is not a short-term popular phenomenon, but a conscious choice of society towards a better life (GSIA, 2021).

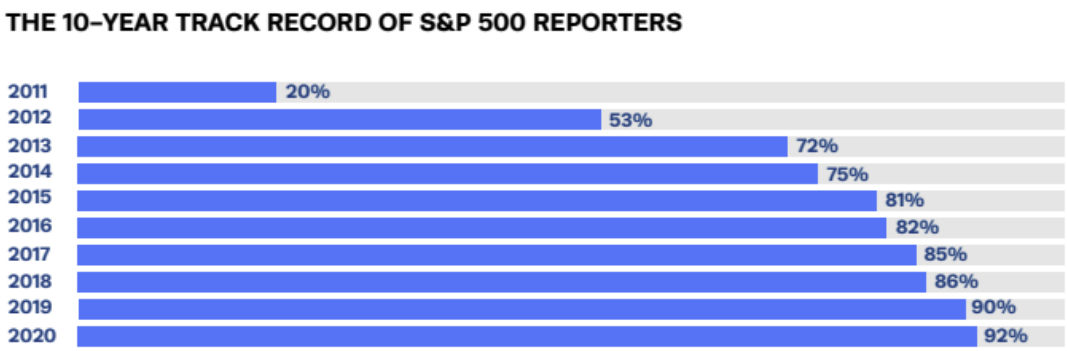


Figure 1. Share of S&P500 Sustainability Report publishers (Governance & Accountability Institute, 2021)

Ernst and Young (2017) reports that interest towards sustainable investing has partly risen because of millennials who pay attention not only to financial returns. Millennials align their investment strategies with their personal values and are willing to invest into the companies making significant steps for social and environmental development. Since 84% of millennials consider ESG performance as a key aspect in investment decision-making, incorporating socially responsible behaviour becomes a necessity for business. Another reason is the macro-economic trend related to the growing demand for resources and their effective usage due to growing population. Thus, actively raising interest towards the social responsibility and rising stakeholders' expectations force companies to develop corporate social responsibility (CSR) activities to keep attractiveness in a long-term perspective.

1.1. Objectives and methodologies

Results of the research whether higher ESG performance leads to a better financial performance are contradictory and will be considered thoroughly in the literature review part. While some papers state that highly ESG-rated companies achieve better stock performance (Von Arx and Ziegler, 2009; Albuquerque, 2020; Engelhardt et al., 2021), others argue that investing in companies with better ESG performance leads to worse financial performance, especially during the crisis periods (Brammer et al., 2006; Di Luigi and Kostovetsky, 2014).

The objective of the study is to contribute to the existing research and enhance the understanding whether the ESG scores have an impact on financial performance in Scandinavian countries and whether it is reasonable for investors to purchase stocks of the companies with high ESG performance from

the financial point of view. It is assumed that investor is willing to have higher stock returns and lower volatility. If a significant dependence between financial and ESG performances exists, then to get insights which ESG factors affect the performance the most.

Using the data for Scandinavian stock-listed companies with the timespan from 2018 to 2021, the study will try to answer the following research questions:

1) Is the ESG performance proportional to the financial performance?
2) What are the most significant ESG factors influencing the financial performance?
3) Do these factors differ among Scandinavian countries?

To clarify the second research question, it should be mentioned that under the significance of the factors influencing the financial performance is meant the coefficient of explanatory variables corresponding to ESG factors.

1.2. Limitations

The main limitation of the research was the availability of ESG data. Search tools providing ESG ratings for free, for instance Sustainalytics ESG Risk and MSCI ESG ratings, do not allow to export ESG data on a country level. Platforms like FTSE Russel and Bloomberg do not publish any ESG ratings publicly. Moreover, historical data export is not available as well at all the publicly available sources, making the data gathering process for the analysis problematic. Due to various calculation methodologies ESG scores may significantly vary depending on the rating provider, and, initially, it was planned to compare the results retrieved based on the ESG scores provided by

different agencies. During the data gathering process, the requests to get access to the databases with ESG information were sent to multiple rating providers (Sustainalytics, Bloomberg and S&P), but it did not lead to success and the idea of comparing different ESG ratings was abandoned. Thus, the only source of information on ESG ratings with the access to the database available was Refinitiv. Moreover, historical ESG data for Scandinavian countries at Refinitiv is not full what reduced the sample volume and possibility to conduct analysis on a longer time span. However, Refinitiv is a trustworthy source of ESG ratings with a relatively good coverage worldwide, and information retrieved from Refinitiv Datastream is sufficient to conduct current research.

1.3. Structure of the study

The thesis is structured as follows: literature review with the summary of results on relationship between ESG and stock performance at different markets will be considered in chapter 2. Chapter 3 covers theoretical background on the models used in the empirical part. Chapter 4 provides the information on the ESG constituents, rating providers as well as sustainable investment strategies currently used to get the reader acquainted with the ESG topic. Then description of data and methodology for the analysis used will be provided. Results of the research will be discussed in the chapter 6 and, then, conclusion and summary of the whole paper will be presented.

2. Literature review

Interest towards corporate social responsibility aspects leads to the broad research in this field and a variety of interesting findings were made during this time. For instance, Iliev and Roth (2021) conducted research on companies willing to increase ESG performance and came to the conclusion that companies representing 'clean' industries are concentrating more on environmental performance rather than social while representatives of 'dirty' industries focus on social factor. They also state that the cost of improvements may be a crucial reason why financially less powerful companies do not choose environmental aspect. Cai et al. (2016) conducted cross-country analysis and concluded that differences between countries depend on country factors like culture, legal system, economic development more than company specific attributes. Another interesting finding from Chinese market is associated with gender factor, and states that gender balance as well as the presence of a female in top management are the key factors for the better CSR performance (McGuinness et al, 2017).

Articles were retrieved from Google Scholar platform and LUT Primo using such keywords as 'ESG performance' and 'CSR performance' and some of the sources were found in the references provided by the authors of research papers related to ESG theme.

Further literature review will be concentrated on relationship between ESG and financial performance since it is the main research theme. There is a wide range of research for US and European markets, but Scandinavian market is still not thoroughly researched, what confirms the importance of the current study.

As it was previously mentioned, the results on the impact of CSR on stock performance are contradictory.

2.1. Negative effect

In one of the early studies Brammer et al. (2006) provide evidence on relationship between socially responsible behaviour and stock returns at the UK market. According to their research, social performance indicators are significantly negatively related to stock returns and stocks of the companies with low level of social responsibility provide considerable abnormal returns. Moreover, it is stated that CSR performance significantly differs in various sectors.

Di Giuli and Kostovetsky (2014) based on the Russel 3000 data during the period 2003-2009 and KLD scores conducted research on relationship between CSR policies and political values in the United States. Among others, it is stated that CSR performance has a negative relationship towards future stock performance and operating performance.

Buchanan et al. (2018) provided research on firm value and CSR for companies listed in Russel 3000 in the year 2007 using the Bloomberg scores and with the accent to financial crisis in the year 2008. Results state that the relationship between ESG performance and Q ratio is positive during the precrisis period, but during the crisis companies with higher ESG scores experience greater decline in firm value.

2.2. Positive effect

Von Arx and Ziegler (2009) focused on CSR effects and stock performance in USA and Europe, using the monthly stock returns in the years 2003-2006, and found environmental and social activities to be valuable in both regions. However, the positive effect from social and environmental performance in United States is stated to be more robust. Thus, sustainable investment at US stock market is rewarded.

Falck and Heblich (2017) provided a theoretical overview of the already existing papers on ESG and concluded that socially responsible behaviour may positively affect not only the community, but also the company if the CSR strategy is lined up with the social trends. As authors state it can be a "win-win" case, when actions towards better future will be paid back by the society.

Jakobsson and Lundberg (2018) conducted analysis using 481 companies listed in S&P500 Index from 2009 to 2016 by implementing panel regression models, and the results of their study indicate a statistically significant negative relationship between ESG ratings and stock price volatility.

Albuquerque et al. (2018) built a predictive model using the data of 4670 US companies from 2003 to 2015 and found that CSR activities positively affect the firm value, especially for the companies with a wide product assortment, and reduce the cost of equity. According to this paper, customers influence the company policies even more than investors.

Wu and Hu (2019) conducted regression analysis on Chinese energy industry using the data of 100 energy companies from 2014 to 2016 and found that companies with higher ESG ratings are less exposed to risk of the stock price crash. Moreover, companies working in electricity field and performing well in environmental protection, technological innovations and corporate image are

the least exposed to the risk of stock price crash. Another research by Hu et al. (2018) states the existence of a statistically significant positive relationship between CSR performance and company value with state-owned companies benefiting the most.

Kaiser (2020) used Refinitiv scores in the analysis on 1079 European and 1756 US companies between 2002 and 2015 and concluded that risks are mitigated in case of sustainable investing.

Barbaric (2021) conducted panel regression analysis on 69 firms from Sweden with high market capitalization using Refinitiv scores and concluded that total ESG performance has a statistically significant positive relationship with ROA, but not with Tobin's Q, standing for relationship between the company's market value and replacement cost of the assets. Considering the ESG pillars separately led to the result that only social aspect has a statistically significant positive relationship, impact of governance and environmental factors is not found.

Albuquerque et al. (2020) in their study made an accent on environmental and social factors. Authors investigated the resiliency of the companies with high E and S scores towards the market fall in 2019 due to coronavirus pandemic. According to the results, companies performing well in social and environmental aspects provided higher returns and were less volatile during the crisis.

Another research (Engelhardt et al, 2021) is also based on the Refinitiv ESG ratings. It includes data for 1452 companies from 16 European countries and states that stocks of highly ESG-scored companies provide higher abnormal returns and are less volatile. Moreover, social pillar is found to be the driver of the results. One more fact highlighted is that ESG is more valuable in the counties with lower disclosure standards and security regulations.

2.3. Neutral or mixed effect

The only paper fully concentrated on the Finnish market, to the best of the author's knowledge, is the paper written by Holanne (2017). The study is based on the Bloomberg ESG scores over the period 2007-2016 and portfolio theory. Results state that ESG disclosure does not have a significant impact on stock performance.

Lööf and Stephan (2019) studied the relationship between ESG performance and downside risk in 5 European countries between 2005 and 2017 using the Sustainalytics ratings. Results state that ESG well-performing companies tend to have low financial downside risks. Another finding of the research is that ESG performance is not related to risk-adjusted return of the stock.

Fiskerstrand (2020) used Dow Jones Sustainability Index to analyze the relationship between abnormal returns and ESG performance in the Norwegian stock market during the period from 2009 to 2018 and found no significant relationship between ESG scores and stock returns.

Johansen and Grindheim (2021) analyzed Nordic countries using 4 different models (CAPM, Fama & French with three- and five-factors, and Carhart model with 4 factors) and came to the conclusion that high- and low- ESG performing companies have the same level of excess returns, and there is neither positive, nor negative significant relationship between ESG scores and returns.

Borovkova and Wu (2020) investigated the dependence between ESG and financial performance of more than 2000 Large-Cap companies from Europe, US, Australia and Asia based on the Refinitiv ESG scores. The results state that there is a positive correlation between the market capitalization and ESG performance, meaning that larger companies have more funds to invest into

CSR activities. Another finding is that in US and Asia investing in socially responsible companies is associated with lower stock returns, but lower stock price volatility at the same time. However, at European and Australian markets, there is no evidence found on relationship between ESG scores and stock returns and maybe the result of the leading positions of institutional investors from these regions in implementation of ESG into portfolio management.

3. Theoretical background

Even though panel regression model is also used in previous research (Kaiser, 2020; Jakobsson and Lundberg, 2018), it was decided to continue with linear regression models in the current research due to some reasons. First, it is assumed that investors make their decisions only based on the last available ESG ratings, and ESG ratings do not have historical value. Moreover, for private investors historical ESG information, especially pillar scores, are not even available at the public sources. Also, the period of three years is relatively short for panel data and, and each company appears exactly 3 times in the dataset. Linear regression approach is applied, for instance, in the research conducted by Engelhardt et al. (2021), Wu and Hu (2019) and Johansen et al. (2021). As a statistical measure of the goodness of fit, it is decided to use R-squared.

Additionally, abnormal stock returns used in the analysis are calculated using the CAPM formula.

3.1. Linear regression models

Classical linear regression is the model used to find the relationship between two or more variables with the help of a linear equation. In the equation one variable is called dependent (or explained) and others are independent (or explanatory) variables.

The equation of the multivariate linear regression is written as follows (Brooks, 2004):

$$y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_n x_n + u \ ,$$

where:

y - explained variable

α - intercept

β_i – the coefficient or slope of line for each of the variables, $i = 1,..,n$

x_i - explanatory variables, $i = 1,..,n$

Commonly used method to fit a linear regression is to use OLS and minimize the total sum of squared residuals. Minimization of RSS allows to get best fitting model for prediction of dependent variable value.

$$RSS = \sum_{i=1}^{n} (y_i - \hat{y}_i)^2 = \sum_{i=1}^{n} (\hat{u}_i)^2$$

To estimate the goodness of fit of the model such statistical measure as R-squared is often used to estimate how much variation in dependent variable is explained by the current model. R^2 is simply the ratio between the explained sum of squares and the total sum of squares. The equation can be written as follows:

$$R^2 = \frac{ESS}{TSS} = \frac{\sum_{i=1}^{n} (\hat{y}_i - \bar{y}_i)^2}{\sum_{i=1}^{n} (y_i - \bar{y}_i)^2}$$

3.2. Capital Asset Pricing Model

CAPM is a fundamental model in portfolio management theory, which allows to estimate the expected equity return based on the systematic (non-diversifiable) risk. The model is associated with Sharpe, Treynor, Mossin and Lintner who worked independently at the beginning of 1960s (Perold, 2004). Later Sharpe received the Nobel prize with Markovitz and Miller for creating an investment decision making model.

The formula of traditional CAPM is presented below (Madura & Fox, 2017):

$$E(R_i) = R_f + \beta_i * E(R_m - R_f)$$

where:

R_i - expected market return for share i

R_f - risk-free interest rate

β_i - equity beta

R_m - overall expected market return

$R_m - R_f$ - measure of risk appropriate for share i

According to the model, stock return equals to the market risk premium multiplied by the beta plus the risk-free rate. Risk-free rate is associated with the time value of the money and beta is the measure of stock volatility in comparison to the whole market. Higher risks are expected to be compensated with higher returns, and CAPM allows to calculate whether the stock return is fairly valued.

4. Corporate social responsibility and ESG scores

It was previously mentioned that there is a difference between ESG and CSR. Corporate social responsibility is related to the company business model aimed to improve the environmental and social aspects in their operating area and, for example, reduce the footprint of their activity. In its turn, ESG is the set of standards which allow the investors to screen the company and its impact on the environment, community, and many other aspects. ESG scores provided by the rating agencies are widely used in sustainable investing.

By sustainable investing it is usually meant that investment decisions are based not only on traditional financial information, but ESG information is also considered. Inclusion of ESG information into decision-making process allows to broaden the understanding about the company, especially about the risks, opportunities, and its impact on society and environment (Silvola & Landau, 2021). Speaking about the sustainable investing, it is also worth mentioning sustainable investment strategies used by investors for decision-making. According to the classification provided by the Global Sustainable Investment Alliance (Alliance, G. S. I., 2021), seven main approaches actively used for investing are: 1) ESG integration, 2) Corporate engagement and shareholder action, 3) Norms-based screening, 4) Negative/exclusionary screening, 5) Best-in-class/positive screening, 6) Sustainability themed investing and 7) Impact investing and community investing. These strategies can be used not only separately from each other, but also combined. Description for each of the strategies can be seen in Appendix 1. ESG integration, strategy in which investment managers include systematic analysis of environmental, social, and governmental factors into the investment decision-making, is the most widely spread strategy worldwide. However, majority of the investment decisions in

Europe are taken using the negative screening and norms-based screening (Alliance, G. S. I., 2021).

Among the main drivers affecting the development of the sustainable investment in Europe may be stated European Union Sustainable Finance Action Plan (2018), which contains Sustainable Finance Disclosure Regulation. Due to this regulation, asset managers and institutional investors are obliged to report sustainability risks. European Taxonomy Regulation (also a part of European Union Sustainable Finance Action Plan) provides the classification of "environmentally sustainable economic activities". Another significant initiative towards sustainable development is a Corporate Sustainability Reporting Directive (2021), EU legislation which requires large companies to disclose the information on their social and environmental impact, making them pay attention to these factors and align company activity with sustainability issues.

Corporate socially responsible behaviour is already a standard practice, and companies which do not behave sustainably lose the customers loyalty and long-term business sustainability value, demanded by investors, especially with the appearance of millennials (Goedeke & Fogliasso, 2020). Since the socially responsible behaviour, aimed to the enhancement of the social and environmental conditions, becomes the requirement for the companies, the need for the global scale of ESG performance becomes the necessity. Using the publicly available information, such as corporate statements and CSRD reports, ESG rating agencies conduct ratings on sustainability level of the companies, which investors may use to estimate the ESG performance of the business.

To the best of the author's knowledge, currently the leading providers of the ESG rating in world are:

Sustainalytics, being a subsidiary of the Morningstar, reports ESG Risk ratings for around 14 000 companies within 172 countries. ESG performance is measured on a global scale and consist of both quantitative and qualitative analysis. ESG risk ratings are absolute and can be used for comparison across peers and subindustries. (Sustainalytics, 2022)

Bloomberg, a leading financial data provider, also has its' own ESG data system, which consists of around 12 000 companies from more than 100 countries. (Bloomberg, 2022)

MSCI, also one of the leading finance companies providing ESG ratings, evaluates companies' exposure to ESG risk in comparison to the peers and provide them ratings on a scale from CCC to AAA. Database includes data about resiliency to ESG risks for around 14 000 equity and fixed income issuers. (MSCI, 2022)

FTSE Russell, the subsidiary of London Stock Exchange, specialises in data analytics. Database of FTSE Russel includes ESG ratings for around 7200 securities from 47 countries. Rating is based only on the publicly available information and includes overall score as well as pillar and theme level scores, which are calculated with the help of more than 300 individual indicators for each company. (FTSE, 2022)

Standard & Poor's, one of the biggest credit-rating agencies, in the ratings concentrates on employee relationships and environmental issues using a bottom-up approach, which differs from the majority of the ratings where top-down approach is used. S&P Global ESG scores are based on the special questionnaire and publicly accessible information and include over 8 000 companies. (S&P Global, 2022)

Another credit-rating agency **Moody's** has a wide range of services related to the integration of ESG best practices and sustainability assessment. Currently, Moody's provides ratings for over 13000 companies worldwide. (Moody's, 2022)

CDP is an NPO helping investors to identify funds investing into the companies which successfully deal with deforestation, climate change and water security issues. Data is provided for free and covers over 20000 funds of all the types to leading in ESG performance. (CDP, 2022)

Refinitiv, also known as Thomson Reuters by the name of the previous owner, has become a part of London Stock Exchange Group being purchased in January of the year 2021. Refinitiv's ESG database consists of 11800 companies. (Refinitiv, 2022)

Since Refinitiv Eikon Datastream is relatively big comparing to other providers and access is provided by the university, it was decided to continue further analysis using Refinitiv ESG scores. Another reason is that access to the full database of other providers was not received.

It is worth mentioning that divergence exists among ESG ratings of various providers, and results received with ratings provided by one company may not replicate with the ESG scores by another. For instance, Refinitiv's aggregate ESG score has a correlation in range between 0.6 and 0.7 with ratings provided by Sustainalytics, Moody's and Standard & Poor's. Correlation with MSCI and Bloomberg ratings is around 0.4 according to the research of Berg et al. (2019).

Next, the methodology of Refinitiv ESG rating is provided.

4.1. Refinitiv ESG Score Methodology

Refinitiv provides ESG data for the investors to identify the socially responsible companies with more than 450 ESG metrics using the publicly available information (annual reports, company websites, CSR reports and stock exchange filings). Separate ratings for each of the pillars allow to recognise strengths and weaknesses in company's activity and estimate possible risks. It is worth mentioning that ESG scores are peer-relative based on the company's industry and country of incorporation. ESG scores are aligned with ESG Disclosure and is published on an annual basis in most cases. Ratings are available both in letters (from D- to A+) and in scores scaled from 0 to 100. Ratings in first quartile are provided to the companies with poor ESG performance and a low level of transparency in ESG reporting. Second quartile means relatively satisfactory performance and a moderate level of ESG information disclosure. Third quartile stands for good performance and degree of corporate ESG disclosure above average. And fourth quartile indicates an excellent level of social responsibility and a high level of ESG data reporting in comparison with the peers.

According to the Refinitiv methodology (2021), ESG performance is evaluated based on the 10 key constituents which are combined into 3 pillars: environmental, social, and governance. Additionally, overall ESG Score is discounted for the controversies within the combined ESG (ESGC) in case if company is involved into the ESG controversies. ESG controversies are monitored in the news to define the companies which were involved in ESG related incidents as well as the severity of incidents and companies' responsibility. Scandals like environmental pollution, violation of rights or corruption may significantly affect the reputation of the company and the

shareholders. In case if company is not involved in any controversies, ESG score and ESGC are the same.

Figure 2. Structure of the Refinitiv ESG Score

Environmental pillar score is based on the category scores of themes as resource use (performance in shrinking of water, energy and material usage through supply chain management improvement and implementation of eco-efficient solutions), emissions (effectiveness in minimization of emissions from business processes), and environmental product innovations (implementation of eco-designed products and environmental solutions).

Social factor consists of a community score (responsibility in business ethics and care about the society), workforce (providing equal opportunities to all the employees and possibilities for further development, maintaining job satisfaction and care about the staff health and safety), human rights (respect towards the human rights) and product responsibility (data privacy and quality of products and provided services).

Governance pillar includes such categories as management (incorporation of best practices for Corporate governance), shareholders score (implementation of anti-takeover measures), CSR strategy (informing on integration of environmental, social, and financial dimensions into everyday decision).

Ten category scores, which constitute the pillars, and ESG controversies scores are calculated as follows according to the Refinitiv ESG scores methodology (Refinitiv, 2021):

$$Score = \frac{N\ of\ companies\ with\ a\ worse\ value + \frac{N\ of\ companies\ with\ the\ same\ value}{2}}{N\ of\ companies\ with\ a\ vlaue}$$

Then using the Refinitiv Business Classification, weights for each of the categories are individually assigned for each industry group for environmental and social pillars. In case of governance score, the benchmark is a country of business incorporation.

Weights are normalized and ranged between 0 and 100. To calculate category weights, category magnitude weights are summarized for each industry group, and each magnitude weight is then divided by the total sum of category magnitudes.

$$Category\ weight\ of\ an\ industry\ group = \frac{Magnitude\ weight\ of\ a\ category}{Sum\ of\ magnitudes\ of\ all\ categories}$$

Finally, pillar scores and overall ESG scores are caluclated as a sum of each category score multiplied by individual category weights.

5. Data and methodology

Data for the current study was retrieved from Thomson Reuters Datastream. As it was previously mentioned, Refinitiv ESG rating provides sufficient amount of data and has been chosen for the research. Observation period choice is based on the accessibility of the historical data for the companies representing Scandinavian markets. Inclusion of the ESG data for the longer timespan, would drastically decrease the list of companies under consideration and seemed inappropriate. For instance, inclusion of the ESG ratings for the year 2017 would decrease the dataset almost twice.

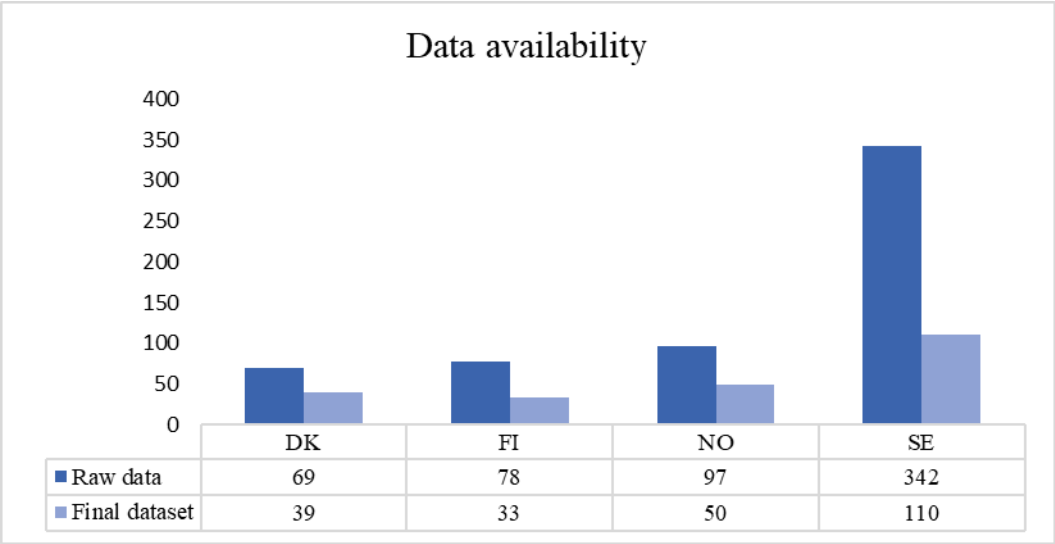
Initially, the raw data included 586 companies from Denmark, Finland, Norway, and Sweden for the chosen timespan between the years 2018 and 2021. List of the companies included into the research is based on the Refinitiv ESG constituent lists provided for each country.

Annual ESG scores are collected for the period between the years 2018-2020, since ESG ratings are published at the annual basis for the previous year only after the financial report period. At the moment of data gathering, this was the last ESG data available at the platform.

Additionally, financial data for the same companies was collected for the period between the years 2019 and 2021. One-year shift is explained by the assumption that financial performance is related to the ESG ratings of the previous year.

Due to the poor availability of ESG ratings and presence of the missing data for other variables as well, great number of companies were excluded from the further analysis (see Figure 3). All the companies which had any missing data for the considered period were fully excluded from the sample. As a result, the

final sample contains 3-year data for 232 stock-listed companies from 4 Scandinavian countries.



	DK	FI	NO	SE
Raw data	69	78	97	342
Final dataset	39	33	50	110

Figure 3. Data availability (raw data vs. final dataset)

ESG performance indicators used in the research include 3 pillar-level scores (environmental, social and governance) and aggregate ESG score. Since the ESG ratings are published on the annual basis, it was decided to continue analysis using the annual data for all the variables.

Financial performance is measured by the following variables.

Annual return (further in analysis YRet) is calculated as followed:

$$(P_t + Div + SpDiv_1 + SpDiv_2 + SpDiv_3 + SpDiv_4)/P_{t-1} - 1) * 100,$$

where P_t is the market price at the end of the year, *Div* is the dividends per share, *SpDiv* - special dividends at a given quarter and P_{t-1} is the market price at the end of the previous year.

Abnormal return (further in analysis AbRet) is calculated as the difference between annual returns and expected returns calculated using the Capital Asset Pricing Model (CAPM). Beta, which reflects the relationship between the

volatilities of the market and the specific stock, is retrieved from Thomson Reuters Datastream. Market risk premium is calculated as the difference between market return retrieved from Morningstar and return on a 10-year government bonds relative to the company's country of origin.

Another dependent variable, which reflects the financial performance is the stock price volatility. It is calculated as an average annual movement of a stock price to a high and low from a mean value for the whole year. It means that stock price volatility equal to 10 percent indicates the historical stock price variation of + 10% to -10% from the annual average price.

Previous research (Barbaric, 2021; Wu and Hu, 2019) also states that company size also affects the financial performance and should be taken into account. For this reason, market capitalization is included, but due to high dispersion in this indicator it is converted into natural logarithm.

Additionally, ROE, Market-to-Book value and Debt-to-Equity ratio are included into the analysis as additional financial indicators of companies' performance since they were used as explanatory variables in previous studies (see for example Engelhardt et al., 2021).

Return on equity is used to assess companies' efficiency in generating profits. MTB is the relationship between the market capitalization of the company and the book value. MTB ratio below zero may indicate that company is undervalued, while ratio above 1 may indicate that company performs well. D/E ratio is the leverage ratio measuring the ability of a company to deal with the financial obligations.

$$ROE = \frac{Net\ Income - Bottom\ Line - Preferred\ Dividend\ Requirement}{Average\ of\ last\ year's\ and\ current\ year's\ Common\ equity} * 100$$

$$Market\ to\ Book\ ratio = \frac{Market\ value\ of\ the\ common\ equity}{Balance\ sheet\ value\ of\ the\ common\ equity}$$

$$Debt\ to\ Equity\ ratio = \frac{Long - term\ debt + Short - term\ debt}{Common\ equity} * 100$$

As it is seen from the pie chart, Swedish stock listed companies are prevailing and compose roughly a half of the whole sample – 47%, portion of Danish, Finnish and Norwegian companies is 17, 14 and 22 percent accordingly. Furthermore, 56 % of the companies in the sample have large capitalization, Mid-Cap companies account for 35 %, and only 9 % are small-capitalized companies. Distribution by market capitalization can be found in appendix 2.

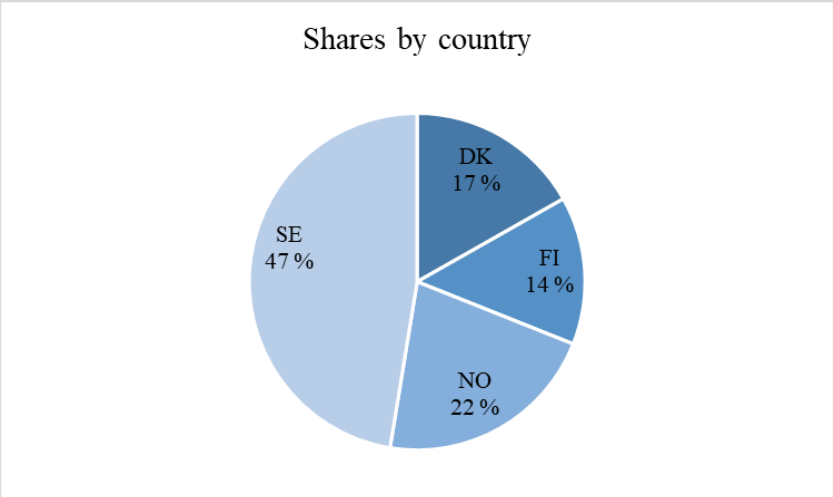


Figure 4. Pie chart representing shares by countries.

Figure 5 represents the descriptive statistics of the sample. Boxplots for each of the variables can be found in appendix 3. The results state that minimum aggregate relative ESG rating provided to the considered companies is 4.12 points, while the maximum equals 94.59 with the mean ESG score of 56.07 points. Considering the environmental performance, maximum score is 97.55 points, and the minimum is equal to 0, what means that scores are widely distributed within the scale from 0 to 100. The average score for the environmental pillar is lower than for the overall ESG score and equals to 49.73 points. Social performance scores are distributed within the range from 1.27 to 94.31 points, and the mean score is 59.43, what is higher than overall score mean or mean of the other pillars. Governance score also varies significantly, minimum governance rating equals to 1.34, while maximum rating provided is 95.77 points. Average governance score of the sample equals to 56.20 points. For all the ratings skewness varies from -0.19 to -0.52, what means that distribution is approximately symmetric.

Kurtosis and skewness values for both returns mean that they are leptokurtic and right skewed. Normal annual returns vary from -97.70 to 235.14 percent, with a standard deviation of 45.32, meaning that normal returns are widely spread out. Mean value of normal returns equals to 24.15 percent. The range of abnormal annual returns is wider with the minimum of -130.75 percent and maximum of 231.25. The mean abnormal return equals to 0.39 percent, and dispersion in relation to the mean value remains at the same level as for the normal returns. Volatility is peaked and positively skewed. Values vary from 10.95 to 57.54 percent, and the mean equals to 26.09 percent.

Since the market capitalization varies significantly, it was decided to use natural logarithm of capitalization in the analysis. Skewness and kurtosis are close to zero meaning that distribution of the variable is close to normal.

Minimum value is equal to 11.22, maximum -21.24, and the mean is equal to 16.60. All the additional financial indicators are highly leptokurtic. The distributions of market-to-book value and debt-to-equity ratio are right-tailed, while ROE is negatively skewed.

	ESG	*E*	*S*	*G*	*YRet*	*AbRet*	*Vol*	*ROE*	*MTB*	*LN_MarkCap*	*D/E*
Mean	56,07	49,73	59,64	56,20	24,15	0,39	26,09	11,45	3,43	16,60	120,19
St. Error	0,70	1,02	0,76	0,83	1,72	1,75	0,34	1,05	0,17	0,06	8,59
Median	57,59	52,31	61,71	57,64	18,30	-3,90	24,06	12,73	1,98	16,62	63,93
St. Dev	18,54	26,90	20,10	21,80	45,32	46,11	8,92	27,76	4,53	1,68	226,55
Kurtosis	-0,45	-1,09	-0,26	-0,78	3,27	3,63	1,00	32,98	40,29	-0,17	79,18
Skewness	-0,32	-0,19	-0,52	-0,23	1,23	1,17	1,12	-1,90	4,99	-0,12	7,09
Minimum	4,12	0,00	1,27	1,34	-97,70	-130,75	10,95	-276,52	-0,32	11,22	-118,84
Maximum	94,59	97,55	94,31	95,77	235,14	231,25	57,54	263,32	52,49	21,24	3484,39
Count	696	696	696	696	696	696	696	696	696	696	696

Figure 5. Descriptive Statistics

Figure 6 represents the pairwise correlation matrix of the variables. When considering ESG ratings, overall ESG score has strong positive correlation with all three pillar scores. Additionally, high correlation between environmental and social pillar scores exists, and governance score is moderately related to environmental and social scores.

Moreover, there is a strong positive correlation between normal and abnormal stock returns, and substantial negative relationship between a logarithm of market capitalization and the volatility of stock prices. Correlation between market capitalization and aggregate ESG performance is at the level of the lower border of moderate relationship.

	ESG	E	S	G	YRet	AbRet	Vol	ROE	MTB	MarkCap	D/E
ESG	1,000										
E	0,861	1,000									
S	0,879	0,728	1,000								
G	0,707	0,402	0,410	1,000							
YRet	-0,096	-0,068	-0,089	-0,069	1,000						
AbRet	-0,085	-0,040	-0,079	-0,087	0,934	1,000					
Vol	-0,344	-0,329	-0,352	-0,186	0,026	-0,007	1,000				
ROE	0,076	0,101	0,097	-0,010	0,196	0,204	-0,346	1,000			
MTB	-0,113	-0,155	-0,109	-0,059	0,059	0,029	0,135	0,121	1,000		
LN_MarkCap	0,399	0,326	0,350	0,324	0,194	0,178	-0,418	0,291	0,144	1,000	
D/E	0,014	0,081	-0,049	0,027	-0,126	-0,125	-0,029	-0,289	-0,099	-0,047	1,000

Figure 6. Correlation Matrix

The boxplots below indicate an upward trend in all the countries during the considered period. Mean and median relative ESG performance was constantly growing, and the situation looks similar for each of the scores. The only exceptions concern a light decline in social scores in Finland for the year 2020 and decrease in median value in Denmark in 2019. Finland seems to be a forerunner in the overall ESG performance with the mean relative ESG score roughly 10 points higher than in other countries. However, some companies in Denmark and Finland obtained quite low ESG ratings.

Environmental performance scores in Finland are significantly higher than in other countries based on the mean value. It may be the reason of relatively low data sample and the fact that some companies in Denmark, Norway and Sweden had zero rating probably due to not disclosing environmental issues in their reports. Interquartile range is tighter and distribution in lower quartile is wider for Finnish companies what significantly differs from other markets. Also, it is worth saying that upper quartile border decreased in the year 2020 what is untypical for the current boxplots.

Social performance distribution reminds the situation earlier considered for the overall ESG scores. Companies in Denmark and Finland perform better and distribution is lower due to the shorter whiskers in comparison to Norway and Sweden.

Governance scores looks similar with almost identical dispersion in Denmark, Finland and Norway and steady growth during the given timespan.

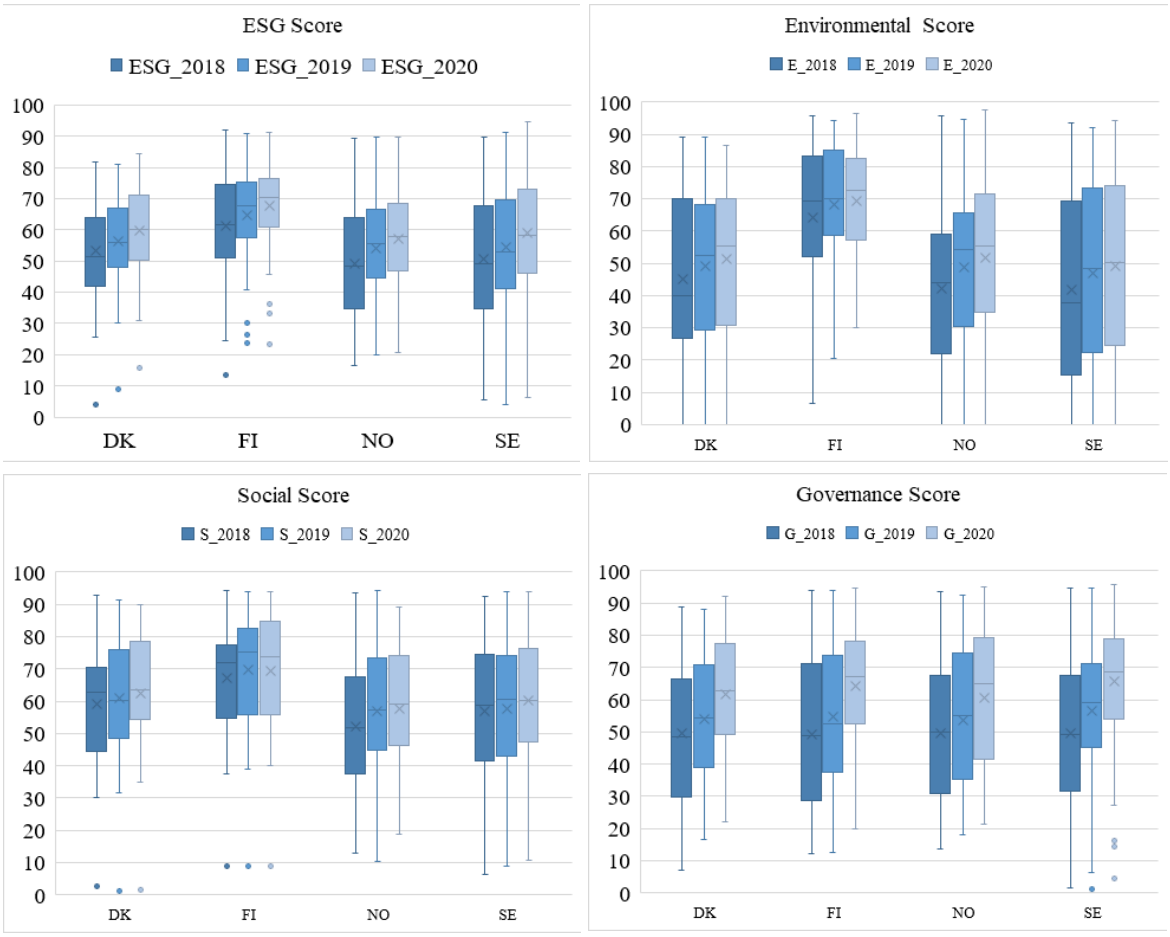


Figure 7. Boxplots with the ESG scores for the timespan 2018-2020

Choice of the appropriate regression model type for the analysis is based on the following assumptions. First, the sample includes data for 3 years and each company appears 3 times, once in each year. Another assumption is that

investors use only the last available ESG performance scores in the decision-making process and there is no value in time series of ESG scores. Moreover, the timespan is not long enough to conduct panel regressions. Thereunder, it was decided to use a set of multivariate regressions in the analysis part. Similar approach was used in the previous research conducted by Wu and Hu (2019), Johansen et al. (2021) and Engelhardt et al. (2021).

Various regression model specifications were tested, and linear specification was chosen since the more complex models have not led to significant performance improvement. For this reason, analysis is conducted using a set of multivariate regressions with linear model specification.

To check the regressions for the evidence of heteroscedasticity and autocorrelation, robust covariance matrix estimates, corrected standard errors and corrected OLS coefficient estimates are retrieved using Newey-West approach available in Econometrics Toolbox of Matlab and compared with the results of the initial OLS regressions (Mathworks, 2022). The results state that built regressions show evidence of heteroscedasticity and autocorrelation, since robust covariance matrix estimates and corrected standard errors estimates are different (corrected OLS coefficient estimates are the same as the initial coefficients). Due to complexity of implementation of the retrieved robust standard errors into the analysis, it is decided that only coefficients which are significant at 1 % significance level will be considered as significant in the current analysis.

To take into consideration the cross-country differences, the regressions are run not only for the whole dataset, but additionally for each of the countries separately.

First, regressions solely for ESG scores and pillar scores are built to check the relationship between ESG and financial performance without any other explanatory variables:

$$Yret_t = \alpha + \beta_0 * ESG_{t-1} + u_t$$

$$Abret_t = \alpha + \beta_0 * ESG_{t-1} + u_t$$

$$Vol_t = \alpha + \beta_0 * ESG_{t-1} + u_t$$

$$Yret_t = \alpha + \beta_0 * E_{t-1} + \beta_1 * S_{t-1} + \beta_2 * G_{t-1} + u_t$$

$$Abret_t = \alpha + \beta_0 * E_{t-1} + \beta_1 * S_{t-1} + \beta_2 * G_{t-1} + u_t$$

$$Vol_t = \alpha + \beta_0 * E_{t-1} + \beta_1 * S_{t-1} + \beta_2 * G_{t-1} + u_t$$

After that, regressions only with market capitalization and additional financial explanatory variables are provided to investigate solely their relationship with returns and volatility:

$$Yret_t = \alpha + \beta_0 * ROE_t + \beta_1 * DE_t + \beta_2 * MTB_t + \beta_3 * \ln(MarkCap)_t + u_t$$

$$Abret_t = \alpha + \beta_0 * ROE_t + \beta_1 * DE_t + \beta_2 * MTB_t + \beta_3 * \ln(MarkCap)_t + u_t$$

$$Vol_t = \alpha + \beta_0 * ROE_t + \beta_1 * DE_t + \beta_2 * MTB_t + \beta_3 * \ln(MarkCap)_t + u_t$$

Then, ESG score is added into the model to investigate the relationship between the aggregate ESG performance and company financial performance, taking into account other explanatory variables, and following linear regression models are built:

$$Yret_t = \alpha + \beta_0*ESG_{t-1} + \beta_1*ROE_t + \beta_2*DE_t + \beta_3*MTB_t + \beta_4*\ln(MarkCap)_t + u_t$$

$$Abret_t = \alpha + \beta_0*ESG_{t-1} + \beta_1*ROE_t + \beta_2*DE_t + \beta_3*MTB_t + \beta_4*\ln(MarkCap)_t + u_t$$

$$Vol_t = \alpha + \beta_0*ESG_{t-1} + \beta_1*ROE_t + \beta_2*DE_t + \beta_3*MTB_t + \beta_4*\ln(MarkCap)_t + u_t$$

The same regression models with the first lags of returns and volatilities were conducted for the sake of comparison. As a result, it was decided not to include the previous lags of the stock returns since significant improvement of the model's predictive power was not found. At the same time, first lag of the volatilities was excluded from the models due to a very strong correlation between the volatility and its first lag.

Then, to investigate which pillars have a significant relationship with financial performance, the following linear regression models with pillar scores were implemented:

$$Yret_t = \alpha + \beta_0*E_{t-1} + \beta_1*S_{t-1} + \beta_2*G_{t-1} + \beta_3*ROE_t + \beta_4*DE_t + \beta_5*MTB_t + \beta_6*\ln(MarkCap)_t + u_t$$

$$Abret_t = \alpha + \beta_0*E_{t-1} + \beta_1*S_{t-1} + \beta_2*G_{t-1} + \beta_3*ROE_t + \beta_4*DE_t + \beta_5*MTB_t + \beta_6*\ln(MarkCap)_t + u_t$$

$$Vol_t = \alpha + \beta_0*E_{t-1} + \beta_1*S_{t-1} + \beta_2*G_{t-1} + \beta_3*ROE_t + \beta_4*DE_t + \beta_5*MTB_t + \beta_6*\ln(MarkCap)_t + u_t$$

6. Results

6.1. Whole sample analysis

In the first part the whole dataset is tested for the significance of the ESG performance on the financial performance of the Scandinavian countries, and results of 15 regression models are then combined into two tables to improve a visual perception of the results. Six linear regression models which include only ESG and pillar scores of the previous year as explanatory variables are demonstrated in the first table and nine regressions which also take into consideration market capitalization and financial explanatory variables are summarized in the second one. Outputs for each of the built regressions may be found in appendices and correspond to the number of regression model in the table.

Table 1 demonstrates that for the whole dataset overall ESG performance is found to be significant for the stock price volatility at 1 percent significance level and the explanatory power of the model equals to almost 12 %. Considering pillar scores separately for the volatility, environmental and social pillars are also found to be significant and the R-squared of the model is 13,6 percent. Both environmental and social pillars, as well as aggregate ESG score, have a negative relationship with stock price volatilities, meaning that in Scandinavia more socially responsible companies have lower volatility.

In the models with annual returns, both normal and abnormal, significance of ESG scores is at the border of predefined significance level, but the models itself are insignificant at 1 percent level.

Table 1. Linear regression models with ESG performance scores for the whole sample with.

Numbering at the horizontal axis corresponds to the model number. In models 1-2, explained variable is annual stock return. In models 3-4, explained variable is abnormal annual stock return. In models 5-6, explained variable is stock price volatility. The table lists the parameter estimates and corresponding standard errors. Stars indicate the significance of parameters at various significance levels (*** p < 0.01, ** p < 0.05, * p < 0.1).

	(1)	(2)	(3)	(4)	(5)	(6)
	Yret	Yret	AbRet	AbRet	Vol	Vol
ESG	-0,2358 **		-0,2118 **		-0,1653 ***	
	(0,0923)		(0,0941)		(0,0171)	
E		0,0038		0,0893		-0,0491 ***
		(0,0942)		(0,0958)		(0,0173)
S		-0,1687		-0,1993		-0,1027 ***
		(0,1266)		(0,1286)		(0,0233)
G		-0,0809		-0,1537*		-0,0129
		(0,0874)		(0,0889)		(0,0161)
Intercept	37,376 ***	38,574 ***	12,266 **	16,471***	35,361 ***	35,379 ***
	(5,4543)	(6,072)	(5,5549)	(6,1716)	(1,0133)	(1,1165)
Observations	696	696	696	696	696	696
R-squared	0,0093	0,0092	0,0072	0,0111	0,118	0,136
F-stat	6,52**	2,14 *	5,07**	2,59 *	92,8 ***	36,3 ***

Considering the Table 2, models which additionally contain overall ESG score as one of the predictors are compared to the models which account only for the market capitalization and variables representing financial indicators. Specifically, significance of coefficient estimates and goodness of fit of the models are compared. Then, overall ESG score is subdivided into the environmental, social and governance pillars to test for the individual effects. This is done for stock price volatilities and both types of annual stock returns.

All the models are significant at 1 percent significance, meaning that independent variables add explanatory power to the models. Addition of the aggregate ESG score into the linear models improves the R-squared roughly by 3 percent and ESG parameter estimates are significant in each of the models.

Considering the regression models with normal annual stock returns, inclusion of ESG scores into the model also improves the performance. Both in models with and without ESG scores as explanatory variable, market capitalization and ROE have a positive relationship with returns which are significant at 1 percent

significance level. DE ratio is negatively related to the stock returns, but significant only at 5 percent significance level. Aggregate ESG score is negatively related to the stock returns with the coefficient of -0.4939 at 1 percent significance level. This means that companies having 1-point higher ESG score are associated with the 0.4939 % decrease of the annual return on average. Decomposition of the overall rating into the pillars has not affected the model performance significantly in comparison with the regression model 2. Market capitalization is still significant at 1 percent significance level with the coefficient of 6,472, meaning that higher market capitalization is associated with higher returns. ROE parameter's estimate also remains significant at 1 percent significance level with the coefficient equal to 0.1947, and DE ratio has a coefficient of -0.0173 only at 5 percent significance level. Social factor, being significant at 1 percent significance level, has a negative relationship with stock returns with the coefficient estimate of -0.3344. Governance factor, in turn, is also negatively related to the stock returns with the coefficient equal to 0.1603, but it is statistically significant only at 5 percent significance level, making it insignificant in the scope of the current research.

The same models are also constructed for abnormal returns. In both regression models 4 and 5, market capitalization and ROE variables have a positive significant relationship with abnormal stock returns at 1 percent significance level, while DE ratio is negatively related to the abnormal returns at 5 significance level similarly to the relative models for normal returns described earlier. Overall ESG performance has a negative relationship with abnormal stock returns with the coefficient of -0.4622 which is significant at 1 percent level. This coefficient is slightly lower than in the regression model 2 with normal returns. Model 6, representing the model with the factors, provides results similar to the previously explained for normal returns. Again, social and governance factors are negatively related to the abnormal stock returns.

However, social factor is significant at 1 percent significance level with the parameter estimates being equal to -0.3626, but governance score is significant only at 5 percent level. Similarities in results of the models with normal and abnormal returns are explained by the high correlation between these variables.

Concerning the volatilities of stock returns, in the model without ESG performance such variables as market capitalization, ROE and DE ratio are negatively related to the stock volatility and parameter estimates are significant at 1 percent significance level. MTB ratio, in turn, has a positive relationship with stock volatility, meaning that the more overvalued is the company, the higher is the volatility of its stocks. MTB ratio coefficient estimate equals to 0.4193 and is also significant at 1 percent level. Inclusion of the overall ESG score, does not change the relationship significantly, the estimate parameters for MTB ratio and market capitalization slightly decrease, but all the coefficients remain significant at 1 percent significance level. Aggregate ESG score is negatively related to the stock volatility of the whole sample, meaning that on average higher ESG performance is associated with the lower stock price volatility and risk. The coefficient estimate of the ESG score variable is equal to -0.0884 and is significant at 1 percent significance level. Decomposition of the overall score into factors indicates that the only factor being significant for stock price volatilities is the social factor with the parameter estimate of -0.0825 at the significance level of 1 percent. Environmental and governance scores are insignificant for the stock price volatility and all other explanatory variables remain significant at 1 percent level like in the regression model 8 with approximately the same coefficients. This means that higher overall ESG score, market capitalization, ROE and DE ratio are associated with lower stock price volatilities and increase in MTB ratio leads to a higher volatility respectively. Moreover, for the whole dataset better social performance is associated with lower volatility.

Table 2. Multivariate linear regression models for the whole sample.

Numbering at the horizontal axis corresponds to the model number. In models 1-3, explained variable is annual stock return. In models 4-6, explained variable is abnormal annual stock return. In models 7-9, explained variable is stock price volatility. The table lists the parameter estimates and corresponding standard errors. Stars indicate the significance of parameters at various significance levels (*** p < 0.01, ** p < 0.05, * p < 0.1).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Yret	Yret	Yret	AbRet	AbRet	AbRet	Vol	Vol	Vol
ESG		-0,4939 ***			-0,4622 ***			-0,0884 ***	
		(0,0981)			(0,1002)			(0,0168)	
E			-0,0268			-0,0543			-0,0122
			(0,0927)			(0,0944)			(0,0158)
S			-0,3344 ***			-0,3626 ***			-0,0825 ***
			(0,1238)			(0,1261)			(0,0211)
G			-0,1603 **			-0,2247 **			-0,0037
			(0,086)			(0,0876)			(0,0146)
ln(MarkCap)	4,0717 ***	6,4163 ***	6,472 ***	3,7007 ***	5,8948 ***	6,083 ***	-1,9461 ***	-1,5262 ***	-1,5296 ***
	(1,043)	(1,126)	(1,1356)	(1,0625)	(1,1504)	(1,1572)	(0,1793)	(0,1932)	(0,1935)
ROE	0,2076 ***	0,1992 ***	0,1947 ***	0,2387 ***	0,2308 ***	0,2163 ***	-0,0955 ***	-0,0971 ***	-0,0949 ***
	(0,0656)	(0,0645)	(0,0652)	(0,0669)	(0,0659)	(0,0664)	(0,0037)	(0,0111)	(0,0111)
MTB	0,1335	-0,2119	-0,223	-0,163	-0,4862	-0,4741	0,4193 ***	0,3575 ***	0,3454 ***
	(0,3740)	(0,3739)	(0,3769)	(0,381)	(0,3821)	(0,3841)	(0,0642)	(0,0641)	(0,0642)
DE	-0,0162 **	-0,0158 **	-0,0173 **	-0,0160 **	-0,0157 **	-0,0181 **	-0,0044 ***	-0,00043 ***	-0,00046 ***
	(0,0077)	(0,0075)	(0,0077)	(0,0078)	(0,0078)	(0,0079)	(0,0013)	(0,0013)	(0,0013)
Intercept	-44,3 ***	-54,283 ***	-54,349 ***	- 61,269 ***	-70,611 **	-67,748 ***	58,569 ***	56,781 ***	57,247 ***
	(17,083)	(16,906)	(17,078)	(17,403)	(17,273)	(17,403)	(2,9355)	(2,9006)	(2,9099)
Observations	696	696	696	696	696	696	696	696	696
R-squared	0,0653	0,0984	0,0993	0,0628	0,0908	0,0964	0,288	0,315	0,326
F-stat	12,1 ***	15,1 ***	10,8 ***	11,6 ***	13,8 ***	10,5 ***	69,9 ***	63,6 ***	47,4 ***

Then, the same set of multivariate linear regressions is conducted for each of the countries to define cross-country similarities and differences and estimate whether ESG performance has a significant relationship with financial performance in each country.

6.2. Swedish companies

Table 3 represents the results of the models solely with ESG performance as the explanatory factor. Regression models with overall ESG score as predictor are significant at 1 percent level for normal and abnormal annual stock returns, but the explanatory power of these models is relatively low, despite the significance of the models at 1 percent level. Models with pillar scores as explanatory variables for stock returns are insignificant at the predefined significance level of 1 percent. In case of stock price volatilities of Swedish companies, both model with aggregate ESG and model with pillars are significant at 1 percent level and have an explanatory power of 17,5 and 24,7 percent respectively. Higher overall ESG score is associated with lower stock price volatility, and environmental and social pillar scores have a statistically significant negative relationship with volatility at 1 percent level. Hence, investing into the socially responsible companies maybe be beneficial in case of risk management, but not making extra profits.

Table 3. Linear regression models with ESG performance scores for Swedish companies
Numbering at the horizontal axis corresponds to the model number. In models 1-2, explained variable is annual stock return. In models 3-4, explained variable is abnormal annual stock return. In models 5-6, explained variable is stock price volatility. The table lists the parameter estimates and corresponding standard errors. Stars indicate the significance of parameters at various significance levels (*** p < 0.01, ** p < 0.05, * p < 0.1).

	(1)	(2)	(3)	(4)	(5)	(6)
	Yret	Yret	AbRet	AbRet	Vol	Vol
ESG	-0,4007 ***		-0,3874 ***		-0,1752 ***	
	(0,1284)		(0,1281)		(0,021)	
E		0,0066		0,0429		-0,0617 ***
		(0,1323)		(0,1317)		(0,0207)
S		-0,3923 **		-0,4315 **		-0,1376 ***
		(0,1867)		(0,1859)		(0,0292)
G		-0,0304		-0,0458		0,0337
		(0,1276)		(0,127)		(0,02)
Intercept	51,142 ***	53,582 ***	24,527**	29,197***	34,838 ***	34,199 ***
	(7,4481)	(8,9481)	(7,4305)	(8,9105)	(1,2185)	(1,4011)
Observations	330	330	330	330	330	330
R-squared	0,0288	0,0319	0,0271	0,0338	0,175	0,247
F-stat	9,73***	3,58 **	9,14 ***	3,8 **	69,5 ***	35,6 ***

The results in the Table 4 state that all the regression models with additional explanatory variables are again significant at 1 percent significance level like for the whole dataset. Inclusion of ESG performance variables into the models improves the R-squared at least by 6 percent for normal and abnormal stock returns, but for the volatility models explanatory power remains almost at the same level.

In case of normal annual stock returns, overall ESG score has a negative relationship with explained variable. The coefficient is equal to -0.7038 and significant at 1 percent significance level. In other words, 1 point increase in overall ESG performance leads to roughly 0.7 percent lower annual stock return. Moreover, Market capitalization is positively related with stock returns both in models with and without ESG variable, meaning that larger companies provided higher returns during the considered period (in the regression model 1 it is a border case). ROE is positively related to stock returns as well, but it is significant only at 10 percent significance level and does not fulfil the predefined requirement of significance.

Decomposition of the aggregate ESG performance into the pillar scores demonstrates that social factor is found to be significant at 1 percent significance level and negatively relate to annual stock return. Also, market capitalization is still significant at 1 percent significance level, having a positive coefficient estimate.

Results retrieved from the models on annual abnormal stock returns state that market capitalization is positively related to dependent variable and significant at 1 percent level. In contrast to normal stock returns, significant relationship with ROE variable is not found at any significance level, but DE ratio is negatively related to stock returns at 5 percent significance level. Then, overall ESG performance has a statistically significant negative relationship with abnormal returns similarly to the model 2 due to high correlation between normal and abnormal returns.

Model with pillars separately states that social factor is negatively related to abnormal stock returns and significant at 1 percent level. Parameter estimate for the social factor equals to -0.7513, meaning that the relationship between social performance and abnormal annual stock returns is negative. Thus, companies which perform better in such aspects as human rights, business ethics or product responsibility are found to provide lower returns. Additionally, governance score has a negative relationship with abnormal stock returns, but it is significant only at 5 percent level. Inclusion of pillar scores into the regression model improves the explanatory power approximately by 9 percent.

The results regarding the models with stock price volatility of Swedish companies are in line with the results for the whole sample. Market capitalization, ROE ratio and DE ratio have a negative relationship with stock volatilities and parameter estimates are significant at 1 percent significance

level. At the same time, MTB is found to be positively related to stock volatility, meaning that more overvalued companies tend to be more volatile. Overall ESG performance is negatively related to a stock price volatility with the parameter estimate being significant at 1 percent significance level. Model with pillar scores as explanatory variables states that a social factor parameter estimate is significant at 1 percent level and negatively relates to stock price volatilities of Swedish companies. Governance score also has a statistically significant negative relationship with stock price volatilities, but only at 10 percent significance level, making it insignificant in the scope of the current research.

Table 4. Multivariate linear regression models for Swedish companies

Numbering at the horizontal axis corresponds to the model number. In models 1-3, explained variable is annual stock return. In models 4-6, explained variable is abnormal annual stock return. In models 7-9, explained variable is stock price volatility. The table lists the parameter estimates and corresponding standard errors. Stars indicate the significance of parameters at various significance levels (*** p < 0.01, ** p < 0.05, * p < 0.1).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Yret	Yret	Yret	AbRet	AbRet	AbRet	Vol	Vol	Vol
ESG		-0,7038 ***			-0,7337 ***			-0,0582 ***	
		(0,1483)			(0,1467)			(0,022)	
E			-0,078			-0,0349			-0,0223
			(0,1327)			(0,1858)			(0,0194)
S			-0,6506 ***			-0,7513 ***			-0,076 ***
			(0,1888)			(0,1858)			(0,0276)
G			-0,0304			-0,0536 **			0,0374 *
			(0,1221)			(0,1203)			(0,0179)
ln(MarkCap)	4,4326 **	8,8177 ***	9,3691 ***	5,0903 ***	9,6619 ***	10,353 ***	-2,45 ***	-2,0873 ***	-1,9105 ***
	(1,7239)	(1,908)	(1,9431)	(1,7124)	(1,8886)	(1,9132)	(0,2499)	(0,283)	(0,2843)
ROE	0,1945 *	0,1899 *	0,2125 *	0,1439	0,1392	0,1622	-0,071 ***	-0,0714 ***	-0,0662 ***
	(0,1155)	(0,1112)	(0,1118)	(0,1147)	(0,1107)	(0,1101)	(0,0167)	(0,0166)	(0,0163)
MTB	0,8128	-0,0245	-0,2712	-0,498	-0,3238	-0,6873	0,5471 ***	0,4819 ***	0,432 ***
	(0,5424)	(0,551)	(0,5630)	(0,5388)	(0,5453)	(0,5544)	(0,0786)	(0,0817)	(0,0824)
DE	-0,017	-0,0138	-0,0162	-0,0249 **	-0,0215 **	-0,0248 **	-0,0044 ***	-0,0043 ***	-0,0042 ***
	(0,0107)	(0,0104)	(0,0105)	(0,0106)	(0,0103)	(0,0104)	(0,0015)	(0,0015)	(0,0015)
Intercept	-49,909 *	-83,474 ***	-86,996 ***	- 84,261 ***	-119,25 ***	-121,22 ***	66,449 ***	63,673 ***	60,907 ***
	(29,262)	(29,207)	(30,361)	(29,067)	(28,91)	(29,894)	(4,2414)	(4,3316)	(4,4424)
Observations	330	330	330	330	330	330	330	330	330
R-squared	0,0585	0,12	0,132	0,065	0,132	0,153	0,372	0,385	0,41
F-stat	5,05 ***	8,81 ***	7 ***	5,65 ***	9,85 ***	8,32 ***	48,2 ***	40,6 ***	32 ***

6.3. Finnish companies

According to the results of regression models with only ESG performance of Finnish companies, presented in Table 5, all the models are found to be insignificant both for returns and volatilities. Social and governance factors are found to be significant for abnormal returns at 10 and 5 percent levels relatively, while environmental and social factors have a statistically significant relationship with stock volatilities at 5 percent level. However, regression models for stock price volatilities for Finnish companies are not found to be significant.

Table 5. Linear regression models with ESG performance scores for Finnish companies
Numbering at the horizontal axis corresponds to the model number. In models 1-2, explained variable is annual stock return. In models 3-4, explained variable is abnormal annual stock return. In models 5-6, explained variable is stock price volatility. The table lists the parameter estimates and corresponding standard errors. Stars indicate the significance of parameters at various significance levels (*** p < 0.01, ** p < 0.05, * p < 0.1).

	(1)	(2)	(3)	(4)	(5)	(6)
	Yret	Yret	AbRet	AbRet	Vol	Vol
ESG	0,2065		-0,1762		0,0286	
	(0,1676)		(0,1739)		(0,0425)	
E		0,2597		0,1944		0,0921 *
		(0,1918)		(0,196)		(0,0485)
S		0,2251		0,3791 *		-0,105 *
		(0,2016)		(0,206)		(0,051)
G		-0,243		-0,347 **		0,0192
		(0,1565)		(0,16)		(0,0396)
Intercept	4,6861	-1,2798	10,343	-18,62	21,973 ***	23,764 ***
	(11,179)	(11,56)	(11,599)	(11,815)	(2,8411)	(2,9249)
Observations	99	99	99	99	99	99
R-squared	0,0154	0,0589	0,0105	0,0822	0,0046	0,0569
F-stat	1,52	1,98	1,03	2,84 **	0,45	1,91

In contrast, all the regression models with additional explanatory variables are significant at 1 percent significance level. Explanatory power of the models with normal and abnormal returns varies between 25 and 31,5 percent. Results for the models with normal annual returns state that ROE has a statistically significant positive relationship with explained variable at 1 percent significance level. Neither overall ESG score, nor pillar scores are found to

have a significant relationship to normal stock return of the Finnish companies. Considering the regression models with abnormal stock return as explained variable, the results are similar to the results for normal returns. ROE is again statistically significant at 1 percent level and positively related to abnormal stock returns. This means that there is no dependence found between annual stock returns and ESG performance in Finland.

Inclusion of overall ESG score and pillar scores into the models for stock price volatilities of Finnish companies improves the explanatory power from roughly 28 to 35 and 41,5 percent respectively. For all the models with stock volatility market capitalization, ROE and DE ratio have a negative relationship with explanatory variable which is significant at 1 percent level. Aggregate ESG score in regression model 8 has a statistically significant positive relationship with volatility of the stock prices, meaning that higher ESG performance leads to a higher volatility. However, decomposition into pillars results in statistically significant negative coefficient estimate for environmental pillar being equal to -0.1827, what means that 1 point increase in environmental performance is associated with 0.18 percent decrease in stock price volatility of Finnish companies.

Table 6. Multivariate linear regression models for Finnish companies

Numbering at the horizontal axis corresponds to the model number. In models 1-3, explained variable is annual stock return. In models 4-6, explained variable is abnormal annual stock return. In models 7-9, explained variable is stock price volatility. The table lists the parameter estimates and corresponding standard errors. Stars indicate the significance of parameters at various significance levels (*** p < 0.01, ** p < 0.05, * p < 0.1).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Yret	Yret	Yret	AbRet	AbRet	AbRet	Vol	Vol	Vol
ESG		0,0659			-0,0223			0,1486 ***	
		(0,1994)			(0,201)			(0,047)	
E			0,1034			-0,0111			-0,1827 ***
			(0,1893)			(0,1887)			(0,0426)
S			0,1131			0,2324			-0,0537
			(0,186)			(0,1854)			(0,0418)
G			-0,1372			-0,2456			0,0199
			(0,1525)			(0,152)			(0,0343)
ln(MarkCap)	3,3888 *	2,8313	2,8186	4,0255 **	4,2146	4,6594 *	-1,5141 ***	-2,7704 ***	-3,0464 ***
	(2,0107)	(2,6314)	(2,7129)	(2,0264)	(2,6534)	(2,7042)	(0,4989)	(0,6209)	(0,6102)
ROE	0,8624 ***	0,8669 ***	0,8284 ***	0,8974 ***	0,8959 ***	0,8379 ***	-0,1912 ***	-0,1811 ***	-0,1875 ***
	(0,1788)	(0,1802)	(0,1839)	(0,1802)	(0,1817)	(0,1833)	(0,0444)	(0,0425)	(0,0414)
MTB	-2,1949	-2,0238	-2,1497	-1,4953	-1,5534	-1,9607	0,0103	0,396	0,5431
	(1,3722)	(1,4727)	(1,5045)	(1,383)	(1,4851)	(1,4996)	(0,3405)	(0,3475)	(0,3384)
DE	0,0389 *	0,0384 *	0,0374 *	0,034	0,0342 *	0,0337	-0,0173 ***	-0,0185 ***	-0,0195 ***
	(0,0218)	(0,022)	(0,0221)	(0,022)	(0,0222)	(0,0221)	(0,0054)	(0,0052)	(0,005)
Intercept	-40,105	-36,485	-38,227	-68,278 **	-69,505 **	-77,299	50,251 ***	58,408 ***	62,193 ***
	(30,235)	(32,292)	(33,144)	(30,472)	(32,562)	(33,037)	(7,5023)	(7,6193)	(7,4545)
Observations	99	99	99	99	99	99	99	99	99
R-squared	0,251	0,251	0,262	0,289	0,289	0,315	0,278	0,348	0,415
F-stat	7,85 ***	6,25 ***	4,61 ***	9,57 ***	7,58 ***	5,98 ***	9,03 ***	9,91 ***	9,24 ***

6.4. Norwegian companies

Analysis of the Norwegian companies and the relationship between the ESG performance and financial performances is conducted in the same way as it was done previously. Table 7 demonstrates the results of regression models where explanatory variables are overall ESG and pillar scores.

Models with normal and abnormal annual stock returns are found to be insignificant and there is no relationship found between financial and ESG performance. However, regression models built for stock price volatility are both significant at 1 percent significance level and R squared for these models is around 25 percent. Results of regression model 5 state that aggregate ESG score has a negative relationship with stock price volatility of Norwegian companies represented in the current sample. Coefficient estimate of overall ESG score is -0.3221 and significant 1 percent level, meaning that 1 percent increase in overall ESG performance, on average, leads to a 0.32 percent stock price volatility decrease.

Table 7. Linear regression models with ESG performance scores for Norwegian companies
Numbering at the horizontal axis corresponds to the model number. In models 1-2, explained variable is annual stock return. In models 3-4, explained variable is abnormal annual stock return. In models 5-6, explained variable is stock price volatility. The table lists the parameter estimates and corresponding standard errors. Stars indicate the significance of parameters at various significance levels (*** p < 0.01, ** p < 0.05, * p < 0.1).

	(1)	(2)	(3)	(4)	(5)	(6)
	Yret	Yret	AbRet	AbRet	Vol	Vol
ESG	-0,2157		-0,1746		-0,3221 ***	
	(0,2454)		(0,2607)		(0,046)	
E		0,3557		0,3896		-0,0799
		(0,2762)		(0,2928)		(0,0517)
S		-0,3654		-0,3008		-0,0654
		(0,3328)		(0,3528)		(0,0623)
G		-0,3191		-0,3964*		-0,1788 ***
		(0,2197)		(0,2329)		(0,0411)
Intercept	28,934 **	38,254 ***	7,7625	18,297	47,343 ***	47,364 ***
	(13,813)	(14,382)	(14,673)	(15,244)	(2,5905)	(2,6937)
Observations	150	150	150	150	150	150
R-squared	0,0052	0,0269	0,003	0,0291	0,249	0,267
F-stat	0,773	1,34	0,448	1,46	49 ***	17,7 ***

Then models with additional explanatory variables are analysed and the results are summarized in the Table 8. Considering the models with normal annual stock return as predictive variable, model which has solely market capitalization and additional financial explanatory variables is significant only at 5 percent significance level. Inclusion of aggregate ESG score into the regression leads to the significance of the model at 1 percent level and improvement of explanatory power from 6.6 to 12.4 percent. Market capitalization and overall ESG score are significant at 1 percent level. While capitalization is positively related to the normal stock return, coefficient estimate for the ESG score variable is negative and has a value of -0.8894. Decomposition of the aggregate ESG score into pillars improves the explanatory power of the model to 15.4 percent and the regression model is significant at 1 percent level like the model with overall ESG score. Market capitalization is also found to have a positive relationship with normal stock returns at 1 percent significance level. Also, governance score has a negative relationship with normal returns at 1 percent significance level.

Results of the regressions for abnormal annual stock returns are similar. Model without ESG performance related variables is significant only at 5 percent level. Inclusion of overall ESG score into the model improves its explanatory power by roughly 6 percent and makes it significant at 1 percent level. Market capitalization is positively related with abnormal stock returns and overall ESG has a negative relationship at 1 percent significance level similarly to the same models built for normal returns. In the regression model with factors, governance score has a negative relationship with abnormal stock returns and parameter estimate equals to -0.9207 at 1 percent significance level. Market capitalization again has a statistically significant positive relationship with abnormal returns.

All the models explaining the relationship with stock price volatilities of Norwegian companies are statistically significant at 1 percent level and have R-squared varying from 46.2 to 51.6 percent. In each of these models, market capitalization and ROE have a statistically significant negative relationship with stock price volatility at 1 percent level. Overall ESG score is found to be significantly negatively related with stock price volatility and coefficient estimate is equal to -0.1546 at 1 percent level. Regression model which has pillar scores as explanatory variables shows that governance score is found to have a statistically significant negative relationship with the stock price volatility of Norwegian companies and coefficient is -0.121.

Table 8. Multivariate linear regression models for Norwegian companies

Numbering at the horizontal axis corresponds to the model number. In models 1-3, explained variable is annual stock return. In models 4-6, explained variable is abnormal annual stock return. In models 7-9, explained variable is stock price volatility. The table lists the parameter estimates and corresponding standard errors. Stars indicate the significance of parameters at various significance levels (*** p < 0.01, ** p < 0.05, * p < 0.1).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Yret	Yret	Yret	AbRet	AbRet	AbRet	Vol	Vol	Vol
ESG		-0,8894 ***			-0,9207 ***			-0,1546 ***	
		(0,2894)			(0,3041)			(0,047)	
E			0,0734			0,049			0,0263
			(0,2746)			(0,2872)			(0,0448)
S			-0,4503			-0,3831			-0,0773
			(0,318)			(0,3326)			(0,0519)
G			-0,6824 ***			-0,7921 ***			-0,121 ***
			(0,2295)			(0,1512)			(0,0374)
ln(MarkCap)	5,4223 *	11,123 ***	12,531 ***	6,1195 **	12,021 ***	13,856 ***	-3,8238 ***	-2,833 ***	-2,6698 ***
	(2,8084)	(3,3005)	(3,3561)	(2,9487)	(3,4686)	(3,5111)	(0,4598)	(0,5382)	(0,5477)
ROE	0,1794	0,1431	0,1024	0,2358 *	0,1983	0,1512	-0,0756 ***	-0,0819 ***	-0,0893 ***
	(0,1185)	(0,1157)	(0,1164)	(0,1244)	(0,1216)	(0,12174)	(0,0194)	(0,0189)	(0,019)
MTB	0,3457	0,095	0,324	0,2252	-0,0343	0,2017	0,3256 **	0,2821 *	0,3327 **
	(0,9638)	(0,9404)	(0,9438)	(1,012)	(0,9883)	(0,9874)	(0,1578)	(0,1533)	(0,154)
DE	-0,0081	-0,0162	-0,0169	-0,0106	-0,019	-0,0197	-0,0045	-0,006	-0,0059
	(0,0233)	(0,0228)	(0,0226)	(0,0245)	(0,024)	(0,0236)	(0,0038)	(0,0037)	(0,0037)
Intercept	-71,125	-114,48 **	-126,39 ***	-100,96 **	-145,85 ***	-162,93***	92,534 ***	84,998 ***	83,645 ***
	(46,085)	(46,968)	(47,478)	(48,388)	(49,36)	(49,991)	(7,5462)	(7,6588)	(7,7988)
Observations	150	150	150	150	150	150	150	150	150
R-squared	0,0665	0,124	0,154	0,0861	0,141	0,178	0,462	0,5	0,516
F-stat	2,58 **	4,07 ***	3,7 ***	3,41 **	4,72 ***	4,39 ***	31,2 ***	28,8 ***	21,6 ***

6.5. Danish companies

Results of the analysis on relationship between ESG performance and financial performance of Danish companies without taking into consideration additional explanatory variables demonstrate that all the models are found to be statistically insignificant at any considered significance level and can be seen in the Table 9. Only environmental score is found to have a negative relationship with stock price volatility at 5 percent significance level, but the model is still insignificant.

Table 9. Linear regression models with ESG performance scores for Danish companies
Numbering at the horizontal axis corresponds to the model number. In models 1-2, explained variable is annual stock return. In models 3-4, explained variable is abnormal annual stock return. In models 5-6, explained variable is stock price volatility. The table lists the parameter estimates and corresponding standard errors. Stars indicate the significance of parameters at various significance levels (*** p < 0.01, ** p < 0.05, * p < 0.1).

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	Yret	*Yret*	*AbRet*	*AbRet*	*Vol*	*Vol*
ESG	*0,107*		*0,0544*		*0,0097*	
	(0,2465)		*(0,2499)*		*(0,0389)*	
E		*0,0173*		*0,1797*		*-0,0732 ** *
		(0,2243)		*(0,2266)*		*(0,0347)*
S		*0,163*		*0,0295*		*0,074*
		(0,293)		*(0,2959)*		*(0,0453)*
G		*-0,0424*		*-0,1677*		*0,0329*
		(0,2078)		*(0,426)*		*(0,0321)*
Intercept	*17,536*	*15,161*	*-9,1373*	*-7,3379*	*24,566 *** *	*22,348 *** *
	(14,457)	*(15,406)*	*(14,655)*	*(15,558)*	*(2,2842)*	*(2,3832)*
Observations	*117*	*117*	*117*	*117*	*117*	*117*
R-squared	*0,0016*	*0,005*	*0,0004*	*0,0113*	*0,0005*	*0,0451*
F-stat	*0,188*	*0,188*	*0,0474*	*0,43*	*0,062*	*1,78*

Table 10 provides the results of analysis with additional explanatory variables for Danish companies. All the models for normal and abnormal annual stock returns which include aggregate ESG score, or pillar scores are found to be insignificant. For normal annual stock returns, MTB ratio is negatively related to explained variable and significant at 10 percent level in regression model with overall ESG score and at 5 percent level with pillar scores as predictors. In regression models for abnormal stock returns market capitalization has a negative relationship with regressand and significant at 5 percent level in

regression model with overall ESG score and at 10 percent level in regression with pillar scores. Also, MTB is found to be statistically significant at 10 percent level and has a negative relationship with abnormal annual stock returns of Danish companies. However, these relationships are insignificant at the predefined level of 1 percent, and, as it was previously said, regression models are insignificant as well.

Considering models with stock price volatilities, regression models are statistically significant at 1 percent level and R-squared varies between 14.6 and 19.2 percent. DE ratio has a negative relationship with stock volatility, but it is significant only at 10 percent level. Then, ROE is found to have a negative relationship with volatility in the model which has aggregate ESG score as explanatory variable, but again only at 10 percent significance level. In the context of the current research these variables are considered to be insignificant at the predefined significance level of 1 percent. However, market capitalization has a statistically significant negative relationship with stock volatility in the models where ESG performance is included. This means that larger capitalization is associated with a lower volatility. Overall ESG score is statistically significant and has a positive relationship with stock price volatility of Danish companies only at 5 percent level. At the same there is no statistically significant relationship found between stock price volatility and pillar scores.

Table 10. Multivariate linear regression models for Danish companies

Numbering at the horizontal axis corresponds to the model number. In models 1-3, explained variable is annual stock return. In models 4-6, explained variable is abnormal annual stock return. In models 7-9, explained variable is stock price volatility. The table lists the parameter estimates and corresponding standard errors. Stars indicate the significance of parameters at various significance levels (*** p < 0.01, ** p < 0.05, * p < 0.1).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Yret	Yret	Yret	AbRet	AbRet	AbRet	Vol	Vol	Vol
ESG		-0,07563			-0,2986			0,1122 **	
		(0,3205)			(0,3239)			(0,0472)	
E			-0,1807			-0,1392			0,0047
			(0,2571)			(0,26)			(0,0379)
S			0,2475			0,1546			0,0619
			(0,33)			(0,3338)			(0,0487)
G			-0,0334			-0,2038			0,0468
			(0,2105)			(0,2129)			(0,031)
ln(MarkCap)	5,1525	5,6887	5,5881	5,9803 *	8,0967 **	7,6466 *	-0,8843 *	-1,6797 ***	-1,6145 ***
	(3,1076)	(3,8603)	(3,9127)	(3,1519)	(3,9014)	(3,9568)	(0,4694)	(0,5689)	(0,5769)
ROE	0,1862	0,1731	0,2284	0,2198	0,168	0,205	-0,0701 **	-0,0506 *	-0,0448
	(0,1973)	(0,2058)	(0,2152)	(0,2001)	(0,208)	(0,2176)	(0,0298)	(0,0303)	(0,0317)
MTB	-1,599 *	-1,561*	-1,8483 **	-1,5124*	-1,3624	-1,6155 *	0,1382	0,0819	0,0668
	(0,8539)	(0,8725)	(0,9252)	(0,866)	(0,8818)	(0,9357)	(0,129)	(0,1286)	(0,1364)
DE	-0,0255	-0,0253	-0,0214	-0,0049	-0,0043	-0,0006	-0,0041 *	-0,0044 *	-0,0042 *
	(0,1123)	(0,016)	(0,0168)	(0,0161)	(0,0162)	(0,017)	(0,0024)	(0,0024)	(0,0024)
Intercept	-57,54	-62,531	-69,48	-104,81 **	-124,51 **	-124,84 **	41,254 ***	48,657 ***	47,26 ***
	(51,488)	(55,864)	(58,473)	(52,222)	(56,459)	(59,133)	(7,7771)	(8,2335)	(8,6223)
Observations	117	117	117	117	117	117	117	117	117
R-squared	0,0669	0,0673	0,0729	0,0647	0,0718	0,0762	0,146	0,188	0,192
F-stat	2,01 *	1,6	1,22	1,94	1,72	1,29	4,8 ***	5,13 ***	3,69 ***

7. Conclusion

The study shows that an aggregate ESG score has a statistically significant negative relationship with the volatility of stock prices in the Scandinavian countries, when solely ESG performance is used as explanatory variables. Decomposition into the pillars leads to the result that better environmental and social factor scores are associated with lower stock price volatility in the considered countries. Social factor score is found to have a more significant impact on a stock price volatility.

After inclusion of market capitalization and additional financial regressors into the models for the whole sample, all the models built for both types of returns and volatility are found to be significant at 1 percent level and appear to have higher explanatory power. Better overall ESG rating is negatively related with all the considered predicted variables, meaning that higher overall ESG rating is associated with lower normal and abnormal annual stock returns, but also with lower stock price volatility. The only factor which has a statistically significant relationship with the predicted variables is social factor, which has a negative relationship with all of the regressands. Market capitalization and ROE measure have a statistically significant positive relationship with normal and abnormal stock returns and negative with volatility. It means that companies with larger capitalization provide higher returns and are less volatile. Also, companies, which generate profits more efficiently, are associated with higher normal and abnormal returns and are less volatile. Additionally, companies with higher MTB are found to have s higher volatility, while higher Debt-to-equity ratio leads to a lower stock price volatility, but the coefficient estimate is quite low.

Results of the cross-country analysis are mixed. Considering regression models built only with an aggregate ESG score and pillar scores state that there is no statistically significant relationship found between ESG and financial performance for Finnish and Danish companies. In Sweden and Norway, a significant negative relationship between overall ESG score and stock price volatility exists. For both countries governance score is found to be negatively related to stock volatility. Effect of the overall ESG performance and namely governance score on financial performance in Norway is more substantial. Additionally, in Sweden an overall ESG performance is negatively related to normal and abnormal returns and social factor is statistically significant for a stock price volatility with a negative coefficient estimate.

Results on the models with additional explanatory variables state that considering normal and abnormal annual stock returns, there is no relationship found between ESG performance and financial performance in Finland and Denmark. For Finnish companies only ROE is found to have a statistically significant positive relationship with both types of returns. In Sweden and Norway higher overall ESG rating is associated with lower stock returns of both types, having a more significant impact in Norway. However, results of the regression models with decomposition into pillar scores state that .in Sweden social factor is found to be significant, while in Norway governance score is significantly negatively related to normal and abnormal annual stock returns. Another finding is that market capitalization has a statistically significant positive relationship with normal and abnormal returns in both countries.

Results of the models with volatility as a predictive variable demonstrate that market capitalization is found to have a statistically significant negative relationship with a stock price volatility in all the countries, meaning that larger

companies are exposed to lower stock price volatilities. In Denmark there is no evidence found that relationship between ESG performance and stock price volatility exists. In Finland, results of the analysis are contradictory, because an aggregate ESG performance is found to affect positively the stock price volatility, while environmental performance has a negative relationship with volatility. Also, ROE and DE measures are negatively related with stock price volatilities of Finnish companies according to the results.

Results in Sweden and Norway are similar to the previously described for annual stock returns in these countries. Better overall ESG performance is associated with lower normal and abnormal annual stock returns. Social factor is found to be statistically significant for Swedish companies and governance score for Norwegian.

In general, there is no evidence found that companies with better ESG performance provide higher returns. Investors should understand that investing in socially responsible companies is not associated with higher returns. However, highly ESG-rated companies turn out to be less volatile, what allows to prevent substantial losses during periods of market crash.

The paper contributes to previous research by providing an overview of a relationship between financial and ESG performance in Scandinavian countries using Refinitiv ESG scores. It was previously mentioned that one of the limitations of the current study is that no access was received to gather ratings of another ESG provider. Also, it was stated that divergence exists among ESG ratings provided by various companies. Therefore, it is recommended to analyze the dependence between financial and ESG performance using a different ESG rating in future research and then compare with the results of this study. This will allow to understand whether the results of this study can be applied by investors with other ESG ratings rather than Refinitiv.

8. Summary

The goal of the study was to investigate the relationship between ESG performance of Scandinavian countries and their financial performance, as well as understand which factors have a significant impact on returns and volatility of stock prices. The study also provides an overview on ESG topic, main rating providers and methodology of Refinitiv ESG rating used in the current research.

In the analysis part, 15 regressions were conducted for the whole sample to investigate the impact of the overall ESG performance and each of the factor on financial performance in Scandinavia. Then, the same regressions were conducted for each of the countries to find similarities and differences among them. Three measures were considered under the financial performance: normal annual stock return, abnormal annual stock return and stock price volatility.

The following research questions were set in the study:

1) **Is the ESG performance proportional to the financial performance?**

Considering solely aggregate ESG score for the whole sample, ESG performance is not found to have a statistically significant relationship with normal and abnormal returns. However, the relationship with stock price volatility is found to be negative and statistically significant. This means, that companies with higher ESG performance are less volatile and investor willing to reduce risks should consider companies with better ESG performance. Thus, current study proves the results previously stated by Jakobsson and Lundberg (2018), Kaiser (2020) and Albuquerque et al. (2020) with new data.

Implementation of additional independent variables improves the explanatory power of the models by roughly 8 percent for both types of stock returns and approximately by 20 percent for stock price volatility. Results for returns are comparatively at the same level, but for stock price volatility improvement of explanatory power is above the level stated in the research of Engelhardt et al. (2021). Combined with other explanatory variables, aggregate ESG score appears to have statistically significant negative impact on stock returns in Scandinavia, in addition to stock price volatility. Thus, investing into the highly ESG-rated Scandinavian companies is associated with lower stock returns, what is in line with Brammer et al. (2006) and results of Engelhardt et al. (2021) and Borovkova and Wu (2020) for the European market.

2) **What are the most significant ESG factors influencing the financial performance?**

Decomposition into the pillar scores allowed to investigate effect of each factor on financial performance. Environmental and social scores have a statistically significant negative relationship with the volatility of the stocks when considered without additional regressands. Hence, companies which care about such as topics as emissions from production, pollution, human rights and, for instance, business ethics are considered to be less risky. Furthermore, social pillar score has a more significant impact for stock price volatility in comparison with environmental. At the same time, no evidence found on relationship between pillar scores and stock returns.

With additional predictors only social factor score is found to be significantly at 1 percent level both for stock returns and volatility, meaning that companies with higher rated social performance provide lower returns, but considered to be less volatile. This finding is also in line with results provided by Engelhardt

et al. (2021), who analyzed European countries during COVID-19 period based on Refinitiv ESG scores. Thus, the interaction between social factor and financial performance is found to be the most significant considering the Scandinavian region.

3) **Do these factors differ among Scandinavian countries?**

Results of the cross-country analysis state that factor significance varies among Scandinavian countries considered in the paper. For instance, in Denmark there is no evidence of relationship between ESG and financial performance found. The only finding is that larger market capitalization of Swedish companies is associated with lower stock price volatility.

In Finland, only environmental score is found to have a statistically significant negative relationship with stock price volatilities when considered with other explanatory variables. It is also worth mentioning that aggregate ESG score is positively related with stock price volatility what is not in line with overall research results. However, there is no relationship between stock returns and ESG performance, and the same finding was previously stated by Holanne (2017) using Bloomberg ESG ratings.

In Norway, companies with overall better ESG performance have a lower stock price volatility. In contrast to Finnish companies, governance score is found to have a statistically significant negative relationship with stock price volatility. Considered with additional explanatory variables, aggregate ESG score and governance score are found to have a statistically significant negative relationship with normal and abnormal annual stock returns, not only with stock price volatility. Johansen and Grindheim (2021) provided contradictory results and have not found any significant relationship between ESG performance and

abnormal stock returns of Norwegian companies despite the fact that Refinitiv ESG scores were used.

Considering solely ESG performance as predictors, coefficient estimates of environmental and social factor scores in Sweden are statistically significant and have a negative relationship with volatility. This means that better performance in environmental and social aspects leads to a lower stock price volatility of Swedish companies. In addition, overall ESG score has a statistically significant negative relationship with stock price volatilities, like for Norwegian companies. Moreover, overall ESG performance is negatively related with both types of stock returns. When considered together with other explanatory variables, only social factor remains significant and has a negative relationship both with returns and volatility. Overall ESG performance also has a statistically significant negative relationship with all the explained variables like in Norway.

Additionally, it is worth mentioning that higher market capitalization is associated with lower stock price volatility in all the countries. In case of returns, companies with larger capitalization are associated with higher returns in Sweden and Norway. Moreover, contribution in stock price volatilities is found to be more significant compared to the stock returns.

In general, the results of the cross-country analysis are mixed. The differences may be related to the composition of the sample, because the distribution among industries significantly varies for the considered countries.

However, in 3 out of 4 countries market capitalization, ROE and aggregate ESG score have a significant negative relationship with stock price volatility.

Overall, results of the study state that, from the investors' point of view, socially responsible investing should be perceived not as a way to get higher

returns, but rather a preventive measure to avoid large losses during the periods of uncertainty. Investing in companies with better ESG performance and larger capitalization may be reasonable to prevent high fluctuations during the crisis periods and, as a result, avoid substantial losses.

Additionally, in Norway and Sweden market capitalization and overall ESG score have statistically significant negative impact on both types of stock returns. This means, that investors aligning investment decision-making with personal values should be ready to partly sacrifice stock returns in these countries.

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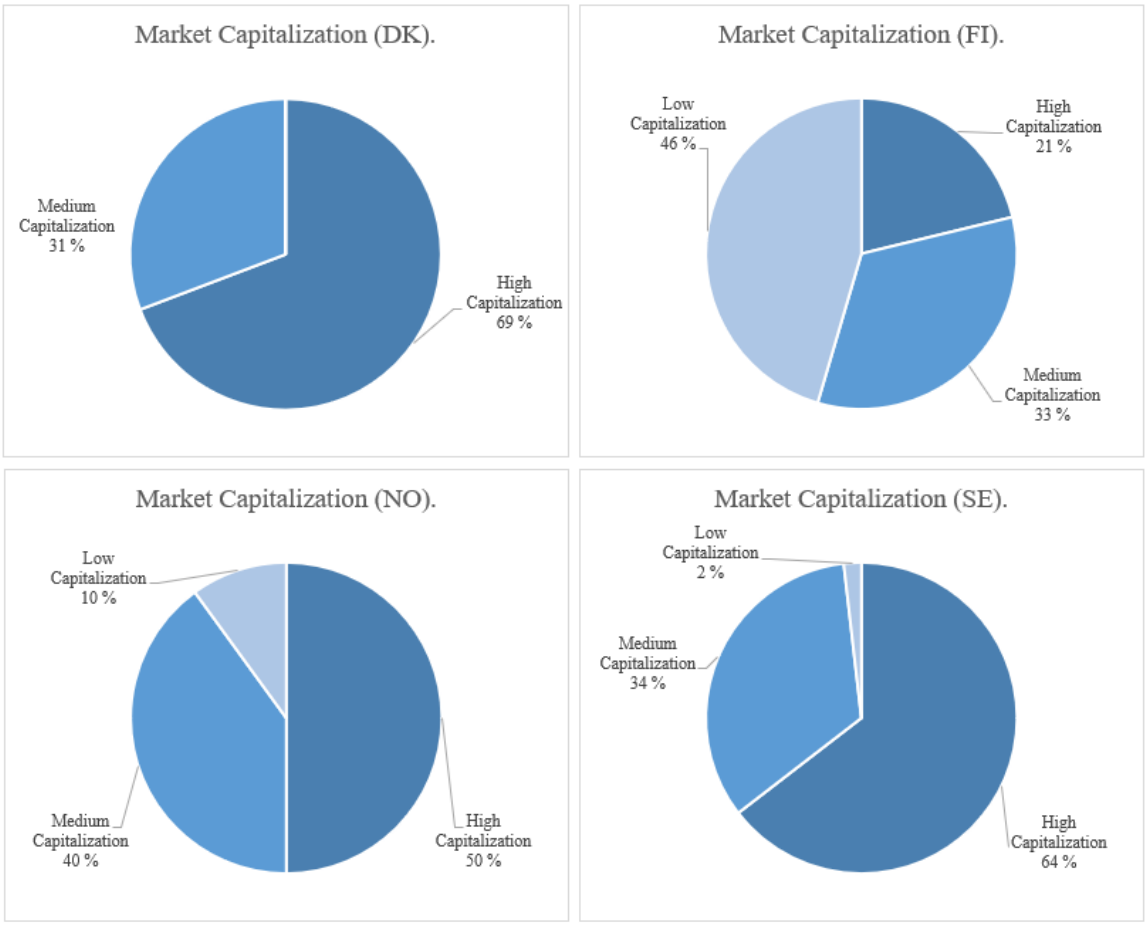
Appendices

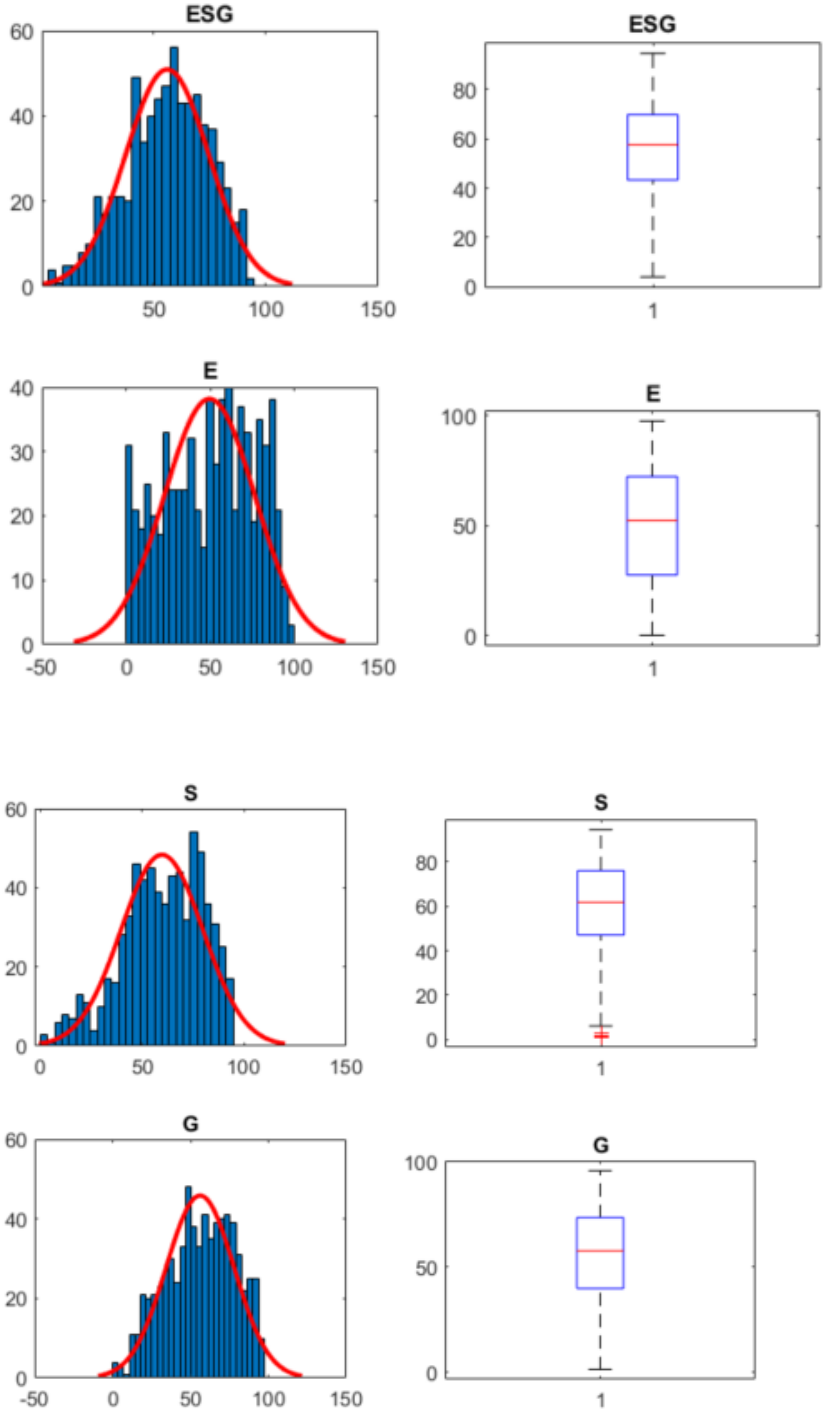
Appendix 1. Sustainable investment approaches. Classification provided by GSIA. Source: Global Sustainable Investment Review 2020

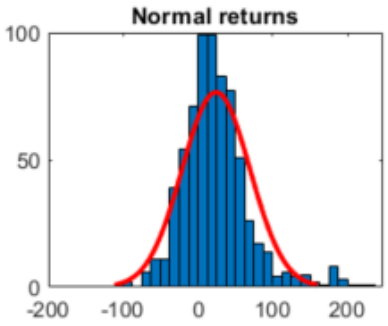
ESG integration	The systematic and explicit inclusion by investment managers of environmental, social and governance factors into financial analysis.
Corporate engagement & shareholder action	Employing shareholder power to influence corporate behaviour, including through direct corporate engagement (i.e., communicating with senior management and/or boards of companies), filing or co-filing shareholder proposals, and proxy voting that is guided by comprehensive ESG guidelines.
Norms-based screening	Screening of investments against minimum standards of business or issuer practice based on international norms such as those issued by the UN, ILO, OECD and NGOs (e.g., Transparency International).
Negative/exclusionary screening	The exclusion from a fund or portfolio of certain sectors, companies, countries or other issuers based on activities considered not investable. Exclusion criteria (based on norms and values) can refer, for example, to product categories (e.g., weapons, tobacco), company practices (e.g., animal testing, violation of human rights, corruption) or controversies.
Best-in-class/positive screening	Investment in sectors, companies or projects selected for positive ESG performance relative to industry peers, and that achieve a rating above a defined threshold.
Sustainability themed/thematic investing	Investing in themes or assets specifically contributing to sustainable solutions - environmental and social - (e.g., sustainable agriculture, green buildings, lower carbon tilted portfolio, gender equity, diversity).
Impact investing and community investing	**Impact investing** Investing to achieve positive, social and environmental impacts - requires measuring and reporting against these impacts, demonstrating the intentionality of investor and underlying asset/investee, and demonstrating the investor contribution. **Community investing** Where capital is specifically directed to traditionally underserved individuals or communities, as well as financing that is provided to businesses with a clear social or environmental purpose. Some community investing is impact investing, but community investing is broader and considers other forms of investing and targeted lending activities.

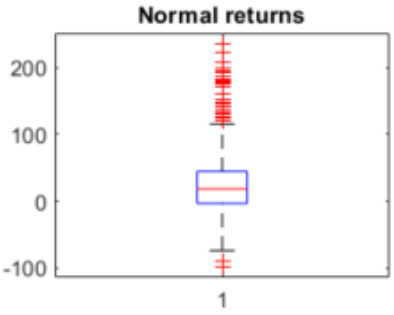
Appendix 2. Market capitalization distribution by countries



Appendix 3. Histograms and boxplots of the variables.




Normal returns
100
50
0
-200
-100
0
100
200


Normal returns
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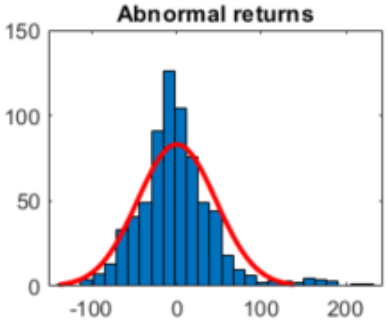
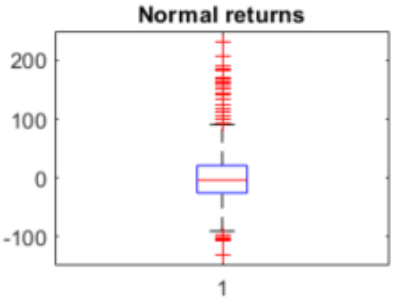
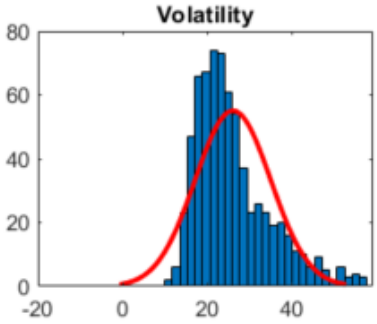
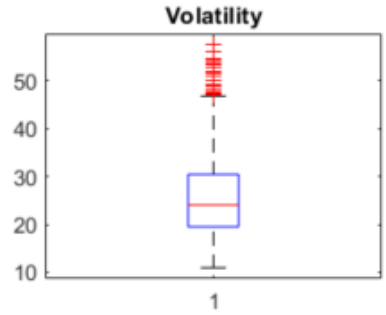
100
0
-100
1


Abnormal returns
150
100
50
0
-100
0
100
200


Normal returns
200
100
0
-100
1


Volatility
80
60
40
20
0
-20
0
20
40


Volatility
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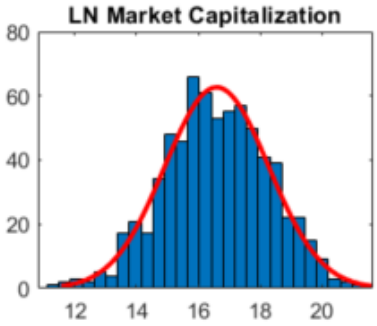
40
30
20
10
1


LN Market Capitalization
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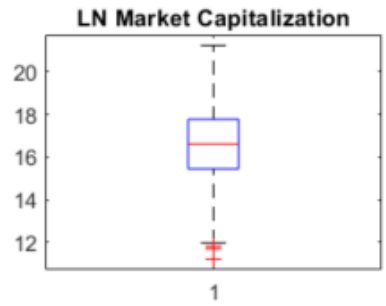
60
40
20
0
12
14
16
18
20


LN Market Capitalization
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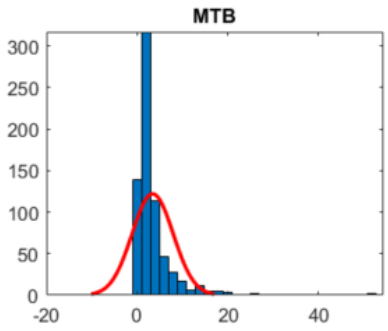
16
14
12
1


MTB
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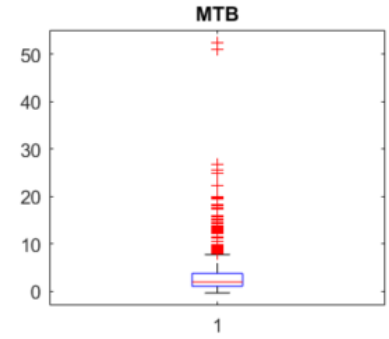
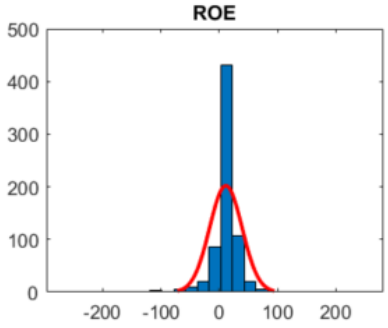
250
200
150
100
50
0
-20
0
20
40


MTB
50
40
30
20
10
0
1


ROE
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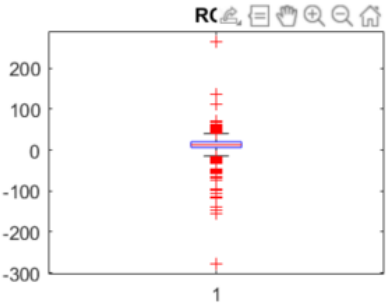
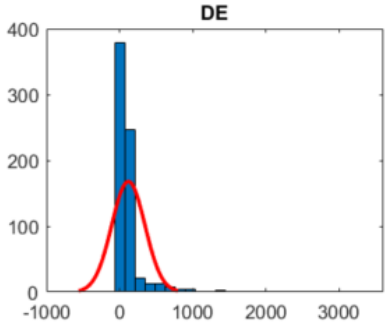
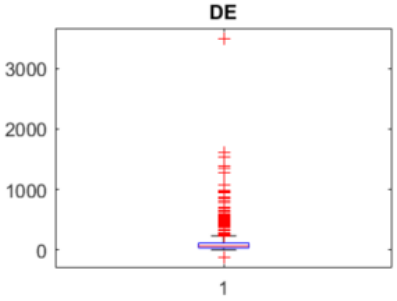
400
300
200
100
0
-200
-100
0
100
200


RO
200
100
0
-100
-200
-300
1


DE
400
300
200
100
0
-1000
0
1000
2000
3000


DE
3000
2000
1000
0
1

Appendix 4. Outputs of the models for the whole sample. Numbers correspond to the model number in table 1.

(1)

```
Linear regression model:
    YRet ~ 1 + ESG

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    ________    _______    _________

    (Intercept)      37.376      5.4543     6.8526    1.6024e-11
    ESG             -0.23585    0.092359   -2.5537     0.010873


Number of observations: 696, Error degrees of freedom: 694
Root Mean Squared Error: 45.1
R-squared: 0.00931,  Adjusted R-Squared: 0.00788
F-statistic vs. constant model: 6.52, p-value = 0.0109
```

(2)

```
Linear regression model:
    YRet ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    ________    _______    _________

    (Intercept)      38.574      6.072      6.3528    3.8326e-10
    E              0.0038018    0.094233   0.040345      0.96783
    S               -0.16874    0.12658    -1.3331      0.18294
    G              -0.080941    0.087459   -0.92548     0.35504


Number of observations: 696, Error degrees of freedom: 692
Root Mean Squared Error: 45.2
R-squared: 0.00919,  Adjusted R-Squared: 0.0049
F-statistic vs. constant model: 2.14, p-value = 0.0939
```

(3)

```
Linear regression model:
    AbRet ~ 1 + ESG

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    ________    _______    ________

    (Intercept)      12.266      5.5549     2.2081    0.027562
    ESG             -0.21181    0.094062   -2.2518    0.024649


Number of observations: 696, Error degrees of freedom: 694
Root Mean Squared Error: 46
R-squared: 0.00725,  Adjusted R-Squared: 0.00582
F-statistic vs. constant model: 5.07, p-value = 0.0246
```

(4)

```
Linear regression model:
    AbRet ~ 1 + E + S + G

Estimated Coefficients:
                    Estimate       SE        tStat      pValue
                    ________    ________    _______    _________

    (Intercept)       16.471      6.1716     2.6689    0.0077888
    E               0.089335    0.095779    0.93272      0.35129
    S                -0.1993     0.12865    -1.5491      0.12182
    G               -0.15374    0.088894    -1.7294     0.084176


Number of observations: 696, Error degrees of freedom: 692
Root Mean Squared Error: 46
R-squared: 0.0111,  Adjusted R-Squared: 0.0068
F-statistic vs. constant model: 2.59, p-value = 0.0522
```

(5)

```
Linear regression model:
    Vol ~ 1 + ESG

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    ________    _______    __________

    (Intercept)       35.361      1.0133     34.895    7.5952e-155
    ESG             -0.16534    0.017159    -9.6357     1.0437e-20


Number of observations: 696, Error degrees of freedom: 694
Root Mean Squared Error: 8.39
R-squared: 0.118,  Adjusted R-Squared: 0.117
F-statistic vs. constant model: 92.8, p-value = 1.04e-20
```

(6)

```
Linear regression model:
    Vol ~ 1 + E + S + G

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    ________    _______    _________

    (Intercept)       35.379      1.1165     31.687    7.627e-137
    E               -0.04909    0.017327    -2.8331     0.0047442
    S               -0.10271    0.023275    -4.4128    1.1834e-05
    G              -0.012867    0.016082    -0.80012       0.42392


Number of observations: 696, Error degrees of freedom: 692
Root Mean Squared Error: 8.31
R-squared: 0.136,  Adjusted R-Squared: 0.132
F-statistic vs. constant model: 36.3, p-value = 8.68e-22
```

Appendix 5. Outputs of the models for the whole sample. Numbers correspond to the model number in table 2.

(1).

```
Linear regression model:
    YRet ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    _________    _______    _________

    (Intercept)       -44.3       17.083    -2.5933    0.0097081
    ROE             0.20762     0.065647     3.1626    0.0016318
    MTB             0.13356      0.37404    0.35707      0.72115
    LN_MarkCap       4.0717        1.043     3.9039   0.00010392
    DE             -0.016252    0.0077116    -2.1075     0.035435


Number of observations: 696, Error degrees of freedom: 691
Root Mean Squared Error: 43.9
R-squared: 0.0653,  Adjusted R-Squared: 0.0599
F-statistic vs. constant model: 12.1, p-value = 1.72e-09
```

(2).

```
Linear regression model:
    YRet ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    _________    _______    _________

    (Intercept)      -54.283       16.906    -3.2108    0.0013851
    ESG              -0.49388     0.098137    -5.0325   6.1828e-07
    ROE               0.19922     0.064543     3.0866    0.0021056
    MTB              -0.21193      0.37398    -0.56668      0.57111
    LN_MarkCap         6.4163        1.126     5.6983   1.7924e-08
    DE               -0.015851    0.0075797    -2.0913     0.036867


Number of observations: 696, Error degrees of freedom: 690
Root Mean Squared Error: 43.2
R-squared: 0.0984,  Adjusted R-Squared: 0.0919
F-statistic vs. constant model: 15.1, p-value = 4.67e-14
```

(3).

```
Linear regression model:
    YRet ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    _________    _______    _________

    (Intercept)      -52.349       17.078    -3.0652    0.0022602
    E              -0.026783     0.092694    -0.28894      0.77271
    S              -0.33441      0.12376     -2.7021    0.0070606
    G              -0.16027     0.085999     -1.8636     0.062799
    ROE             0.19473     0.065218      2.9858    0.0029289
    MTB             -0.22301      0.37694    -0.59163      0.55429
    LN_MarkCap         6.472        1.1356     5.6991   1.7869e-08
    DE             -0.017354    0.0077193     -2.2481     0.024885


Number of observations: 696, Error degrees of freedom: 688
Root Mean Squared Error: 43.2
R-squared: 0.0993,  Adjusted R-Squared: 0.0901
F-statistic vs. constant model: 10.8, p-value = 5.34e-13
```

(4).

```
Linear regression model:
    AbRet ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate        SE         tStat       pValue
                   ________    _________    _______    __________

    (Intercept)      -61.269       17.403    -3.5205    0.00045902
    ROE              0.23868     0.066879     3.5689    0.00038335
    MTB              -0.16297      0.38106    -0.42768       0.66902
    LN_MarkCap         3.7007       1.0625     3.4828     0.0005274
    DE              -0.016052    0.0078563    -2.0432      0.041416


Number of observations: 696, Error degrees of freedom: 691
Root Mean Squared Error: 44.8
R-squared: 0.0628,  Adjusted R-Squared: 0.0573
F-statistic vs. constant model: 11.6, p-value = 4.25e-09
```

(5).

```
Linear regression model:
    AbRet ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate        SE         tStat       pValue
                   ________    _________    _______    __________

    (Intercept)      -70.611       17.273    -4.0879    4.8658e-05
    ESG              -0.46217      0.10027    -4.6094    4.8114e-06
    ROE              0.23082     0.065942     3.5003    0.00049457
    MTB              -0.48627      0.38209    -1.2727       0.20356
    LN_MarkCap         5.8948       1.1504      5.124    3.8864e-07
    DE              -0.015677    0.0077441    -2.0244      0.043318


Number of observations: 696, Error degrees of freedom: 690
Root Mean Squared Error: 44.1
R-squared: 0.0908,  Adjusted R-Squared: 0.0842
F-statistic vs. constant model: 13.8, p-value = 7.66e-13
```

(6).

```
Linear regression model:
    AbRet ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate        SE         tStat       pValue
                   ________    _________    _______    __________

    (Intercept)      -67.748       17.403    -3.893    0.00010867
    E                0.05434     0.094455     0.5753       0.56527
    S                -0.36262      0.12611    -2.8754     0.0041601
    G                -0.22475     0.087632    -2.5647      0.010538
    ROE              0.21635     0.066457     3.2554     0.0011876
    MTB              -0.47409       0.3841    -1.2343       0.21752
    LN_MarkCap         6.0873       1.1572     5.2604    1.9219e-07
    DE              -0.018133    0.0078659    -2.3053      0.021446


Number of observations: 696, Error degrees of freedom: 688
Root Mean Squared Error: 44.1
R-squared: 0.0964,  Adjusted R-Squared: 0.0872
F-statistic vs. constant model: 10.5, p-value = 1.48e-12
```

(7).

```
Linear regression model:
    Vol ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                    ________    _________    _______    _________

    (Intercept)        58.569       2.9355     19.952    2.7223e-70
    ROE             -0.095566     0.011281    -8.4716    1.4541e-16
    MTB               0.41937     0.064274     6.5247    1.3175e-10
    LN_MarkCap        -1.9461      0.17922    -10.859     1.808e-25
    DE              -0.0043847    0.0013252    -3.3088    0.00098556


Number of observations: 696, Error degrees of freedom: 691
Root Mean Squared Error: 7.55
R-squared: 0.288,  Adjusted R-Squared: 0.284
F-statistic vs. constant model: 69.9, p-value = 1.02e-49
```

(8).

```
Linear regression model:
    Vol ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                    ________    _________    _______    _________

    (Intercept)        56.781       2.9006     19.575    3.3354e-68
    ESG             -0.088451     0.016837    -5.2533    1.9928e-07
    ROE              -0.09707     0.011073    -8.7661    1.4306e-17
    MTB                0.3575     0.064162     5.5718    3.6169e-08
    LN_MarkCap        -1.5262      0.19318    -7.9003    1.1004e-14
    DE              -0.0043129    0.0013004    -3.3165    0.00095919


Number of observations: 696, Error degrees of freedom: 690
Root Mean Squared Error: 7.41
R-squared: 0.315,  Adjusted R-Squared: 0.311
F-statistic vs. constant model: 63.6, p-value = 1.39e-54
```

(9).

```
Linear regression model:
    Vol ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                    ________    _________    _______    _________

    (Intercept)        57.247       2.9099     19.673    1.055e-68
    E               -0.012195     0.015794    -0.77212      0.44031
    S               -0.082526     0.021087    -3.9136    9.9957e-05
    G                0.0037567    0.014653     0.25638      0.79774
    ROE             -0.094929     0.011112    -8.5429    8.3995e-17
    MTB                0.3454     0.064225     5.3781    1.0328e-07
    LN_MarkCap        -1.5296      0.19349    -7.9053    1.0645e-14
    DE              -0.0046146    0.0013152    -3.5086    0.00047986


Number of observations: 696, Error degrees of freedom: 688
Root Mean Squared Error: 7.37
R-squared: 0.326,  Adjusted R-Squared: 0.319
F-statistic vs. constant model: 47.4, p-value = 5.96e-55
```

Appendix 6. Outputs of the models for Swedish companies. Numbers correspond to the model number in table 3.

(1)

```
Linear regression model:
    YRet ~ 1 + ESG

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    _______    _________

    (Intercept)      51.142     7.4481     6.8665    3.3065e-11
    ESG             -0.40071    0.12845   -3.1195     0.0019724


Number of observations: 330, Error degrees of freedom: 328
Root Mean Squared Error: 45.4
R-squared: 0.0288,  Adjusted R-Squared: 0.0259
F-statistic vs. constant model: 9.73, p-value = 0.00197
```

(2)

```
Linear regression model:
    YRet ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    _______    _________

    (Intercept)      53.582     8.9481     5.9881    5.6061e-09
    E               0.006576    0.13229   0.049707     0.96039
    S               -0.39233    0.18672    -2.1012     0.036391
    G               -0.030364   0.12758     -0.238     0.81203


Number of observations: 330, Error degrees of freedom: 326
Root Mean Squared Error: 45.4
R-squared: 0.0319,  Adjusted R-Squared: 0.023
F-statistic vs. constant model: 3.58, p-value = 0.0142
```

(3)

```
Linear regression model:
    AbRet ~ 1 + ESG

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    _______    _________

    (Intercept)      24.527     7.4305     3.3008    0.0010701
    ESG             -0.38737    0.12815    -3.0228    0.0027022


Number of observations: 330, Error degrees of freedom: 328
Root Mean Squared Error: 45.3
R-squared: 0.0271,  Adjusted R-Squared: 0.0241
F-statistic vs. constant model: 9.14, p-value = 0.0027
```

(4)

```
Linear regression model:
    AbRet ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    _______    ________    _________

    (Intercept)       29.197     8.9105      3.2767    0.0011635
    E               0.042861    0.13174     0.32535      0.74513
    S               -0.43148    0.18593     -2.3207     0.020922
    G               -0.045771    0.12704    -0.36029      0.71887


Number of observations: 330, Error degrees of freedom: 326
Root Mean Squared Error: 45.2
R-squared: 0.0338,  Adjusted R-Squared: 0.0249
F-statistic vs. constant model: 3.8, p-value = 0.0106
```

(5)

```
Linear regression model:
    Vol ~ 1 + ESG

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    ________    _______    __________

    (Intercept)       34.838      1.2185      28.59    4.4809e-91
    ESG             -0.17522    0.021016    -8.3377    2.1152e-15


Number of observations: 330, Error degrees of freedom: 328
Root Mean Squared Error: 7.42
R-squared: 0.175,  Adjusted R-Squared: 0.172
F-statistic vs. constant model: 69.5, p-value = 2.12e-15
```

(6)

```
Linear regression model:
    Vol ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    ________    _______    __________

    (Intercept)       34.199      1.4011      24.41    1.4307e-75
    E               -0.061704    0.020714    -2.9789     0.0031103
    S                -0.13762    0.029235    -4.7075     3.714e-06
    G                 0.03367    0.019976     1.6856      0.092839


Number of observations: 330, Error degrees of freedom: 326
Root Mean Squared Error: 7.11
R-squared: 0.247,  Adjusted R-Squared: 0.24
F-statistic vs. constant model: 35.6, p-value = 6.47e-20
```

Appendix 7. Outputs of the models for Swedish companies. Numbers correspond to the model number in table 4.

(1).

```
Linear regression model:
    YRet ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE        tStat      pValue
                    ________    ________    _______    ________

    (Intercept)       -49.909      29.262    -1.7056    0.089042
    ROE               0.19448     0.11549     1.6839    0.093156
    MTB               0.81285     0.54245     1.4985     0.13498
    LN_MarkCap         4.4326      1.7239     2.5713    0.010577
    DE               -0.017033    0.010697    -1.5922     0.11231


Number of observations: 330, Error degrees of freedom: 325
Root Mean Squared Error: 44.9
R-squared: 0.0585,  Adjusted R-Squared: 0.0469
F-statistic vs. constant model: 5.05, p-value = 0.000584
```

(2).

```
Linear regression model:
    YRet ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    ________    _______    _________

    (Intercept)       -83.474      29.207     -2.858    0.0045392
    ESG               -0.70379     0.14826    -4.7469    3.1051e-06
    ROE                0.18994     0.11185     1.6982     0.090438
    MTB               0.024587     0.55095   0.044626      0.96443
    LN_MarkCap         8.8177       1.908     4.6214    5.5108e-06
    DE               -0.013825    0.010382    -1.3317        0.1839


Number of observations: 330, Error degrees of freedom: 324
Root Mean Squared Error: 43.4
R-squared: 0.12,  Adjusted R-Squared: 0.106
F-statistic vs. constant model: 8.81, p-value = 7.41e-08
```

(3).

```
Linear regression model:
    YRet ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    ________    _______    _________

    (Intercept)       -86.996      30.361     -2.8654    0.004439
    E                 -0.077965    0.13268    -0.58759     0.55722
    S                  -0.65058    0.18876     -3.4467   0.00064282
    G                 -0.030383    0.12215    -0.24874     0.80372
    ROE                0.21246     0.11179      1.9005    0.058259
    MTB               -0.27125     0.56303    -0.48177      0.6303
    LN_MarkCap         9.3691      1.9431      4.8217    2.1981e-06
    DE               -0.016258    0.010557       -1.54     0.12454


Number of observations: 330, Error degrees of freedom: 322
Root Mean Squared Error: 43.3
R-squared: 0.132,  Adjusted R-Squared: 0.113
F-statistic vs. constant model: 7, p-value = 8.79e-08
```

(4).

```
Linear regression model:
    AbRet ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    ________    _______    _________

    (Intercept)      -84.261      29.067    -2.8988    0.0040003
    ROE              0.14394     0.11472     1.2547      0.21049
    MTB              0.49802     0.53884    0.92424      0.35605
    LN_MarkCap        5.0903      1.7124     2.9726    0.0031736
    DE               -0.02489    0.010626   -2.3424     0.019764


Number of observations: 330, Error degrees of freedom: 325
Root Mean Squared Error: 44.6
R-squared: 0.065,  Adjusted R-Squared: 0.0535
F-statistic vs. constant model: 5.65, p-value = 0.00021
```

(5).

```
Linear regression model:
    AbRet ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    ________    _______    _________

    (Intercept)      -119.25      28.91      -4.125    4.7174e-05
    ESG              -0.73373     0.14675    -4.9997    9.4221e-07
    ROE              0.13921      0.11071     1.2574       0.20952
    MTB              -0.32378     0.54535   -0.59372       0.55311
    LN_MarkCap        9.6619      1.8886      5.1159     5.358e-07
    DE               -0.021547    0.010276   -2.0968      0.036787


Number of observations: 330, Error degrees of freedom: 324
Root Mean Squared Error: 43
R-squared: 0.132,  Adjusted R-Squared: 0.119
F-statistic vs. constant model: 9.85, p-value = 8.84e-09
```

(6).

```
Linear regression model:
    AbRet ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    ________    _______    _________

    (Intercept)      -121.22      29.894    -4.0552    6.2891e-05
    E                -0.034928    0.13064   -0.26735       0.78937
    S                 -0.75127    0.18585    -4.0424    6.6256e-05
    G                -0.053594    0.12027   -0.44562       0.65617
    ROE               0.16216     0.11007     1.4732       0.14166
    MTB               -0.6873     0.55436    -1.2398       0.21595
    LN_MarkCap         10.353      1.9132     5.4114    1.2228e-07
    DE               -0.024855    0.010395   -2.3911      0.017372


Number of observations: 330, Error degrees of freedom: 322
Root Mean Squared Error: 42.6
R-squared: 0.153,  Adjusted R-Squared: 0.135
F-statistic vs. constant model: 8.32, p-value = 2.4e-09
```

(7).

```
Linear regression model:
    Vol ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                    ________    ________    _______    __________

    (Intercept)       66.449      4.2414      15.667    1.3256e-41
    ROE              -0.071055    0.01674    -4.2447     2.86e-05
    MTB               0.54712     0.078625    6.9585    1.9031e-11
    LN_MarkCap         -2.45      0.24987    -9.8052    4.7161e-20
    DE               -0.0044519   0.0015505   -2.8712     0.0043572


Number of observations: 330, Error degrees of freedom: 325
Root Mean Squared Error: 6.5
R-squared: 0.372,  Adjusted R-Squared: 0.364
F-statistic vs. constant model: 48.2, p-value = 8.68e-32
```

(8).

```
Linear regression model:
    Vol ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                    ________    ________    _______    __________

    (Intercept)       63.673      4.3316      14.7      7.811e-38
    ESG              -0.058208    0.021988   -2.6472     0.0085117
    ROE              -0.071431    0.016588   -4.3062    2.2039e-05
    MTB               0.48192     0.081708    5.8981    9.2483e-09
    LN_MarkCap         -2.0873     0.28297    -7.3766    1.3722e-12
    DE               -0.0041866   0.0015396   -2.7192     0.0068964


Number of observations: 330, Error degrees of freedom: 324
Root Mean Squared Error: 6.44
R-squared: 0.385,  Adjusted R-Squared: 0.376
F-statistic vs. constant model: 40.6, p-value = 2.12e-32
```

(9).

```
Linear regression model:
    Vol ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                    ________    ________    _______    __________

    (Intercept)       60.907      4.4424      13.71     5.1425e-34
    E                -0.022313    0.019414   -1.1493      0.25129
    S                -0.076016    0.027619   -2.7524     0.0062522
    G                 0.037459    0.017872    2.0959      0.03687
    ROE              -0.066186    0.016357   -4.0463    6.5204e-05
    MTB               0.432       0.082381    5.2439    2.8538e-07
    LN_MarkCap         -1.9105     0.28431    -6.7197    8.2766e-11
    DE               -0.0042252   0.0015447   -2.7353     0.0065782


Number of observations: 330, Error degrees of freedom: 322
Root Mean Squared Error: 6.33
R-squared: 0.41,  Adjusted R-Squared: 0.397
F-statistic vs. constant model: 32, p-value = 1.34e-33
```

Appendix 8. Outputs of the models for Finnish companies. Numbers correspond to the model number in table 5.

(1)

```
Linear regression model:
    YRet ~ 1 + ESG

Estimated Coefficients:
                   Estimate      SE       tStat     pValue
                   ________    ______    ________    _______

    (Intercept)     4.6861     11.179    0.41918    0.67601
    ESG            0.20651     0.1676     1.2321    0.22088


Number of observations: 99, Error degrees of freedom: 97
Root Mean Squared Error: 27.9
R-squared: 0.0154,  Adjusted R-Squared: 0.00526
F-statistic vs. constant model: 1.52, p-value = 0.221
```

(2)

```
Linear regression model:
    YRet ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate      SE        tStat      pValue
                   ________    _______    ________    _______

    (Intercept)    -1.2798       11.56    -0.11072    0.91207
    E              0.25974     0.19179      1.3543    0.17886
    S              0.22512     0.20161      1.1166    0.26699
    G               -0.243     0.15653     -1.5524    0.12389


Number of observations: 99, Error degrees of freedom: 95
Root Mean Squared Error: 27.6
R-squared: 0.0589,  Adjusted R-Squared: 0.0292
F-statistic vs. constant model: 1.98, p-value = 0.122
```

(3)

```
Linear regression model:
    AbRet ~ 1 + ESG

Estimated Coefficients:
                   Estimate      SE       tStat      pValue
                   ________    ______    ________    _______

    (Intercept)    -10.343     11.599    -0.89166    0.37478
    ESG            0.17621     0.1739      1.0133    0.31345


Number of observations: 99, Error degrees of freedom: 97
Root Mean Squared Error: 29
R-squared: 0.0105,  Adjusted R-Squared: 0.000273
F-statistic vs. constant model: 1.03, p-value = 0.313
```

(4)

```
Linear regression model:
    AbRet ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate      SE        tStat      pValue
                   ________    _______    _______    ________

    (Intercept)     -18.62      11.815     -1.576     0.11835
    E              0.19441     0.19603    0.99175     0.32384
    S              0.37909     0.20606     1.8397    0.068937
    G               -0.347     0.15999    -2.1689    0.032585


Number of observations: 99, Error degrees of freedom: 95
Root Mean Squared Error: 28.2
R-squared: 0.0822,  Adjusted R-Squared: 0.0533
F-statistic vs. constant model: 2.84, p-value = 0.0421
```

(5)

```
Linear regression model:
    Vol ~ 1 + ESG

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    _______    _________

    (Intercept)      21.973     2.8411      7.734    9.8163e-12
    ESG             0.028608    0.042594   0.67164      0.50341


Number of observations: 99, Error degrees of freedom: 97
Root Mean Squared Error: 7.1
R-squared: 0.00463,  Adjusted R-Squared: -0.00563
F-statistic vs. constant model: 0.451, p-value = 0.503
```

(6)

```
Linear regression model:
    Vol ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate      SE        tStat      pValue
                   ________    _______    _______    ________

    (Intercept)      23.764     2.9249     8.1247    1.643e-12
    E              0.092063    0.04853     1.897     0.060862
    S              -0.10496    0.051015   -2.0574    0.042387
    G              0.019255    0.039608   0.48613     0.62799


Number of observations: 99, Error degrees of freedom: 95
Root Mean Squared Error: 6.99
R-squared: 0.0569,  Adjusted R-Squared: 0.0271
F-statistic vs. constant model: 1.91, p-value = 0.133
```

Appendix 9. Outputs of the models for Finnish companies. Numbers correspond to the model number in table 6.

(1).

```
Linear regression model:
    YRet ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    ________    _______    _________

    (Intercept)     -40.105      30.235    -1.3264      0.18791
    ROE              0.8624     0.17884     4.8223    5.4537e-06
    MTB             -2.1949      1.3722    -1.5995      0.11306
    LN_MarkCap       3.3888      2.0107     1.6854     0.095225
    DE             0.038938    0.021838      1.783     0.077806


Number of observations: 99, Error degrees of freedom: 94
Root Mean Squared Error: 24.8
R-squared: 0.251,  Adjusted R-Squared: 0.219
F-statistic vs. constant model: 7.85, p-value = 1.66e-05
```

(2).

```
Linear regression model:
    YRet ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    ________    _______    _________

    (Intercept)     -36.485      32.292    -1.1299      0.26144
    ESG            0.065928      0.1994    0.33063      0.74167
    ROE             0.86687      0.1802     4.8107    5.7856e-06
    MTB             -2.0238      1.4727    -1.3742       0.1727
    LN_MarkCap       2.8313      2.6314      1.076      0.28472
    DE             0.038417    0.021999     1.7463     0.084061


Number of observations: 99, Error degrees of freedom: 93
Root Mean Squared Error: 24.9
R-squared: 0.251,  Adjusted R-Squared: 0.211
F-statistic vs. constant model: 6.25, p-value = 4.88e-05
```

(3).

```
Linear regression model:
    YRet ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    ________    _______    _________

    (Intercept)     -38.227      33.144    -1.1534      0.25178
    E               0.10343     0.18931     0.5463      0.58615
    S               0.11311     0.18596    0.60826      0.54453
    G              -0.13716     0.15246   -0.89964      0.37068
    ROE             0.82844     0.18395     4.5038    1.9755e-05
    MTB             -2.1497      1.5045    -1.4289      0.15646
    LN_MarkCap       2.8186      2.7129      1.039      0.30158
    DE             0.037439    0.022152     1.6901     0.094434


Number of observations: 99, Error degrees of freedom: 91
Root Mean Squared Error: 25
R-squared: 0.262,  Adjusted R-Squared: 0.205
F-statistic vs. constant model: 4.61, p-value = 0.00019
```

(4).

```
Linear regression model:
    AbRet ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate       SE       tStat       pValue
                   ________    ________    _______    _________

    (Intercept)     -68.278      30.472    -2.2407     0.027403
    ROE             0.89736     0.18024     4.9787    2.8937e-06
    MTB             -1.4953       1.383    -1.0812      0.28236
    LN_MarkCap       4.0255      2.0264     1.9865     0.049886
    DE              0.034006    0.022009     1.5451      0.12569


Number of observations: 99, Error degrees of freedom: 94
Root Mean Squared Error: 25
R-squared: 0.289,  Adjusted R-Squared: 0.259
F-statistic vs. constant model: 9.57, p-value = 1.56e-06
```

(5).

```
Linear regression model:
    AbRet ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate       SE       tStat       pValue
                   ________    ________    _______    _________

    (Intercept)     -69.505      32.562    -2.1345     0.035428
    ESG            -0.022352    0.20107    -0.11117     0.91172
    ROE             0.89584     0.18171     4.9302    3.5744e-06
    MTB             -1.5534      1.4851     -1.046      0.29828
    LN_MarkCap       4.2146      2.6534     1.5883       0.1156
    DE              0.034183    0.022183     1.5409      0.12673


Number of observations: 99, Error degrees of freedom: 93
Root Mean Squared Error: 25.1
R-squared: 0.289,  Adjusted R-Squared: 0.251
F-statistic vs. constant model: 7.58, p-value = 5.26e-06
```

(6).

```
Linear regression model:
    AbRet ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate       SE       tStat       pValue
                   ________    ________    _______    _________

    (Intercept)     -77.299      33.037    -2.3397     0.021485
    E              -0.011107     0.1887   -0.058861      0.95319
    S               0.23241     0.18536      1.2538      0.21312
    G              -0.24559     0.15197      -1.616      0.10956
    ROE             0.83789     0.18335      4.5698    1.5306e-05
    MTB             -1.9607      1.4996     -1.3075      0.19435
    LN_MarkCap       4.6594      2.7042       1.723     0.088281
    DE              0.033736    0.022081      1.5279      0.13002


Number of observations: 99, Error degrees of freedom: 91
Root Mean Squared Error: 24.9
R-squared: 0.315,  Adjusted R-Squared: 0.263
F-statistic vs. constant model: 5.98, p-value = 9.54e-06
```

(7).

```
Linear regression model:
    Vol ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                    ________    _________    _______    _________

    (Intercept)       50.251       7.5023       6.698    1.5343e-09
    ROE              -0.19118     0.044375    -4.3084    4.0429e-05
    MTB               0.010317     0.3405     0.030299     0.97589
    LN_MarkCap       -1.5141      0.49891     -3.0348     0.0031127
    DE               -0.017358    0.0054187   -3.2034     0.0018548


Number of observations: 99, Error degrees of freedom: 94
Root Mean Squared Error: 6.15
R-squared: 0.278,  Adjusted R-Squared: 0.247
F-statistic vs. constant model: 9.03, p-value = 3.22e-06
```

(8).

```
Linear regression model:
    Vol ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                    ________    _________    _______    _________

    (Intercept)       58.408       7.6193      7.6658    1.6813e-11
    ESG               0.14858     0.047049     3.1578     0.0021435
    ROE              -0.18111     0.042518    -4.2596    4.8975e-05
    MTB               0.396       0.3475      1.1396       0.25739
    LN_MarkCap       -2.7704      0.62088     -4.462     2.2728e-05
    DE               -0.018534    0.0051907   -3.5706    0.00056603
```

(9).

```
Linear regression model:
    Vol ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                    ________    _________    _______    _________

    (Intercept)       62.193       7.4545      8.3431    7.4306e-13
    E                 0.18274     0.042579     4.2917    4.4171e-05
    S                -0.053702    0.041824    -1.284        0.2024
    G                 0.019902     0.03429     0.58039      0.56309
    ROE              -0.1875      0.041372    -4.5322    1.7704e-05
    MTB               0.54307     0.33838      1.6049       0.11198
    LN_MarkCap       -3.0464      0.61017     -4.9927     2.853e-06
    DE               -0.019507    0.0049822   -3.9154    0.00017416


Number of observations: 99, Error degrees of freedom: 91
Root Mean Squared Error: 5.62
R-squared: 0.415,  Adjusted R-Squared: 0.37
F-statistic vs. constant model: 9.24, p-value = 1.36e-08
```

Appendix 10. Outputs of the models for Norwegian companies. Numbers correspond to the model number in table 7.

(1)

```
Linear regression model:
    YRet ~ 1 + ESG

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    ________    ________

    (Intercept)      28.934     13.813      2.0947    0.037897
    ESG             -0.21575    0.24544    -0.87905     0.3808


Number of observations: 150, Error degrees of freedom: 148
Root Mean Squared Error: 53.9
R-squared: 0.00519,  Adjusted R-Squared: -0.00153
F-statistic vs. constant model: 0.773, p-value = 0.381
```

(2)

```
Linear regression model:
    YRet ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    _______    _________

    (Intercept)      38.254     14.382     2.6598    0.0086917
    E                0.35575    0.27624    1.2878      0.19985
    S               -0.36541    0.33284   -1.0978      0.27408
    G               -0.31914    0.21974   -1.4524      0.14854


Number of observations: 150, Error degrees of freedom: 146
Root Mean Squared Error: 53.6
R-squared: 0.0269,  Adjusted R-Squared: 0.00687
F-statistic vs. constant model: 1.34, p-value = 0.263
```

(3)

```
Linear regression model:
    AbRet ~ 1 + ESG

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    ________    _______

    (Intercept)     7.7625      14.673     0.52902    0.59759
    ESG             -0.1746    0.26073    -0.66967    0.50411


Number of observations: 150, Error degrees of freedom: 148
Root Mean Squared Error: 57.2
R-squared: 0.00302,  Adjusted R-Squared: -0.00372
F-statistic vs. constant model: 0.448, p-value = 0.504
```

(4)

```
Linear regression model:
    AbRet ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    ________    ________

    (Intercept)      18.297     15.244      1.2003     0.23199
    E               0.38961     0.2928      1.3307     0.18538
    S              -0.30078    0.35279    -0.85258     0.39529
    G               -0.3964    0.23291     -1.7019    0.090894


Number of observations: 150, Error degrees of freedom: 146
Root Mean Squared Error: 56.8
R-squared: 0.0291,  Adjusted R-Squared: 0.00915
F-statistic vs. constant model: 1.46, p-value = 0.228
```

(5)

```
Linear regression model:
    Vol ~ 1 + ESG

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    ______    __________

    (Intercept)      47.343     2.5905     18.275    8.9027e-40
    ESG             -0.32208    0.046031   -6.997    8.4282e-11


Number of observations: 150, Error degrees of freedom: 148
Root Mean Squared Error: 10.1
R-squared: 0.249,  Adjusted R-Squared: 0.243
F-statistic vs. constant model: 49, p-value = 8.43e-11
```

(6)

```
Linear regression model:
    Vol ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate      SE        tStat       pValue
                   ________    _______    _______    __________

    (Intercept)      47.364     2.6937     17.583    7.1291e-38
    E               -0.0799    0.051739   -1.5443      0.12469
    S              -0.06545    0.062341   -1.0499      0.29551
    G              -0.17876    0.041157   -4.3434     2.611e-05


Number of observations: 150, Error degrees of freedom: 146
Root Mean Squared Error: 10
R-squared: 0.267,  Adjusted R-Squared: 0.252
F-statistic vs. constant model: 17.7, p-value = 7.32e-10
```

Appendix 11. Outputs of the models for Norwegian companies. Numbers correspond to the model number in table 8.

(1).

```
Linear regression model:
    YRet ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE       tStat       pValue
                    ________    _______    ________    _________

    (Intercept)       -71.125     46.085     -1.5434     0.12493
    ROE               0.17937    0.11846      1.5142     0.13215
    MTB               0.34571     0.9638      0.3587     0.72034
    LN_MarkCap         5.4223     2.8084      1.9308    0.055463
    DE             -0.0081045    0.02333    -0.34738     0.72881


Number of observations: 150, Error degrees of freedom: 145
Root Mean Squared Error: 52.7
R-squared: 0.0665,  Adjusted R-Squared: 0.0407
F-statistic vs. constant model: 2.58, p-value = 0.0397
```

(2).

```
Linear regression model:
    YRet ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE       tStat       pValue
                    ________    _______    ________    _________

    (Intercept)       -114.48     46.968     -2.4375    0.016008
    ESG               -0.88936    0.28939    -3.0732    0.0025332
    ROE                 0.1431    0.11575     1.2362      0.21839
    MTB               0.094983    0.94045      0.101      0.91969
    LN_MarkCap          11.123     3.3005       3.37   0.00096496
    DE              -0.016209    0.022832    -0.70991      0.47891


Number of observations: 150, Error degrees of freedom: 144
Root Mean Squared Error: 51.2
R-squared: 0.124,  Adjusted R-Squared: 0.0935
F-statistic vs. constant model: 4.07, p-value = 0.00173
```

(3).

```
Linear regression model:
    YRet ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE       tStat       pValue
                    ________    _______    ________    _________

    (Intercept)       -126.39     47.784     -2.6451    0.0090875
    E                0.073422    0.27456     0.26741      0.78954
    S                -0.45031    0.31792     -1.4164      0.15885
    G                 -0.6824    0.22952     -2.9732    0.0034631
    ROE               0.10237    0.11636     0.87975      0.38048
    MTB               0.32393    0.94383     0.34321      0.73194
    LN_MarkCap         12.531     3.3561       3.734   0.00027209
    DE              -0.016863    0.022587    -0.74659      0.45655


Number of observations: 150, Error degrees of freedom: 142
Root Mean Squared Error: 50.7
R-squared: 0.154,  Adjusted R-Squared: 0.113
F-statistic vs. constant model: 3.7, p-value = 0.00105
```

(4).

```
Linear regression model:
    AbRet ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    ________    ________    ________

    (Intercept)      -100.96      48.388     -2.0864    0.038692
    ROE              0.23581     0.12438       1.896    0.059956
    MTB              0.22524       1.012     0.22257     0.82418
    LN_MarkCap        6.1195      2.9487      2.0753    0.039727
    DE               -0.0105     0.02449     -0.4323     0.66616


Number of observations: 150, Error degrees of freedom: 145
Root Mean Squared Error: 55.3
R-squared: 0.0861,  Adjusted R-Squared: 0.0608
F-statistic vs. constant model: 3.41, p-value = 0.0106
```

(5).

```
Linear regression model:
    AbRet ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    ________    ________    _________

    (Intercept)      -145.85       49.36     -2.9547    0.0036571
    ESG              -0.9207     0.30413     -3.0274    0.0029237
    ROE              0.19826     0.12165      1.6298      0.10533
    MTB             -0.0343     0.98835     -0.0347      0.97234
    LN_MarkCap        12.021      3.4686      3.4656   0.00069754
    DE               -0.0189     0.02399     -0.7909      0.43025


Number of observations: 150, Error degrees of freedom: 144
Root Mean Squared Error: 53.8
R-squared: 0.141,  Adjusted R-Squared: 0.111
F-statistic vs. constant model: 4.72, p-value = 0.000508
```

(6).

```
Linear regression model:
    AbRet ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    ________    ________    _________

    (Intercept)      -162.93      49.991     -3.2592   0.0013984
    E                0.04905     0.28725     0.17075     0.86466
    S                -0.3832     0.33261     -1.1519     0.25129
    G                -0.7921     0.24012     -3.2988   0.0012273
    ROE              0.15121     0.12174      1.2421     0.21626
    MTB               0.2017     0.98743     0.20427     0.83844
    LN_MarkCap        13.856      3.5111      3.9464   0.00012431
    DE               -0.0197     0.02363     -0.8355     0.40482


Number of observations: 150, Error degrees of freedom: 142
Root Mean Squared Error: 53
R-squared: 0.178,  Adjusted R-Squared: 0.137
F-statistic vs. constant model: 4.39, p-value = 0.000195
```

(7).

```
Linear regression model:
    Vol ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    _________    _______    _________

    (Intercept)       92.534       7.5462     12.262    3.6506e-24
    ROE            -0.075581     0.019397    -3.8966    0.00014853
    MTB              0.32566      0.15782     2.0635      0.040845
    LN_MarkCap        -3.8238      0.45986    -8.3152    6.0716e-14
    DE             -0.004512    0.0038202    -1.1811        0.2395


Number of observations: 150, Error degrees of freedom: 145
Root Mean Squared Error: 8.63
R-squared: 0.462,  Adjusted R-Squared: 0.448
F-statistic vs. constant model: 31.2, p-value = 9.79e-19
```

(8).

```
Linear regression model:
    Vol ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    _________    _______    _________

    (Intercept)       84.998       7.6588     11.098    4.574e-21
    ESG              -0.15458     0.047189    -3.2757    0.0013203
    ROE             -0.081885     0.018875    -4.3382    2.6869e-05
    MTB               0.28208      0.15335     1.8394     0.067909
    LN_MarkCap         -2.833      0.53819     -5.264    5.0198e-07
    DE             -0.0059206    0.0037231    -1.5902       0.11397


Number of observations: 150, Error degrees of freedom: 144
Root Mean Squared Error: 8.35
R-squared: 0.5,  Adjusted R-Squared: 0.482
F-statistic vs. constant model: 28.8, p-value = 3.72e-20
```

(9).

```
Linear regression model:
    Vol ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate       SE        tStat       pValue
                    ________    _________    _______    _________

    (Intercept)       83.645       7.7988     10.725    5.0019e-20
    E                0.026283     0.044812    0.58652       0.55845
    S               -0.077323     0.051888    -1.4902        0.1384
    G                -0.12095     0.037459     -3.229     0.0015433
    ROE             -0.089328     0.018992    -4.7035    5.9981e-06
    MTB               0.33272      0.15404     2.1599      0.032457
    LN_MarkCap         -2.6698      0.54774    -4.8743    2.8846e-06
    DE             -0.0059105    0.0036863    -1.6034       0.11108


Number of observations: 150, Error degrees of freedom: 142
Root Mean Squared Error: 8.27
R-squared: 0.516,  Adjusted R-Squared: 0.492
F-statistic vs. constant model: 21.6, p-value = 1.1e-19
```

Appendix 12. Outputs of the models for Danish companies. Numbers correspond to the model number in table 9.

(1)

```
Linear regression model:
    YRet ~ 1 + ESG

Estimated Coefficients:
                   Estimate      SE        tStat     pValue
                   ________    _______    _______    _______

    (Intercept)     17.536      14.457      1.213     0.22762
    ESG            0.10698     0.24651    0.43395    0.66513


Number of observations: 117, Error degrees of freedom: 115
Root Mean Squared Error: 42.2
R-squared: 0.00163,  Adjusted R-Squared: -0.00705
F-statistic vs. constant model: 0.188, p-value = 0.665
```

(2)

```
Linear regression model:
    YRet ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate       SE        tStat      pValue
                   ________    _______    ________    _______

    (Intercept)      15.161     15.406      0.9841     0.32717
    E              0.017353    0.22435    0.077347    0.93848
    S                 0.163    0.29305     0.55622    0.57916
    G             -0.042446    0.20783    -0.20423    0.83854


Number of observations: 117, Error degrees of freedom: 113
Root Mean Squared Error: 42.5
R-squared: 0.00496,  Adjusted R-Squared: -0.0215
F-statistic vs. constant model: 0.188, p-value = 0.905
```

(3)

```
Linear regression model:
    AbRet ~ 1 + ESG

Estimated Coefficients:
                   Estimate      SE       tStat      pValue
                   ________    ______    ________    _______

    (Intercept)     -9.1373    14.655    -0.62349     0.5342
    ESG            0.054431    0.2499     0.21781    0.82796


Number of observations: 117, Error degrees of freedom: 115
Root Mean Squared Error: 42.8
R-squared: 0.000412,  Adjusted R-Squared: -0.00828
F-statistic vs. constant model: 0.0474, p-value = 0.828
```

(4)

```
Linear regression model:
    AbRet ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate      SE        tStat      pValue
                   ________    _______    ________    _______

    (Intercept)     -7.3379     15.558    -0.47166    0.63808
    E               0.17971    0.22657      0.7932    0.42932
    S               0.02949    0.29594     0.09965     0.9208
    G              -0.16767    0.20988    -0.79887    0.42604


Number of observations: 117, Error degrees of freedom: 113
Root Mean Squared Error: 42.9
R-squared: 0.0113,  Adjusted R-Squared: -0.015
F-statistic vs. constant model: 0.43, p-value = 0.732
```

(5)

```
reg_Vol_4 =
Linear regression model:
    Vol ~ 1 + ESG

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    _______    _______    __________

    (Intercept)      24.566     2.2842     10.755    4.3248e-19
    ESG           0.0096977    0.03895    0.24898       0.80382


Number of observations: 117, Error degrees of freedom: 115
Root Mean Squared Error: 6.67
R-squared: 0.000539,  Adjusted R-Squared: -0.00815
F-statistic vs. constant model: 0.062, p-value = 0.804
```

(6)

```
reg_Vol_5 =
Linear regression model:
    Vol ~ 1 + E + S + G

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    _______    _______    __________

    (Intercept)      22.348     2.3832     9.3774    8.4227e-16
    E              -0.073192    0.034707   -2.1089      0.037164
    S               0.074028    0.045334     1.633       0.10526
    G               0.032876    0.032151    1.0225       0.30871


Number of observations: 117, Error degrees of freedom: 113
Root Mean Squared Error: 6.57
R-squared: 0.0451,  Adjusted R-Squared: 0.0198
F-statistic vs. constant model: 1.78, p-value = 0.155
```

Appendix 13. Outputs of the models for Danish companies. Numbers correspond to the model number in table 10.

(1).

```
Linear regression model:
    YRet ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate       SE       tStat      pValue
                   ________    ________    _______    ________

    (Intercept)       -57.54      51.488    -1.1175     0.26615
    ROE             0.18623     0.19733    0.94375     0.34733
    MTB              -1.599     0.85388    -1.8726    0.063725
    LN_MarkCap        5.1525      3.1076      1.658     0.10011
    DE             -0.025519    0.015945    -1.6004     0.11232


Number of observations: 117, Error degrees of freedom: 112
Root Mean Squared Error: 41.3
R-squared: 0.0669,  Adjusted R-Squared: 0.0335
F-statistic vs. constant model: 2.01, p-value = 0.0985
```

(2).

```
Linear regression model:
    YRet ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate       SE       tStat      pValue
                   ________    ________    _______    ________

    (Intercept)       -62.531     55.864    -1.1193     0.26541
    ESG            -0.075633     0.3205   -0.23598     0.81388
    ROE              0.17309    0.20584    0.84092      0.4022
    MTB               -1.561    0.87248    -1.7892    0.076314
    LN_MarkCap         5.6887     3.8603     1.4737      0.1434
    DE             -0.025354   0.016028    -1.5819     0.11652


Number of observations: 117, Error degrees of freedom: 111
Root Mean Squared Error: 41.5
R-squared: 0.0673,  Adjusted R-Squared: 0.0253
F-statistic vs. constant model: 1.6, p-value = 0.165
```

(3).

```
Linear regression model:
    YRet ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                   Estimate       SE       tStat      pValue
                   ________    ________    _______    ________

    (Intercept)       -69.48     58.473    -1.1882     0.23732
    E               -0.18007    0.25707   -0.70048     0.48512
    S                 0.2475    0.33004    0.74991     0.45492
    G              -0.033424    0.21055   -0.15874     0.87417
    ROE              0.22845    0.21518     1.0617     0.29072
    MTB              -1.8483    0.92523    -1.9976     0.04825
    LN_MarkCap         5.5881     3.9127     1.4282     0.15609
    DE             -0.021441   0.016845    -1.2728     0.20579


Number of observations: 117, Error degrees of freedom: 109
Root Mean Squared Error: 41.8
R-squared: 0.0729,  Adjusted R-Squared: 0.0134
F-statistic vs. constant model: 1.22, p-value = 0.296
```

(4).

```
Linear regression model:
    AbRet ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE        tStat       pValue
                    ________    ________    ________    ________

    (Intercept)       -104.81      52.222      -2.007    0.047158
    ROE               0.21983     0.20014      1.0984     0.27439
    MTB               -1.5124     0.86605     -1.7463    0.083498
    LN_MarkCap         5.9803      3.1519      1.8973     0.06036
    DE             -0.0049553    0.016172    -0.30641     0.75986


Number of observations: 117, Error degrees of freedom: 112
Root Mean Squared Error: 41.9
R-squared: 0.0647,  Adjusted R-Squared: 0.0313
F-statistic vs. constant model: 1.94, p-value = 0.109
```

(5).

```
Linear regression model:
    AbRet ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE        tStat       pValue
                    ________    ________    ________    ________

    (Intercept)       -124.51      56.459      -2.2053    0.029494
    ESG               -0.29856     0.32392     -0.92171     0.35868
    ROE               0.16798     0.20803      0.80747     0.42112
    MTB               -1.3624     0.88178      -1.5451     0.12517
    LN_MarkCap         8.0967      3.9014       2.0753    0.040265
    DE             -0.0043053    0.016199    -0.26578      0.7909


Number of observations: 117, Error degrees of freedom: 111
Root Mean Squared Error: 42
R-squared: 0.0718,  Adjusted R-Squared: 0.03
F-statistic vs. constant model: 1.72, p-value = 0.136
```

(6).

```
Linear regression model:
    AbRet ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE        tStat       pValue
                    ________    ________    ________    ________

    (Intercept)       -124.84      59.133      -2.1112    0.037038
    E                 -0.13916     0.25997     -0.53531     0.59353
    S                 0.15463     0.33376      0.46329     0.64408
    G                 -0.20376     0.21293     -0.95693     0.34072
    ROE               0.20497      0.2176      0.94193     0.34831
    MTB               -1.6155     0.93567      -1.7265    0.087082
    LN_MarkCap         7.6466      3.9568       1.9325    0.055891
    DE             -0.00063912    0.017035    -0.037517     0.97014


Number of observations: 117, Error degrees of freedom: 109
Root Mean Squared Error: 42.2
R-squared: 0.0762,  Adjusted R-Squared: 0.0169
F-statistic vs. constant model: 1.29, p-value = 0.264
```

(7).

```
Linear regression model:
    Vol ~ 1 + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                    ________    _________    _______    _________

    (Intercept)       41.254       7.7771     5.3046    5.7526e-07
    ROE              -0.07016     0.029806    -2.3539      0.020321
    MTB               0.13825      0.12898     1.0719       0.28607
    LN_MarkCap       -0.88434       0.4694     -1.884      0.062158
    DE             -0.0041511    0.0024084    -1.7236      0.087542


Number of observations: 117, Error degrees of freedom: 112
Root Mean Squared Error: 6.24
R-squared: 0.146,  Adjusted R-Squared: 0.116
F-statistic vs. constant model: 4.8, p-value = 0.00131
```

(8).

```
Linear regression model:
    Vol ~ 1 + ESG + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                    ________    _________    _______    _________

    (Intercept)       48.657       8.2335     5.9096    3.8354e-08
    ESG               0.11219     0.047237      2.375      0.019262
    ROE              -0.050674     0.030337    -1.6703      0.097668
    MTB               0.081898      0.12859    0.63689       0.52551
    LN_MarkCap        -1.6797      0.56895    -2.9522     0.0038508
    DE             -0.0043954    0.0023623    -1.8607      0.065437


Number of observations: 117, Error degrees of freedom: 111
Root Mean Squared Error: 6.12
R-squared: 0.188,  Adjusted R-Squared: 0.151
F-statistic vs. constant model: 5.13, p-value = 0.000287
```

(9).

```
Linear regression model:
    Vol ~ 1 + E + S + G + ROE + MTB + LN_MarkCap + DE

Estimated Coefficients:
                    Estimate        SE         tStat       pValue
                    ________    _________    _______    _________

    (Intercept)       47.26        8.6223     5.4812    2.7531e-07
    E                0.004729     0.037907    0.12475       0.90095
    S                0.061943     0.048666     1.2728       0.20579
    G                0.046872     0.031048     1.5097       0.13402
    ROE              -0.044826     0.031729    -1.4128       0.16058
    MTB               0.066763      0.13643    0.48935       0.62558
    LN_MarkCap        -1.6145      0.57695    -2.7982      0.006077
    DE             -0.0042261    0.002484    -1.7014      0.091727


Number of observations: 117, Error degrees of freedom: 109
Root Mean Squared Error: 6.16
R-squared: 0.192,  Adjusted R-Squared: 0.14
F-statistic vs. constant model: 3.69, p-value = 0.00128
```