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Performance of Sustainability Focused Funds in Scandinavia

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Abstract

The consciousness about sustainability and environmental solutions has never been greater than it is now. Several companies and private investors are taking these issues into account when choosing where to invest. This study investigates the relationship between sustainability focus and the financial performance of funds in Scandinavia. We analyse a panel data consisting of 72 observations from the period 1st of January 2015 to 31st of December 2020 collected from Thomson Reuters Eikon Database. Our sample is composed of 35 sustainable focused funds and 35 matched conventional funds. As benchmark, we use the MSCI World Index. We conduct the analysis using the Carhart four-factor model, which allows us to compare the different alpha values for a sustainable portfolio and a conventional portfolio. The result indicates that the sustainability focus affects the financial performance of a fund positively, but not in a significant way. Further, we find with help from a regression of only the last year of our period that Covid-19 has significantly improved the performance of sustainable funds compared to the conventional portfolio. Finally, making one portfolio of the funds with the highest ESG-score and one portfolio of the funds with the lowest ESG-score, we do not find difference in returns featuring funds with high and low ESG-scores.

Keywords: Sustainability, ESG, Covid-19, Matched pair, Scandinavian funds, Valuation models, Risk-adjusted performance measures

Preface

This master thesis has been completed as part of the master's degree in Business Administration at Oslo Metropolitan University. The thesis is a part of the compulsory education plan and amounts 30 credits.

The purpose of this study is to investigate the difference between Scandinavian sustainable funds and matched conventional funds in financial performance and risk-adjusted performance measures. This has been an exciting subject to explore during the Covid-19 pandemic as the increasing sustainable focus is more relevant than ever.

We have found sustainability focus very interesting to write about, and we think that our research question has been very relevant. We would like to thank our supervisor, Danielle Zhang, for constructive feedback, useful advice and outstanding support throughout the whole process.

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1 Introduction

Does sustainability focus affect the financial performance of funds in Scandinavia?

In this thesis, we want to investigate how funds with sustainability focus perform financially compared to conventional funds that do not have that same priority. The reason for our choice of research question is our general interest in sustainable investments and for the environment. We want to write about a topic that we find very interesting and a subject that we know we will find motivating through the whole writing period. Our second reason is that the world is facing a major environmental movement and that the focus on sustainable solutions has never been greater than now. These two reasons combined lays the foundation for our chosen research question.

Further on, this leads to the main hypothesis of our thesis. The hypothesis we want to test is if the financial performance of sustainable funds is similar or better than matched conventional funds. We also want to determine if the covid-19 situation or the ESG-score of each fund impacts the performance. The way we do this is first by collecting data with help from Thomson Reuters' Eikon database. Second, in order to test our main hypothesis, we use different valuation models and performance measures to find similarities and differences between the funds.

There are several interesting findings in our thesis. First, the main finding is that the sustainable funds do not perform differently than the conventional funds in a significant way during our analysing period. This is shown with help from regressing financial data and analysis of chosen performance measures. Second, we find that during the covid-19 period, the sustainable portfolio performs significantly better than the matching conventional funds. Our third finding is that we do not find any significant difference in the performance of funds with high ESG-score compared to funds with a low ESG-score.

This thesis contributes to already well described literature about the financial performance of funds in the global market. Our first contribution to the literature is the results we find for the Scandinavian market. We use data that are as up to date as possible, and in that way, we make

new assumptions about the market. Our second contribution to the literature is our findings about the covid-19 period. The performance of funds in the covid-19 situation is not well investigated earlier as long as we can see, making our contribution extra interesting. Comparing our study to previous literature, there are both similarities and differences. Some previous research finds that conventional funds outperform sustainable funds, while some find no correlation between sustainability focus and financial performance. We will discuss previous literature closer in chapter 2.

The structure of our thesis will be that we first present our research question and main hypothesis in chapter one. In chapter two, we start with presenting the theory behind the three sustainability aspects SRI, CSR, and ESG. Next, we follow up previous research and a more detailed description of our hypothesises. In chapter three, we describe our choice of method and research design. We follow up by presenting the different valuation models, performance measures and our dataset. In chapter four, we go through the results of our regressions and discuss them focusing on our hypothesises. In chapter five, we end our thesis with a conclusion and suggestions for further research.

2 Literature Review and Hypothesis

This section presents the concept of environmental, social, and corporate governance and how this concept has evolved. Next, we look at previous research that discusses the same subject as our study. Finally, we construct three hypotheses based on the previous research that we will investigate through this thesis. The purpose of this is to be able to explain the methodological choices, discoveries, and concepts.

2.1 Concepts related to sustainability

Over the last years, it has developed several sustainability theories. We focus on the three major concepts in this thesis: social responsibility investment, corporate social responsibility, and environmental social corporate governance.

2.1.1 Socially responsible investment

Socially responsible investment (SRI) refers to organisations that promote ethical and social topics including the environment, social fairness, corporate ethics, diversity, and justice. Over the past 35 years, SRI has generally been characterised by applying positive and negative screenings to investment selection. Such screening can, for example, be on issues like alcohol, environmental protection, gambling, human rights, military involvement, nuclear power, pornography, and tobacco – as well as shareholders activism and community investing (Krosinsky & Robins, 2012, p. 6). The 1980s were when several mutual funds were founded to accommodate the interest in SRI to the investors. These funds contained both the positive and the negative screens as mentioned above. In the 90s, an index for SRI funds called "The Domain Social Index" was developed, which existed of 400 large corporations. The idea of this index was to provide a benchmark for the companies that were selected based on the SRI criteria to measure the performance of screened investments versus unscreened investments (Donovan, 2019).

2.1.2 Corporate social responsibility

Corporate social responsibility (CSR) is associated with how an organisation operates in a way that affects society and the environment positively rather than negatively. The main focus is to find non-financial aspects that are important for the organisations. Carter, Kale, and Grimm

defines CSR as "Social responsible deals with the managerial of the consideration of non-market forces of corporate activity outside of a market or regulatory framework and includes considerations of issues such as employee welfare, community programs, charitable donations, and environmental protection" (Carter et al., 2000, p. 219). In the late 1990s, the idea of CSR became almost universally accepted and promoted by all constituents such as governments, corporations, non-governmental organisations and individuals. Most of the leading international institutions, such as the United Nations, World Bank, and other economic corporations endorsed CSR and established guidelines and permanently staffed divisions to research and promote CSR (Lee, 2008, p. 53).

2.1.3 Environmental, social and corporate governance

Socially Responsible Investment, Corporate Social Responsibility, and sustainable development build the foundations to the term Environmental, Social and corporate Governance (ESG). The ESG factors cover a wide spectre of issues that are not part of the financial analysis. The term ESG was first presented in 2004 in the report "Who Cares Wins: Connecting Financial Markets to a Changing World". The ESG investing started with the former United Nations Secretary-General Kofi Annan. He wanted to find ways to integrate ESG into capital markets. The reports aimed to increase awareness of the ESG factors for all the members involved in the financial market. (Compact, 2004). The major challenges using ESG rating to assess a sustainability number for the companies are the lack of available information that is created because companies have to report the data on their own initiative and the difference in delivery of the sustainability data provided by the companies (Schäfer, 2005, p. 108). Another challenge is the lack of standardisations, which make comparability difficult. Because of the lack of standardisation and awareness of sustainability theory, corporations can consciously manipulate stakeholders perceptions through "green-washing" (Siew, 2015, p. 188). However, a corporate disclosure on the ESG rating was launched by the Global Reporting Initiative (GRI) in 2000. Further on, SASB and GRI announced a collaborative work plan to help companies use the sets they provided (SASB, 2020). This has helped clarify the advanced industry sector-specific reporting and its relevance for investors. Overall, the ESG information is maturing, and the quality is getting better, but it is still not perfect (Kell, 2018)

2.2 Previous Research

This section presents similar empirical studies that have examined subjects that are close to our thesis. Several articles present the same themes, but the previous literature finds mixed evidence on how ESG and sustainability correlate with a firm's financial performance. Some research finds that funds with high ESG-score perform better than conventional funds, some find that the correlation is negative, and some find no correlation. We use the previous literature as a theoretical frame of reference for our hypothesises.

Hamilton et al. (1993) identified 32 US SRI funds through Lipper Analytics Service. These funds were compared with 320 randomly selected conventional funds in the period 1981 to 1990. Using Jensen's Alpha on monthly returns, they found that SRI funds did not have a significant excess return and that the performance of SRI funds were not significantly different from the performance of the conventional funds (Hamilton et al., 1993, p. 64).

Chris Mallin and Brahim Saadouni (1995) analysed the financial performance of ethical investment funds and compared them with non-ethical funds in the UK (Mallin et al., 1995, p. 483). They stated that many earlier studies described different investment strategies containing ethical considerations but that there had been little empirical work about the financial performance of ethical investment funds. Mallin et al. introduced the matched pair analysis by selecting 29 ethical trust companies and 29 non-ethical trust companies so that each of the ethical companies could be directly compared to one that was non-ethical in the matter of size and date started. They also compared both ethical and non-ethical companies with the market in general. They found that the ethical trust companies were outperformed by both the non-ethical trust companies and the market. However, they found that the ethical trust companies outperformed the non-ethical companies measured by Jensen's alpha, the Sharpe ratio, and the Treynor ratio on a risk-adjusted basis.

Dr Michael Schröder (2004) reviewed methods and results on previous studies of SRI funds and SRI indices. Several of these studies proved that SRI funds did not underperform compared to conventional funds, which were intriguing because SRI investment funds only used a subset of the total investment universe, and by that, they should have the same performance or worse performance than conventional funds. In Schröder's study, they investigated the performance

of 16 German and Swiss funds and 30 U.S. funds that concentrated on socially responsible investing. They found that socially screened assets seemed to have no clear disadvantage regarding their performance compared to conventional funds (Schröder, 2004, p. 131). Another method to measure the performance of SRI funds was to compare the performance with various available index funds. Therefore, Schröder completed a new study investigating the main risk-return characteristic of the most important international SRI equity indices with conventional benchmark indices (Schröder, 2007, p. 331). The study was based on 29 SRI stock indices, and the analysis revealed that most of the SRI stock indices had a higher risk compared to benchmarks.

Bauer, Koedijk, and Otten (2005) conducted a study to evaluate 103 ethical funds from Germany, UK, and the US using CAPM and the Carhart four-factor model. Their research gave some interesting results. First, they found no sign of significant difference in return between ethical and conventional funds. Second, ethical funds exhibited a distinct investment style compared to conventional funds using the multi-factor model. Third, they found that ethical funds tended to be more growth-oriented and less value-oriented than conventional funds (Bauer et al., 2005, p. 1766).

Kempf and Osthoff (2007) investigated if investors that applied social responsibility screens to their portfolios could increase their performance to their investment process, in the article "The effect of socially responsible investing on portfolio performance". To answer their question, they implemented a simple strategy of buying stocks with high SRI ratings and selling stocks with low ratings. Further on, they constructed a portfolio based on negative screening, positive screening, and best-in-class screening. They measured the performance using Carhart's four-factor model (Kempf & Osthoff, 2007, p. 909). The main result from their research was that negative screens did not lead to a significant excess return, but positive screens based on community and employee screening led to a significant positive alpha value. All of the other single screens did not result in significant alpha values. Screening from SRI also resulted in positive significant alpha values, and the best-in-class screens gave even stronger results than positive screening (Kempf & Osthoff, 2007, p. 921).

Gregory and Whittaker (2007) examined the performance of UK SRI funds and found that the performance of the funds was time-varying. They used Carhart's four-factor model to investigate how the funds performed and discovered that SRI funds were more exposed to small companies, growth companies, and momentum factors. They concluded that SRI fund investors did not lose financially compared to conventional fund investors. In addition, they showed that SRI investors improved risk-adjusted performance in UK funds by investing in past "winners" and avoid past "losers" (Gregory & Whittaker, 2007, p. 1327).

Climent and Soriano (2011) studied the American fund market, comparing green funds to SRI funds and conventional mutual funds in the period from 1987-2009. Using a CAPM-based methodology, they found that the green funds performed lower than both SRI funds and traditional mutual funds. However, after dividing the study into smaller periods, they discovered that the green funds' performance were not significantly different from the other funds in the latest 8 years. (Climent & Soriano, 2011, p. 285).

Chang, Nelson, and Doug White (2012) investigated the American fund market to see if green mutual funds performed differently from conventional funds. The data used in their study was 131 green mutual funds and all the other conventional funds that were listed in the respective Morningstar categories. Most of the funds had data for up to 15 years back in time (Chang et al., 2012, p. 693). The research findings showed that the green funds underperformed compared to the traditional mutual funds on a risk-adjusted basis. The paper also said that if green funds should be able to compete with traditional funds in the future the negative gap in performance must be removed.

Capelle-Blancard and Monjon (2014) examined the financial performance of SRI funds related to the screening process's features. To measure this, they created three sets of explanatory variables. Regardless of performance targets, they found that SRI funds did not outcompete the market. Furthermore, they confirmed that there was a cost to the SRI screening process. Finally, the financial performance of SRI funds were damaged by the exclusions of non-ethical shares (Capelle-Blancard & Monjon, 2014, p. 516)

Halbritter and Dorfleiter (2015) investigated the link between corporate social and financial performance based on ESG rating to review the existing empirical evidence related to this relationship. Their framework applied an ESG portfolio using the Carhart four-factor model and cross-sectional Fama and Macbeth regression. They found that the ESG portfolio did not display any significant difference in return between companies featuring high and low ESG ratings. Furthermore, a best-in-class approach using sector-specific ESG scores did not generate abnormal returns. Their findings strongly argue against previous empirical literature suggesting abnormal returns of an ESG portfolio (Halbritter & Dorfleitner, 2015, p. 35).

Lopez-de-Silanes, McCahery, and Pudschedl (2020) conducted a study to examine the link between ESG disclosure and quality through a cross-country comparison of varying ESG disclosure requirements and stewardship codes. Their research yielded many interesting findings. First, they found a strong relationship between the quantity and quality of ESG data disclosed by companies. Further, there was evidence that ESG was correlated with a decrease in risk. Finally, there was a negative relationship between ESG and performance in the US, which was consistent with the factor that ESG-oriented investors were willing to pay a premium for high-rated ESG investments (Lopez-de-Silanes et al., 2020, p. 35).

Hale (2020) reported in a Morningstar article that all equity funds suffered a large loss during the first quarter of 2020 because of the covid-19 pandemic, but that sustainable funds held up better than the conventional funds (Hale, 2020). 70% of the sustainable funds finished in the top halves of their Morningstar categories, and 24 out of 26 ESG related index funds outperformed their closest conventional funds (Hale, 2020).

2.3 Hypothesises

Our review of previous literature helps us to develop three different hypotheses to investigate our research question. Previous research finds mostly that ESG portfolios perform similar or worse than matching conventional portfolios. Based on this, we expect to find that sustainability focused portfolio would underperform against a matched conventional portfolio and the market. However, we want to see if the sustainable portfolio can outperform the conventional portfolio as the focus on sustainability is increasing. Therefore, our main hypothesis is:

Hypothesis 1:

H_0: *The financial performance of sustainable funds is similar to matched conventional funds.*

H_1: *The financial performance of sustainable funds is better than matched conventional funds.*

In addition, we find it interesting to see if the appearance of covid-19 has affected the performance of the different types of funds. Hale (2020) reported recently that sustainable funds performed better than conventional funds during the first quarter of the covid-19 pandemic. Because of that, we will test if the sustainable funds outperform the conventional funds during 2020.

Hypothesis 2:

H_0: *The financial performance of the sustainable funds during the covid-19 period has been similar to matching conventional funds.*

H_1: *The financial performance of the sustainable funds during the covid-19 periods has been better than matching conventional funds.*

As the ESG-score is the most common measure to see if a fund or an asset is sustainable, we find it interesting to see if this correlates with the financial performance. Halbritter and Dorfleiter (2015) find no significant differences in return between companies featuring high and low ESG score. Therefore, we would like to investigate if the ESG-score affects the financial performance of a fund, and our expectations is to find no significant difference.

Hypothesis 3:

H_0: *There is no correlation between the ESG-score of the fund and the financial performance.*

H_1: *There is a positive correlation between the ESG-score of the fund and the financial performance.*

3 Methodology and data

In this chapter, we show the methods we use for our analysis and how we identify the data for our research. First, we discuss the research design of our thesis, and after we describe the criteria for the choice of data, our analysing period, and the final data sample.

3.1 Methodology and Research Design

There are two main methods to choose between, the qualitative and the quantitative method. The qualitative method collects information using interactive processes between two or more people. This method typically uses interviews, experiments, and surveys to collect information about topics and then interprets the data after. In this case, the information that is collected often is in words and not in numbers.

The quantitative method aims to discover answers by implementing scientific procedures that are reliable and unbiased (Davies & Hughes, 2014, p. 9). The main goal is to establish statistically significant conclusions about a population by studying a representative sample of the population (Lowhorn, 2007). This method often consists of collecting numerical data and use them to solve the problem. For our purpose, the quantitative method is the most relevant because we use historical returns to find statistical patterns in the performance of our chosen funds.

The research design describes the total strategy used for solving our research. In general, we say there are three different main types of research design in the quantitative method. First, we have the descriptive design that describes already known aspects with precision. This design will not try to find causal relationships or test hypotheses. Second, we have the exploratory design that investigates new problems that not necessarily has been defined yet. The main work here is to inspect new problems, not to find solutions to already existing problems. Finally, we have the causal design. The main task is to find causal relationships between one dependent and two or more independent variables (Schenker & Rumrill Jr, 2004, p. 121). For our research question, to see if there is a relationship between the sustainability focus and the performance of the funds, the causal design will be the most natural way to solve our problem.

3.2 Methodology: Factor models

This section presents the Capital Asset Pricing Model (CAPM), the Fama-French three-factor model, and the Carhart four-factor model.

3.2.1 Capital Asset Pricing Model

CAPM is a model that gives precise predictions of the relationship between the risk of an asset and its expected return. This relationship serves two vital functions. First, it provides a benchmark rate of return for evaluating a possible investment. Second, the model helps to make a qualified estimate of the expected return of an asset that has not yet been traded in the marketplace (Bodie et al., 2013, p. 291). CAPM is developed by (Sharpe, 1964), (Lintner, 1965) and (Mossin, 1966). The model contains a risk-free interest rate, the market return, and a beta for the risk shown below.

$$E(r_i) = r_f + \beta_i\left[E(r_M) - r_f\right] \quad (1)$$

Where:

$E(r_i)$: Expected return of investment

r_f : Risk-free rate

β_i : Beta on the investment

$E(r_M)$: Market return of investment

3.2.2 Fama-French Three-Factor Model

The Fama-French three-factor model expands the CAPM by adding more factors. The model has three types of systematic risk; market risk, the risk associated with size (SMB), and risk related to value (HML) (Fama & French, 1993, p. 392). Fama and French developed the three-factor model after discovering that the average return on small stocks was too high given their β estimates, and the average return on large stocks were too low (Fama & French, 1992, p. 349).

Small-minus-Big (SMB) measures historical excess return due to investing in companies with low market values compared to companies with high market values. It is based on the difference in return between the small and the large companies. Fama and French constructed two

portfolios where they ranked all shares on the NYSE every June from 1963 to 1991 by size and used the median size to divide the shares on NYSE, Amex, NASDAQ into two groups: small and big. (Fama & French, 1993). The difference in return between these two portfolios is the SMB factor. A zero value of the SMB coefficient in the regression signifies a large-cap, and a value greater than 0,5 indicates a small-cap (Rao & Boudreaux, 2008, p. 143).

High-minus-low (HML) is based on the book-to-market ratio and measures the historical excess return of value stocks and growth stocks, where the value stocks have a high book-to-market ratio, and the growth stocks have a low book-to-market ratio. For the HML factor, the distribution is done by placing the highest 30% of shares in book-to-market value in one group and the lowest 30% of shares in another group (Fama & French, 1993). A zero value of the HML coefficient in the regression signifies that the portfolio being studied is a growth portfolio, while a value greater than 0,3 signifies a value portfolio (Rao & Boudreaux, 2008, p. 143).

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1\left(R_{Mt} - R_{ft}\right) + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_{it} \qquad (2)$$

Where:

R_{it} : Total return of a stock or portfolio i at time t

R_{ft} : Risk-free rate of return at time t

R_{Mt} : Total market portfolio returns at time t

$R_{it} - R_{ft}$: excess return of the market portfolio (index)

SMB_t: Historic excess return of small-cap over large-cap companies

HML_t: Historic excess return of value stocks over growth stocks

3.2.3 Carhart Four-Factor Model

In 1993, Jegadeesh and Titman discovered a tendency to get a significant abnormal return by buying past winners and selling past losers in the period from 1965 to 1989. The strategy is to choose stocks based on the last 6-month performance and hold them for another 6-months, which is a momentum property called the one-year momentum effect (Jegadeesh & Titman, 1993, p. 67). Carhart constructed the four-factor model as an extension of the Fama and French three-factor model by adding an extra factor capturing Jegadeesh and Titman's one-year momentum anomaly to evaluate the mutual fund performance (Carhart, 1997).

The momentum factor was constructed as the equal-weighted average of firms with the highest 30% eleven-month return lagged one month, minus the equal-weighted average of firms with the lowest 30% eleven-month return lagged one month. The portfolios included all NYSE, Amex, and NASDAQ stocks and were re-formed monthly (Carhart, 1997). The four-factor model eliminates almost all of the patterns in pricing errors and indicates that it well describes the cross-sectional variation in average stock return (Carhart, 1997). A positive beta on the MOM factor implies that the fund has exposure to momentum stocks, and vice versa for a negative beta (Carhart, 1997)

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1(R_{Mt} - R_{ft}) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOM_t + \varepsilon_{it} \quad (3)$$

Where:

MOM_t : One year momentum premium in stock return

3.3 Risk-Adjusted Performance Measures

Previous research on the same subject gives different measurement methods and makes it easier to compare various investments. In this section, we describe the performance measures we have chosen for our analysis.

3.3.1 Sharpe ratio

William F. Sharpe defined the Sharpe ratio to compare investments taking both performance and risk into account (Sharpe, 1966). The ratio's input is the fund's historical performance, the risk-free rate of return, and the risk of the investment represented with the standard deviation. The Sharpe ratio is given below:

$$Sharpe\ ratio = \frac{r_i - r_f}{\sigma_i} \quad (4)$$

Where:

r_i : Performance of the investment

r_f : Risk-free rate of return

σ_i : Total risk of the investment

3.3.2 Treynor ratio

The Treynor ratio is very similar to the Sharpe ratio, except that it only takes the systematic risk, beta, into account (Treynor & Mazuy, 1966). The Treynor ratio is a better performance measure if the investor is well diversified. The main disadvantage with the Treynor ratio is the use of beta as a benchmark when the beta shows historical values that may not be the same today as in the past. Unlike the Sharpe ratio, the Treynor ratio excludes the unsystematic risk, so the formula looks like this:

$$Treynor\ ratio = \frac{r_i - r_f}{\beta_i} \tag{5}$$

Where:

β_i: Measure of systematic risk

3.3.3 Jensen's alpha

Jensen's alpha is the risk-adjusted measure of performance for portfolios resulting from Michael C. Jensen's paper from 1968 (Jensen, 1968). The alpha added to CAPM tells if the fund has a higher expected return than other funds with the same level of risk. The model searches for abnormal return for a portfolio that exceeds the theoretical expected return represented with CAPM. Every investor will search to find funds with a positive alpha when higher alphas are associated with an ability to earn a higher return.

The formula for Jensen's alpha is:

$$Jensen's\ alpha = R_i - \left[R_f + \beta_M * \left(R_M - R_f\right)\right] \tag{6}$$

Where:

R_i : The realised return of the fund

R_f : The risk-free rate of return

β_M : The beta of the fund with respect to the market index.

R_M : The return of the market index

3.3.4 Tracking error

Money managers are often convicted by total return performance relative to a prespecified benchmark. The return of assets can be very noisy, and it can take a long time before the average performance is known. Hence, this has led many fund inventors to focus on the volatility of tracking error (Roll, 1992, p. 14). The tracking error is defined as the volatility of return difference between a portfolio and the benchmark index. Tracking error estimates are especially influential in constructing and managing index funds (Pope & Yadav, 1994, p. 27). A low tracking error means that the fund follows the index closely and vice versa for a high tracking error. The tracking error is given below:

$$Tracking\ Error: \sqrt{\frac{\sum_{i=1}^{n}(R_P - R_B)^2}{N-1}} \tag{7}$$

Where:

R_p: Return of fund

R_m: Return of Benchmark

N: Number of return periods

3.3.5 Information ratio

The Information ratio is defined as a measure that seeks to summarise the mean-variance properties of an active portfolio in a single number (Goodwin, 1998, p. 34). Another definition of the Information ratio is the average excess return per unit of volatility in the excess return. The Information ratio seeks to find how a fund performs compared to a benchmark index or security and, in that way, see if an investor can outperform the benchmark over time. The calculation of the Information ratio is done by using the standard formulas for the mean and standard deviation of a portfolio. The next step is to subtract the benchmark return from the portfolio return and find a potential excess return. We have called this difference α_P. In the end, this is divided by the tracking error, which gives us the Information ratio.

$$Information\ ratio: \frac{\alpha_P}{\sigma(T_E)} \tag{8}$$

Where:

$\sigma(T_E) =$ Tracking error

3.3.6 M^2 measure

The M^2 measure, also known as the Modigliani-Modigliani measure, shows the risk-adjusted return of an investment compared to the performance of a benchmark index (Modigliani & Leah, 1997). When calculating the M^2 measure, we first calculate the Sharpe ratio of the fund and then multiply it with the annualised standard deviation of a benchmark index. In our thesis, we use MSCI World Index as the benchmark. Next, the average risk-free rate of return is added, and now the portfolio and the benchmark have the same standard deviation. The formula for the M^2 measure is:

$$M^2 = S * \sigma_m + r_f \tag{9}$$

Where:

S: Sharpe ratio

σ_m: Annualized standard deviation of the market

r_f: Average risk-free rate

3.3.7 Sortino measure

In the early 80s, Dr Frank Sortino came up with a research to improve the measure of risk-adjusted return. The Sortino ratio is a modification of the Sharpe ratio, where the Sortino ratio uses the downside deviation as a measure of risk (Rollinger & Hoffman, 2013, p. 3). The ratio sets a required target, and only those returns falling below the required target are considered risky. The Sortino ratio is defined as:

$$Sortino\ ratio = \frac{R - T}{TDD} \tag{10}$$

Where:

R: The average period returns

T: The required target rate of return

TDD: The target downside deviation

3.4 Sample

3.4.1 Selection criteria

When choosing which funds that are relevant for our research, we decide different criteria that the funds need to fulfil. We have listed our 5 criteria below.

Criteria 1: The funds have to be listed in the Thomson Reuters Eikon database. We choose funds using FSCREEN from Eikon and disable the three standard criteria, which are that the asset is active, primary flag, and that the asset universe is mutual funds. By doing this, we get a big sample of funds that we can select for our analysis.

Criteria 2: The funds have to be of Scandinavian origin. By adding the criterion "Domicile is Denmark, Norway, and Sweden", we limit our dataset to Scandinavian funds. We use this criterion because we find the Scandinavian funds most exciting, and at the same time, we limit the number of funds down to a decent number.

Criteria 3: To get enough observations, we choose only funds with at least 6 years of historical performance data. By this criterion, we think that we have enough observations to get results with high statistical precision. The way to do this is by only choose funds with a launch date before the 1st of January 2015. Unfortunately, this can lead to survivorship bias which is described in section 3.6.1.

Criteria 4: We choose only funds that have a global focus. By adding the criterion that geographically focus is global, we remove the funds that only invest in limited geographical areas, and we also remove funds that only invest in specific industries. Because of that, our benchmark index is comparable with all our chosen funds. That is in line with previous methods used by Hamilton et al. (1993) and Kreander et al. (2005)

Criteria 5: We try at the best of our ability to match sustainable and conventional funds that the same company manages. By using this criterion, we will remove possible differences in main strategies, standards, and different attributes that may occur when matching funds are from different companies.

3.4.2 Analysing period

As described in section 3.4.1, we only use funds with a launch date from before the 1st of January 2015. We want to analyse the most recent observations that are available, which give us the analysing period from the start of January 2015 to the end of December 2020. In total, we have 72 observations per fund. The reason for this choice of period is the increasing focus on sustainability and environmental investments over the last years. More investors care about the environment now than in previous periods. We think a period of six years of time makes enough observations to give a good view of how each fund's performance has been.

3.4.3 Matched pair

A matched pair analysis can be used to compare funds with different investment strategies in pairs, such as ethical funds versus non-ethical funds. The matched pair analysis uses various factors like size, age, domicile, and investment universe (Kreander et al., 2005, p. 1473). Matched pair was first introduced by Chris Mallin and Brahim Saadouini in 1995. The background of the article was that there had been comparatively little empirical work carried out on the financial performance of ethical investment funds. Mallin et al. (1995) wanted to analyse the financial performance of UK ethical investment funds and compare their performance against both UK non-ethical investment funds and a benchmark portfolio. They argue that fund size and formation data may affect financial performance. Therefore, they controlled for both of these factors in their analysis. They found out that the ethical funds tend to have superior performance to their matched non-ethical funds when comparing the Jensen's alpha, Treynor, and Sharpe, but this effect was weak (Mallin et al., 1995, p. 495).

According to the surveys provided by Gregory, Matatko, and Luthor (1997), several assumptions can lead to a comparison of the conventional fund and climate fund measurement of risk-adjusted being biased. Climate funds can be relatively young compared to conventional funds, and there can be a higher management cost for the young funds (Gregory et al., 1997, p. 724). These biases can also lead to problems, for example, when using a single-factor model. The primary reason for this is that the single-factor model like CAPM assumes that the systematic risk of an asset is only captured by the covariance of the market portfolio, which explains the entire variation in the stock's return. Gregory et al. (1997) adopted the matched pair approach to Mallin at el (1995) and added more factors like age of the fund, size of the

fund, and ethical status. They found that age appeared to be an essential factor, whereas the size and ethical status were not significant (Kreander et al., 2005, p. 1469). Therefore, in our thesis, we do not compare the funds in pairs, but we use the matched pair analysis so that the funds we choose is comparable according to the factors we determine.

3.4.4 Selection method

Using the matched pair method described in section 3.4.3, we find conventional funds that, to the best of our ability, match the sustainable funds we choose. We attempt to find sustainable and conventional funds that is run by the same company. By doing this, we remove most of the possible differences in strategies, size, domicile, and other factors that can occur if different companies run them. An example of a pair of funds is DNB Miljøinvest and DNB Global A.

The fund screening process is done with help from Thomson Reuters Eikon. Using the criteria from section 3.4.1, we limit the dataset to 35 sustainable funds and 35 conventional funds. Table 8 in the appendix shows the final funds we have chosen compared by the factors launch date, NAV-value, and ESG score.

3.5 Data

3.5.1 Data collection

Several agencies report ESG ratings for companies such as MSCI, KLD, SAM, and Thomson Reuters. Which one of those that report the most accurate and credible values is not easy to answer, but we choose Thomson Reuters. This is because of the availability at school, and we can see that it has been used many times before. Thomson Reuters uses the Eikon database, and this allows us to find monthly time-series data from the last 6 years on the performance of all the selected funds.

The Thomson Reuters ESG score is one of the most comprehensive in the market (Eikon, 2017, p. 3). The ESG score replaced the ASSET4 tool in 2016 and is now the most common measurement for sustainable investments with historical values back to 2002. The ESG score was designed to give an objectively and transparent measure of a company's performance on different ESG themes (Eikon, 2017, p. 3). The score can be shown both with percentage,

numbers and letter grades from D- to A+. It is calculated with help from over 400 measures of a company and 178 data points divided into 10 main categories. These categories are the background for each of the three pillar scores social (ESGS), environmental (ESGE), and governance (ESGG), which in total gives the final ESG-score for a company.

3.5.2 Factors in Carhart's four-factor model

The factors needed in the Carhart four-factor model are risk-free interest rate, market return, small-minus-big factor, high-minus-low factor, and the momentum factor. Because we use monthly returns on each fund, we need to collect monthly data for each factor. The factors are downloaded from Kenneth French's website, as the website offers various investment market factors, for example, the geographical area. As we look at funds with a global investment universe, we use factors from French's website that are constructed based on a global perspective (French, 2020). The global factors provide monthly data from 01.07.1990 and include data from 23 countries in four regions, including Denmark, Norway, and Sweden.

The way the factors are constructed is explained on French's website, and we will give a summary here. The factors are constructed using the six value-weight portfolios formed on size and book-to-market. All returns are in US dollars, and the market factor (MktRf) is the return on a region's value-weight market portfolio minus the US one-month treasury bill. The SMB factors are constructed by sorting stocks in a region into two market caps. The big companies are the 10% largest companies, and the small companies are the 10% smallest. The return for the SMB factor is then calculated by subtracting the return of the big companies from the return of the small companies. The HML factor sorts the stocks into three book-to-market equity groups. Therefore, the return is calculated by subtracting growth companies' return from value companies' return, where the growth companies are the 30% of the companies with the lowest book-to-market and the value companies are the 30% with the highest book-to-market. The momentum factor is six groups constructed by size and stock trend, where the group is sorted into two losing, two neutral, and two winning groups. The factors are the average return from the two winning groups in a region minus the average return from the two losing groups.

3.5.3 Combined portfolio

We construct two portfolios consisting of the average monthly NAV-change in percent for all the sustainability funds in one portfolio and all the conventional funds in another portfolio. We use the one-factor model, the Fama and French three-factor model, and the Carhart four-factor model for the two portfolios to generate a general estimate of the performance for the sustainable funds and the conventional funds. To investigate whether there are underlying trends in the return of the merged portfolios, we do a similar analysis as (Kempf & Osthoff, 2007, p. 919) and (Bauer et al., 2005, p. 1763), where they have divided the time series into sub-periods. We want to see if there is an underlying trend before and after covid-19, so we divide our sample into two series. The first period is named pre-covid. This portfolio consists of 60 months. The second period is called post-covid and consists of 12 months with performance data. In table 1 below, we show a summary of some key statistics for the funds of our analysis.

Table 1: Summary statistics for sample of funds

	N	Mean	Median	Std.Dev.	min	max
All funds						
Value	70	938.381	370.719	1328.911	3.983	5310.757
ESG-score	70	55.5757	66.478	25.905	0	81.569
Annual return	70	.091	.08	.08	-.005	.503
Sustainable funds						
Value	70	882.912	398.028	1304.852	3.983	5303.496
ESG-score	70	59.914	66.516	22.332	0	81.569
Annual return	70	.099	.091	.076	.01	.368
Conventinal funds						
Value	70	993.85	339.729	1369.297	4.514	5310.757
ESG-score	70	51.6	66.44	28.767	0	73.503
Annual return	70	.083	.077	.084	-.005	.503

Note: This table reports summary statistics (mean, median, standard deviation, minimum, and maximum) for the funds. Our data sample includes a total of 70 diversified equity funds consisting of 72 observations per fund from the period 1st of January 2015 to 31st of December 2020.

3.5.4 ESG portfolio

We construct two ESG portfolios which consist of funds being ranked after ESG-score. In our sample of funds, we have 12 funds that do not have a score, so we choose to put these funds in one portfolio that we call "Lowest ESG-rated funds". The other portfolio consists of the 12 highest ESG-rated funds, and the portfolio name is "Highest ESG-rated funds". Table 12 shows the two portfolios and how they are divided. As we were unable to gather monthly ESG-score for each fund, we believe this method is the best way to see how the ESG-score impacts the financial performance of the funds.

3.6 Validity

Several preconditions must be fulfilled for a regression to be valid. In this section, we describe heteroscedasticity and serial correlation that both are factors that cannot be present for a regression to be valid. We also present several tests to check for these factors.

3.6.1 Selection bias

A bias, in general, can be defined as a trend in collections, analysis, interpretations, publications, or reviews of data that can lead to conclusions that are systematically different from the truth (Stock & Watson, 2015, p. 116). Selection bias is a bias that occurs from failing in achieving the fully randomised sample in an analysis. Another way to describe this is that when selection bias is present, the analysis of a sample will not be representable for the total population. This is a threat to both the internal and the external validity of the analysis and will simultaneously violate the first OLS assumption that the correlation between the regressors and the error term is zero. A type of selection bias that is very relevant for our thesis is survivorship bias. We have chosen only funds that have survived the whole period, which can lead to wrong conclusions as funds that do not exist anymore are left out.

3.6.2 Heteroscedasticity

In the case of heteroscedasticity, the standard errors of the regression will be inconsistent. The error term of a regression u_i is homoscedastic if the variance of the conditional distribution given X_i is constant for $I = 1,\ldots n$ and does not depend on X_i (Stock & Watson, 2015, p. 204). When the variance is not constant given X_i, the standard errors are heteroscedastic. When we

have heteroscedasticity, one of the OLS assumptions will be violated, which will threaten the internal validity of the regression.

3.6.2.1 Breusch-Pagan test

"A simple test for heteroscedasticity and random coefficient variation" was introduced in 1979 to test for heteroscedasticity in a regression. The test checks whether the standard errors in a linear regression depend on the independent variables' values or not (Breusch & Pagan, 1979, p. 1287). The test gives a Lagrange multiplier that is chi-square distributed, and a p-value will tell whether the standard errors are homoscedastic or heteroscedastic. We have used Stata to produce the results of the test. A weakness of the Breusch-Pagan test is that it assumes that the possible heteroscedasticity is a linear function of the independent variable. That means that the test will not be able to find possibly not-linear heteroscedastic correlations between the dependent and independent variables.

3.6.3 Serial correlation

Serial correlation, or autocorrelation, occurs when the standard errors of the observations in the regression are correlated. When using panel data, the standard errors can correlate both across entities and across time. The absence of autocorrelation is an assumption for valid results with OLS regression. With panel data, correlation in the standard errors in the same entity over time will not violate that assumption. However, when the standard errors across different entities, in our case funds, are correlated, this will violate the assumption. As with heteroscedasticity, this will threaten the internal validity of the results.

3.6.3.1 Durbin-Watson test

The Durbin-Watson test is a test to check for serial correlation in linear regression (Durbin & Watson, 1950). Checking for serial correlation means that we want to see if there is a momentum factor in the dataset we are using. Using this test makes it possible to check for both positive and negative autocorrelation. What represents the Durbin-Watson test is the d-statistic that is always between 0 and 4 and. Values between 0 and 2 means a positive autocorrelation, values between 2 and 4 shows a negative autocorrelation, and a value of 2 gives evidence for no autocorrelation. The formula for the d-statistic is given below.

$$d = \frac{\Sigma(e_t - e_{t-1})^2}{\Sigma(e_t^2)} \quad (11)$$

Where:

e_t = the residual of the OLS regression

e_{t-1} = the residual of the first lag

Even though the Durbin-Watson test is one of the most well-known tools to check for autocorrelation in a regression, the test has several drawbacks (Moody, 2009, p. 162). One of the drawbacks is the test's precision. Using the DW-tables to find critical values to compare with the DW-statistic from the regression will give two critical values. In some cases, the DW-statistic will be between these values, and that will make it difficult whether to keep or reject the null hypothesis. Another problem with the Durbin-Watson test is when we have a lagged dependent variable. In that case, we will get biased values of the test towards 2. This is critical because the test can say that there is no serial correlation when the actual case is that serial correlation is present.

3.6.4 Results from validity tests

Our results from both the Durbin-Watson test and the Breusch-Pagan test are given in table 13 and 14. First, we have checked for serial correlation in the residuals using the Durbin-Watson test. Our null hypothesis is that there is no serial correlation, and our alternative hypothesis is that we do have a serial correlation in our data set. From the table, we can see that the d-statistic is 1,908 for the conventional funds and 2,056 for the sustainable funds. The critical values with 4 regressors excluding the constant and 72 observations are 1,503 and 1,736 (Savin & White, 1977, p. 1994). As our test statistics is above the higher critical value, we keep our H_0 about no serial correlation.

Second, we have tested for heteroscedasticity in the residuals using the Breusch-Pagan test. The null hypothesis is that the residuals are homoscedastic, and the alternative hypothesis is that the residuals are heteroscedastic. Our test-statistics are 0,08 for the sustainable funds and 0,10 for the conventional funds. The p-values are not significant at any level, so we keep our H_0 that the residuals are homoscedastic. This is expected as we have used robust standard errors when regressing our model in Stata. Looking at the scatter plot of the residuals shown under the tables

in figure 2, we can see that the residuals are pretty similar throughout the whole period, with a few outliers in the sustainable and conventional portfolio.

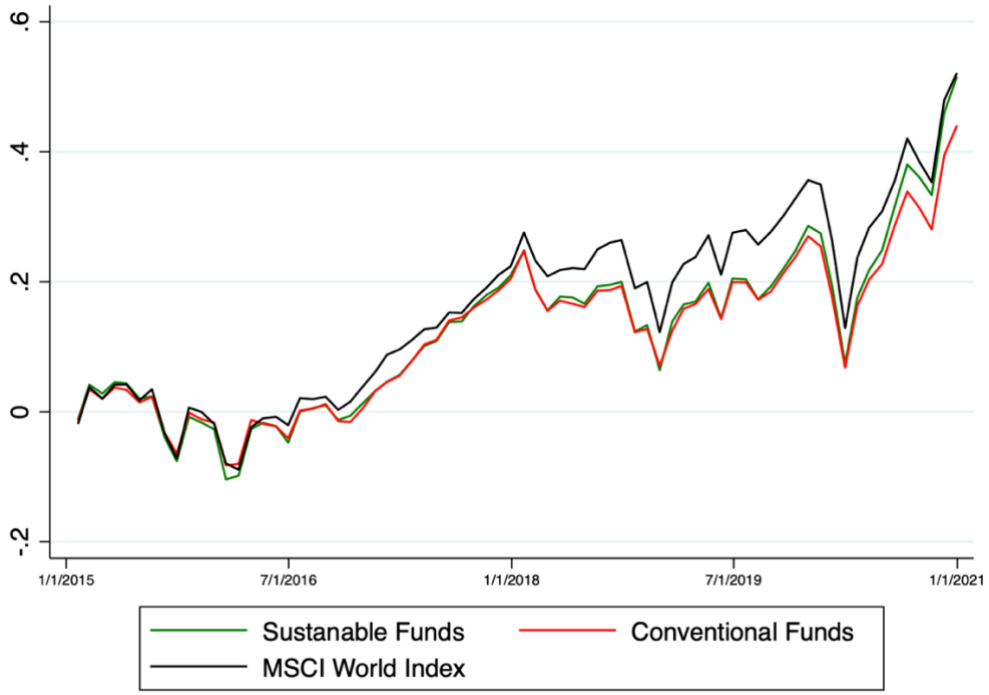
4 Results and discussion

In this chapter, we present our results and discuss them up against our hypothesises. First, we present our results from the regressions of the combined portfolios. Second, we go through and discuss the results of our performance measures. Third, we show the results of our regression of the covid-19 trend periods. Finally, we look at the results of our regressions featuring the highest and lowest ESG rating funds.

4.1 Combined portfolios

In this section, we discuss the main hypothesis test of our thesis, if the sustainable funds perform similar or better than the conventional funds during our period. First, we present a figure of the historical return of the portfolios to give a graphical view on how the performance have been. Second, we show a table of the excess return of the two portfolios and compare the results. Then, we regress different factor models on the two portfolios intending to find a final statement in our main hypothesis.

Figure 1: Historical return



Note: This figure presents the historical return from January 1st, 2015, to December 31st, 2020. The black line represents the MSCI World index, the green line represents the combined sustainable portfolio, and the red line represents the combined conventional portfolio.

Figure 1 above presents the historical return from the 1st of January 2015 to the 31st of December 2020. We can see a clear correlation between the sustainable and conventional portfolio performance and the MSCI World Index as they largely follow the same route through the period. We can also see that the green line for the sustainable portfolio is slightly above the red line for the conventional portfolio for the last year of our period because the sustainable funds perform better than the conventional funds in this period. This is interesting for our second hypothesis that will be discussed later. The MSCI World index perform better than both portfolios for the whole period. Relating this graph to our hypothesis, we do not get evidence to say that there is any significant difference between the return of the sustainable and the conventional portfolio.

Table 2: Descriptive statistics of excess return

	Mean	Median	Standard Deviation	Minimum	Maximum.
Sustainable Funds	.00641	.00747	.04271	-.12073	.12692
Conventional Funds	.00537	.00677	.03891	-.10974	.11407

Note: This table shows the descriptive statistics for the excess return of the combined sustainable and conventional portfolio.

Moving on, table 2 presents the descriptive statistics for the excess return of the sustainable and conventional funds. The excess return can be described as the difference between the actual annual return of the fund and the risk-free rate return. From the table, we can see that sustainable funds have a higher mean and median value than the conventional funds. Further on, we see that the mean is less than the median, so the distribution is negatively skewed. The standard deviation is higher for the sustainable funds, which is consistent with what we see in the graph of the historical return where the sustainable portfolio in almost every extremal point have higher peaks and lower bottoms than the conventional portfolio.

Further on, this leads to expected values in the minimum and the maximum values, where higher volatility leads to a more negative minimum and a higher maximum for the sustainable funds. For our hypothesis, the most interesting is the mean value that is higher for the

sustainable portfolio. However, the difference is so small that we need to look at the regressions below to see if the difference is significant.

Table 3: Regression table, Combined portfolio

	One-Factor Susatainable	One-Factor Conventional	Three-Factor Sustainable	Three-Factor Conventional	Four-Factor Sustainable	Four-Factor Conventional	Four-Factor Difference
Alpha	-0.00244**	-0.00266**	-0.00242**	-0.00296***	-0.00239**	-0.00299***	0.000606
	(-2.15)	(-2.35)	(-2.54)	(-2.82)	(-2.57)	(-2.91)	(1.07)
Mkt-RF	0.961***	0.872***	0.956***	0.875***	0.949***	0.883***	0.0661***
	(40.49)	(36.88)	(34.58)	(33.93)	(20.96)	(22.47)	(4.29)
SMB			0.0529	-0.0122	0.0537	-0.0131	0.0669*
			(0.58)	(-0.15)	(0.57)	(-0.16)	(1.89)
HML			0.00102	-0.0378	-0.0231	-0.0117	-0.0114
			(0.02)	(-0.79)	(-0.37)	(-0.20)	(-0.37)
MOM					-0.0302	0.0328	-0.0630**
					(-0.35)	(0.45)	(-2.09)
Observations	72	72	72	72	72	72	72
Adjusted R^2	0.949	0.941	0.948	0.940	0.948	0.939	0.441

Note: This table presents the results obtained from OLS regression using the one-factor, three-factor, and four-factor models. Alpha is the intercept of the model. Mkt-RF is the excess return on the value weighted market factor. SMB, HML and MOM is the factor-mimic for size, book-to-market, and one year return momentum. t statistics in parenthesis, *** p < 0,01; ** p < 0,05; * p < 0.1

Table 3 shows the results from our regressions of the one-factor, three-factor, and four-factor model for the combined portfolios. We can see that the alpha values for all the regressions are significant negative at a 5% level and some even at a 1% level. The Mkt-Rf factor is below 1 for all the portfolios, and all the coefficients are significant at a 1% level. This is as expected as the return of the portfolios are lower than the market index. The rest of the coefficients for the three-factor and the four-factor model do say something about which direction in size and value the portfolio's investments are exposed to, but they are not significant at any level and will not be commented further. The adjusted R^2 value is satisfying for all the regressions with a value of at least 0,939.

The most interesting coefficient to look at for our hypothesis is the alpha value of the portfolios. Looking at all the factor regressions, we can see that the alphas for the sustainable funds are less negative than for the conventional funds. The value of the alpha can be interpreted as the return of the portfolio if all the betas are zero. A less negative alpha for the sustainable portfolio gives evidence to say that the sustainable portfolio performs better than the conventional portfolio. To test if this difference is significant, we regress the sustainable portfolio minus the conventional portfolio in the column furthest to the right in the table in the regression called Four-factor difference. As we can read from the table, the alpha value of this regression is 0,000606. However, this coefficient is not significant at any level, which means that we cannot be sure that it is positive. Because of that, we cannot reject the null hypothesis about the similar performance of the two portfolios during our analysing period.

Comparing our findings to previous research, we have both similarities and differences. We find that sustainable funds perform insignificant better than conventional funds. The fact that we do not find a significant difference in return of the portfolios is in line with what Bauer et al. find in their research from 2005. Our findings are also consistent with what Gregory and Whittaker find in 2007, where they state that SRI investors do not lose financially to conventional investors. On the other hand, our findings are different from both Climent and Soriano's work from 2011 and Chang et al. research from 2012, who find that green mutual funds underperform compared to traditional mutual funds.

4.2 Performance measures

In this section, we use several performance measures to discuss our main hypothesis, whether the financial performance of the sustainable portfolio is similar or better than the conventional portfolio. We calculate the summary statistics for both portfolios for all the performance measures and compare the results for each measure. Finally, we test the significance of the differences in values.

Table 4: Summary statistics performance measure

	N	Mean	Median	Std. Dev.	min	max
Sustainable funds						
Sharpe ratio	35	.48	.469	.244	.068	.891
Treynor ratio	35	.007	.006	.003	.001	.013
Jensen's alpha	35	.007	.007	.005	.001	.026
Tracking error	35	.024	.021	.021	0	.098
Information ratio	35	-.001	.011	.174	-.304	.335
M^2 measure	35	-.001	-.001	.003	-.005	.005
Sortino ratio	35	.239	.239	.116	.054	.472
Conventional funds						
Sharpe ratio	35	.436	.41	.275	-.022	1.541
Treynor ratio	35	.006	.006	.004	0	.02
Jensen's alpha	35	.006	.006	.004	.001	.021
Tracking error	35	.023	.018	.022	.002	.115
Information ratio	35	-.03	-.079	.171	-.255	.581
M^2 measure	35	-.001	-.002	.003	-.007	.011
Sortino ratio	35	.219	.208	.142	.022	.843

Note: This table presents the summary statistics (mean, median, standard deviation, minimum, and maximum) for the performance measures for the two combined portfolios.

First, looking at the performance measures ranked in table 9 and 10 in the appendix, we can see that the same funds largely are in the top quantile of all the rankings. Overall, some of the funds that perform well at all the measures are Öhman Global Growth, Handelsbanken Hallbar Energi, and SPP Global Solutions A. At the other end of the ranking, we find funds that overall have the lowest performance measures on all the rankings. Examples of these worst performing funds are Jyske Globale Aktier KL and Cicero Hallbar Mix A.

Linking our results up to our hypothesis test, we first find it interesting to compare the average performance measures for the sustainable and conventional portfolio. Looking at the line for the Sharpe ratio, we see that the sustainable funds have a higher value than the conventional

funds with a ratio of 0,48 versus 0,436 for the conventional funds. This gives evidence that sustainable funds have a higher average return in excess of the risk-free rate per unit of risk compared to conventional funds.

Next, looking at the average of the Treynor ratio, we find that the sustainable funds perform slightly better than the conventional funds with a ratio of 0,007 versus 0,006 for the conventional funds. The Treynor ratio tells what excess return a fund has on average to the risk-free rate per unit of systematic risk, and a higher value for the sustainable funds means that they have a higher excess return. Nevertheless, the difference is so small that it is impossible to say that one is significantly better than the other just by looking at the numbers.

When looking at the table for Jensen's alpha, we see that the sustainable funds, on average have a value of 0,007 and the conventional funds have a value of 0,006. Looking at table 9, where the alpha values are ranked, we can also see more sustainable funds in the upper part than conventional funds with 20 sustainable versus 15 conventional in the upper 35 funds. Because of that, it is expected that the average Jensen's alpha is higher for sustainable funds than for conventional funds.

The next performance measure is the tracking error, and we see that the values are almost similar for both portfolios. The sustainable funds have an average tracking error of 0,024, and the conventional funds have a value of 0,023. Here, a value close to zero means that the fund follows the benchmark at a higher level, so in this case, the conventional funds perform closer to the benchmark. A higher tracking error means that the portfolio has a higher difference in return from the benchmark.

Looking at the Information ratio, we find that both the sustainable and the conventional portfolios have negative ratios with the values -0,001 and -0,03. A positive Information ratio means that the funds over time perform better than the benchmark index. Because of that, it is expected to see two negative average values when the index for the whole period perform better than both the sustainable and the conventional portfolios. However, we can see that the sustainable average Information ratio is less negative than the conventional ratio, which tells that the sustainable portfolio performs slightly better than the conventional portfolio.

Next, looking at the average M^2 measure the value is -0,001 for both the portfolios. We can interpret this measure as the excess return of the portfolios compared with the benchmark index, where they now have the same volatility. They both have negative values, which is expected as we do not expect them to beat the market index.

Finally, looking at the average Sortino measure for both portfolios, the ratios are 0,239 for the sustainable portfolio and 0,219 for the conventional portfolio. Unlike the Sharpe ratio, the Sortino ratio only takes the downside deviation into account. This makes the ratio useful for the investors as it is the downside risk that matters, the upside risk will only benefit the investors. As we can see from the average Sortino ratios, the sustainable portfolio performs better than the conventional portfolio.

Table 5: Significance tests of differences in performance measures

	Degrees of freedom	Difference in mean	t-statistics	P-value
Sharpe ratio	34	.0445	1.0185	.1578
Treynor ratio	34	.0006	1.0088	.1601
Jensen's alpha	34	.0015	1.8186	.0389
Tracking error	34	.0008	.1539	.4393
Information ratio	34	.0288	1.0970	.1402
M^2 measure	34	.0006	1.2768	.1052
Sortino ratio	34	.0208	.9039	.1862

Note: This table presents the significance tests of differences in performance measures between the sustainable and conventional portfolio.

Overall, we find that sustainable funds outperform conventional funds in most of the performance measures. However, looking at the values from table 4, we see that the differences in performance are minimal. To find if the differences are significant, we use a t-test in table 5 above. As we can see from the table, only Jensen's alpha shows a difference that is significant at a 5% level. All the other performance measures have p-values that are too high to reject H_0 and conclude that sustainable funds perform better than conventional funds. Hence, we fail to reject our null hypothesis about similar performance during the period.

Comparing our results to previous research, the finding of a significant difference in Jensen's alpha is consistent with what Mallin found in 1995. His research said that ethical funds outperformed non-ethical funds in the same way. The finding that the tracking error is higher for the sustainable portfolio than for the conventional portfolio is consistent with previous findings from Schröder in 2007, where he have found that sustainable funds are more volatile than conventional funds.

4.3 Covid-19 trends

In this section, we discuss our second hypothesis test, whether the sustainable portfolio perform better than the conventional portfolio during the covid-19 period. The method we use is Carhart's four-factor model, and the table is shown below. Under we discuss the results taking our second hypothesis into account.

Table 6: Regression table, Covid-19 trends

	Pre-Covid Susatainable Funds	Post-Covid Sustainable Funds	Pre-Covid Conventional Funds	Post-Covid Conventional Funds	Post-Covid Difference
Alpha	-0.00320***	0.00568	-0.00321***	-0.000564	0.00625***
	(-3.13)	(1.57)	(-2.72)	(-0.16)	(8.76)
Mkt-RF	0.964***	0.992***	0.882***	0.922***	0.0695***
	(21.32)	(20.63)	(18.63)	(18.27)	(6.27)
SMB	0.117	-0.126	0.0303	-0.150	0.0233
	(1.21)	(-0.68)	(0.30)	(-0.83)	(0.54)
HML	0.0653	0.152	0.0373	0.0252	0.127**
	(1.20)	(1.13)	(0.53)	(0.19)	(3.30)
MOM	-0.0552	0.203	0.0186	0.127	0.0761***
	(-0.71)	(1.62)	(0.24)	(0.94)	(3.81)
Observations	60	12	60	12	12
Adjusted R^2	0.928	0.986	0.898	0.983	0.803

Note: This table presents the results obtained from OLS regression using the four-factor model. Alpha is the intercept of the model. Mkt-RF is the excess return on the value weighted market factor. SMB, HML and MOM is the factor-mimic for size, book-to-market, and one-year return momentum. t statistics in parenthesis, *** p < 0,01; ** p < 0,05; * p < 0.1

By looking at table 6 above, we can compare the portfolios pre-covid and post-covid. We can see that the alpha value for both sustainable and conventional funds are significant at a 1% level for the pre-covid regression but not for the post-covid period. This is as expected because the post-covid period only has 12 observations, and in this case, that is not enough to make significant alphas. Moving on to the market factor, the coefficients are significantly lower than 1 for all the regressions. The SMB, HML and MOM-factors can say something about which

directions the investments of the portfolios are exposed to, but they are not significant for any of the regressions and will not be commented further.

Even though the alphas are not significant, the most interesting finding is that the alpha for sustainable funds change from negative pre-covid to positive post-covid. At the same time, the conventional funds have negative alphas for both periods. This also correlates with the observation from figure 2, where we find that the sustainable funds perform better than the conventional funds in the year 2020.

For solving our hypothesis test, we need to see if the difference in alpha is significant. The regression named “Post-Covid Difference” in the column furthest to the right in table 6 shows the conventional portfolio subtracted from the sustainable portfolio in the last 12 periods. As we can see, this gives a positive alpha value of 0,00625. This coefficient is significant at a 1% level which means that we can reject the null hypothesis and conclude that the sustainable funds performed better than the conventional portfolio in 2020.

Comparing these findings to previous research, we only have one comparable article. We find that the sustainable portfolio outperforms the conventional portfolio during 2020, and this is partly the same as what Hale find in his article from 2020, where he concludes that the sustainable funds perform better than the conventional funds in the first quarter of 2020.

4.4 ESG portfolios

In this section, we discuss our third hypothesis test which is whether there is a positive correlation between the ESG-score of a fund and the financial performance or not. To solve this, we regress Carhart's four-factor model on the 12 funds with the highest ESG-score in our sample and the 12 funds with the lowest ESG-score. Our regression is given below.

Table 7: Regression table, ESG portfolios

	Highest ESG-rated funds	Lowest ESG-rated funds	Difference
Alpha	-0.00330** (-2.49)	-0.00249** (-2.21)	-0.000809 (-0.57)
Mkt-RF	0.848*** (16.97)	0.822*** (17.91)	0.0259 (0.63)
SMB	-0.127 (-1.22)	0.147 (1.66)	-0.274*** (-3.43)
HML	-0.117 (-1.23)	0.0159 (0.23)	-0.133* (-1.70)
MOM	-0.0647 (-0.77)	0.0403 (0.45)	-0.105 (-1.48)
Observations	72	72	72
Adjusted R^2	0.909	0.921	0.118

Note: This table presents the results obtained from OLS regression using the four-factor model. Alpha is the intercept of the model. Mkt-RF is the excess return on the value weighted market factor. SMB, HML and MOM is the factor-mimic for size, book-to-market, and one-year return momentum. t statistics in parenthesis, *** p < 0,01; ** p < 0,05; * p < 0.1

Carhart's four-factor model of the two described portfolios is presented above. Due to our third hypothesis, the alpha value is the most interesting also in this table. As we can see, both portfolios have negative alphas, the portfolio with the highest ESG funds a little more negative. These alphas are significant at a 5% level. The market factor β_1 is below 1 for all the regressions, and that is expected as the return of the portfolio is lower than the market index.

For the last 3 factors of the model, the coefficients are not significant and will not be commented further.

As our hypothesis is whether the ESG-score and financial performance are positively correlated or not, we need to look at the difference between the portfolios that are given in the right column of table 7 above. This regression shows the highest ESG portfolio minus the lowest ESG portfolio. The alpha value of the difference is -0,000809, which means that the lowest ESG portfolio performs better than the highest ESG portfolio. At the same time, this coefficient is not significant at any level. Because of this, we cannot reject the null hypothesis and conclude that there is no positive correlation between the ESG score of the fund and the financial performance in our sample. We keep our null hypothesis about no correlation.

Our findings that there is no positive correlation between the ESG-score and the financial performance of the funds are backed up by several previous research. In 2015, Hallbritter and Dorfleiter found that the ESG portfolio did not display any significant return differences between companies featuring high and low ESG rating, which is consistent with our findings. Lopez-de-Silanes et al. stated in 2020 that there was a negative correlation between the ESG-score and the financial performance of the funds. This is in line with our findings as the portfolio with the lowest ESG-score perform better than the portfolio with highest the ESG-score.

5 Conclusion and further research

In this section, we conclude our research and highlight some implications from this research. In addition, we refer to limitations that have occurred for the thesis and suggest possible areas for further research.

5.1 Conclusion

In this thesis, we study if sustainability focus affects the financial performance of funds in Scandinavia. Sustainable and environmental thinking is becoming more and more relevant, and this leads us to the research question:

Does sustainability focus affect the financial performance of funds in Scandinavia?

Our first finding is that there is no significant difference in the sustainable and conventional portfolio performance during our analysing period. Looking at the regressions of the performance through the whole period and the performance measures, we see that the sustainable portfolio perform better than the conventional portfolio, but the difference is not significant. Second, looking at the performance of the funds in the covid-19 period, we find that the sustainable portfolio outperforms the conventional portfolio in a significant way. This is shown with the significant positive alpha in the regression of the difference between the two portfolios in table 6. Our third main finding is that we do not find any positive correlation between the ESG-score of the funds and the financial performance. This is shown in table 7, where we find an insignificant negative alpha of the difference between the two portfolios.

This study gives updated findings on how the performance for Scandinavian sustainability focused funds is compared to matching conventional funds. This market has been investigated several times before, but with help from this thesis, it is possible to take investment decisions based on new market estimates. This study also contributes to better knowledge about how the fund market has developed in the covid-19 period.

5.2 Limitations

First, it is unclear how sustainable a fund is, as we can see from our ESG portfolio from table 12. Because ESG-reporting is not statutory, some funds may not want to report their ESG-score, leading to some sustainable funds categorised as non-sustainable funds and vice versa. Second, the size of our sample limits us not to test if there are any differences between the countries. As we have 14 Danish funds, 8 Norwegian funds and 13 Swedish funds that focus on sustainability, this provides us too few observations to compare the effect between the countries. Third, due to the current stated ESG-rating and the lack of long-term data, we were not able to collect monthly ESG-rating. This prevents us from testing if a change in the reported ESG-score for a fund during our period would affect the financial performance of that fund.

5.3 Further research

Because of the momentum sustainable funds have had during covid-19, we think that new sustainable funds will be established in the future. Because of that, we suggest that this study also could be re-done in a few years to give a better view of how the covid-19 situation really has affected the market. For example, we have seen through this semester that the performance of the sustainable funds have been much worse than our findings for 2020. This can have different reasons, and one of them is the low key interest rate in the US. A new analysis for 2020 and 2021, and maybe even more years, will probably give very different answers than what we find in our analysis. If the covid-19 trend continues so that more sustainability focused funds are created, and more companies start to report ESG-score, then we can have a more complete study with a more significant sample. This can give heavier weighted results that can help confirm or deny previous empirical findings to a greater extent.

Further research on sustainability in Scandinavia with a global focus may also use other indices such as Global Destination Sustainability Index and Dow Jones Sustainability World Index to provide a broader data set. This can be useful because the sustainable index has a sample of companies to invest in that is closer to the possible sample for sustainable funds than a conventional market index.

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Appendix

Table 8: Matched pair

Fund ref.	Sustainable Funds	Date started	Value	ESG-score	Fund ref	Conventional funds	Date started	Value	ESG-score
DA1	AL Invest, Udenlandske Aktier, Etisk	08.02.1999	506,40	-	DB1	ValueInvest Global KL	15.07.1998	499,21	73,50
DA2	Danske Invest Global Sustainable Future DKK d	23.05.2000	398,03	74,09	DB2	Danske Invest Global Indeks DKK d	31.05.2000	1534,31	67,98
DA3	Danske Invest Global Sustainable Future 2 KL	18.09.2000	30,79	74,13	DB3	Danske Invest Globale Virksomhedsobl DKK d	18.12.2000	172,33	68,53
DA4	C WorldWide Globale Aktier Etik Udl	29.12.2000	56,94	71,57	DB4	C WorldWide Globale Aktier Klasse A	30.06.1990	756,12	73,10
DA5	Sparinvest INDEX Dow Jones Sust World KL	15.01.2002	343,41	81,57	DB5	Sparinvest INDEX Globale Aktier Min Risiko KL	16.03.2007	674,54	64,28
DA6	Danske Invest Global Sustainable Future - Akk DKK	21.11.2002	275,81	73,67	DB6	Danske Invest Global Indeks - Akk DKK h	23.09.2003	200,29	68,36
DA7	Nordea Invest Global Stars 1	07.11.2003	762,80	65,32	DB7	Nordea Invest Aktier	29.01.1999	286,19	66,02
DA8	Nykredit Invest Globale Aktier SRI	01.06.2004	280,99	66,05	DB8	Nykredit Invest Globale Aktier Basis	21.06.2000	316,76	67,95
DA9	Maj Invest Global Sundhed	10.11.2008	91,34	-	DB9	Maj Invest Makro	22.03.2013	87,65	-
DA10	Nordea Invest Eng Abs Return Eq II Etisk tilvalg	09.07.2009	57,11	66,72	DB10	Nordea Invest Portefolje Aktier	24.02.2011	5310,76	66,22
DA11	Nordea Invest Klima og Miljo	13.11.2009	486,74	61,47	DB11	Nordea Invest Globale Aktier Indeks	19.11.2012	339,73	66,85
DA12	Jyske Invest Globale Aktier SRI KL	01.03.2010	38,62	69,08	DB12	Jyske Invest Globale Aktier KL	07.06.1988	85,08	70,78
DA13	Nykredit Invest Baeredygtige Aktier	30.11.2011	587,82	69,63	DB13	Nykredit Invest Globale Fokusaktier	30.11.2011	231,18	72,28
DA14	Danske Invest Engros Global Eq Solution 2 FIN EUR W	15.01.2014	788,78	66,52	DB14	Danske Invest Engros Flexinvest Aktier KL	05.10.2006	2629,22	67,03
NA1	Storebrand Fremtid 100 S	01.07.1981	169,24	62,16	NB1	Storebrand Global Verdi	05.11.1997	96,03	62,81
NA2	DNB Miljoinvest	06.11.1989	690,86	59,92	NB2	DNB Global A	04.06.1987	590,01	73,20
NA3	Fondsfinans Fornybar Energi	04.12.2000	13,86	63,70	NB3	Fondsfinans Aktiv 60/40	04.04.2000	22,21	-
NA4	C WorldWide Globale Aksjer Etisk	28.12.2000	112,74	-	NB4	C WorldWide Globale Aksjer	19.09.1995	56,59	-
NA5	Storebrand Fremtid 50 S	10.02.2006	81,64	61,66	NB5	Storebrand Indeks - Alle Markeder A	20.06.2011	13,85	66,26
NA6	PLUSS Utland Etisk	17.10.2006	3,98	69,43	NB6	PLUSS Utland Aksje	10.07.1995	9,64	69,33
NA7	Nordea Stabile Aksjer Global Etisk	10.11.2008	1225,11	67,31	NB7	Nordea Aksjer Verden	30.10.2007	88,28	-
NA8	Storebrand Global Solutions A	01.10.2012	34,05	65,56	NB8	Storebrand Global Multifactor A	19.12.2006	1350,31	57,02
SA1	Handelsbanken Global Tema (A1 SEK)	29.10.1987	3843,80	62,96	SB1	Handelsbanken Halsovard Tema(A1 SEK)	01.12.2000	1393,79	66,89
SA2	Lansforsakringar Global Hallbar A	27.11.1990	1982,12	71,56	SB2	Lansforsakringar Mix A	10.12.1990	1616,65	-
SA3	SEB Halbarhetsfond Varlden	21.12.1990	4683,21	67,39	SB3	SEB Dynamisk Aktiefond	01.01.1977	1275,06	67,72
SA4	SEB Hallbarhetsfond Global	21.10.1991	1782,39	72,42	SB4	SEB Aktiesparfond	31.10.1978	1622,88	66,36
SA5	Nordea Inst Aktiefonden Varlden icke-utd	11.05.1998	135,16	68,21	SB5	Nordea Stabil	24.04.2006	152,45	66,44
SA6	Ohman Global Hallbar A	21.12.1998	1950,87	65,78	SB6	Ohman Global Growth	15.04.1996	495,21	52,61
SA7	KPA Etisk Aktiefond	01.03.1999	700,37	70,41	SB7	AMF Aktiefond Varlden	30.12.1998	5078,70	67,09
SA8	Nordnet Hallbar Pension	10.03.2009	17,82	-	SB8	Nordnet Forsiktig	10.03.2009	4,51	-
SA9	GodFond Sverige & Varlden	22.04.2009	139,80	69,18	SB9	Agenta Globala Aktier	01.05.2008	307,73	-
SA10	SPP Global Solutions A	01.10.2012	848,42	65,54	SB10	SPP Aktiefond Global A SEK	26.05.2000	3848,42	66,82
SA11	Cicero Hallbar Mix A	31.01.2013	695,01	63,77	SB11	Cicero World 0-50	30.12.2011	11,05	-
SA12	SEB Hallbarhetsfond Global utd	01.03.2013	1782,39	72,42	SB12	SEB Dynamisk Aktiefond utd	01.03.2013	1275,06	67,72
SA13	Handelsbanken Hallbar Energi (A1 EUR)	10.10.2014	5303,50	57,78	SB13	Handelsbanken Multi Asset 100 (A1 SEK)	18.05.2004	2352,95	62,87

Note: This table presents the matched pair of funds based on fund name, fund company, date started, total value, and ESG-score. The total value is the NAV measured in USD.

Table 9: Ranked performance measures

Sharpe raito rank			Treynor ratio rank			Jenesens alpha rank		
Rank	Fund. ref	Sharpe ratio	Rank	Fund. ref	Treynor ratio	Rank	Fund. ref	Jensens alpha
1	SB6	1,5407	1	SB6	0,02	1	NA2	0,0257
2	SA13	0,8913	2	SA13	0,0133	2	SA13	0,0254
3	SA10	0,8539	3	SB1	0,0127	3	SB6	0,0209
4	SA1	0,8488	4	DA4	0,0112	4	NA8	0,0116
5	NA4	0,8228	5	NA4	0,0111	5	SA10	0,0115
6	NA8	0,8222	6	SA10	0,011	6	SA6	0,0107
7	SA6	0,7998	7	SA1	0,0107	7	SA1	0,0102
8	SB1	0,7638	8	NA8	0,0106	8	NA6	0,0097
9	SB9	0,7333	9	NA2	0,0102	9	NB6	0,0096
10	NB4	0,7292	10	SA6	0,0098	10	SB13	0,0094
11	DA4	0,721	11	NB4	0,0098	11	NA1	0,009
12	SB10	0,6831	12	SB9	0,0092	12	SB9	0,0088
13	NA2	0,6673	13	SB10	0,0083	13	DB6	0,0087
14	NB5	0,6635	14	DB9	0,0083	14	NB5	0,0085
15	DB9	0,6458	15	SA7	0,0082	15	SA7	0,0085
16	DA6	0,6271	16	NB5	0,008	16	SB7	0,0085
17	SA7	0,6169	17	DA6	0,0079	17	NB2	0,0085
18	DA3	0,6167	18	DA3	0,0078	18	NA4	0,0084
19	SA5	0,6008	19	NA6	0,0077	19	DA9	0,0082
20	DA5	0,5951	20	SB13	0,0077	20	SB1	0,0081
21	SA2	0,5933	21	DA5	0,0075	21	SB10	0,0081
22	NA6	0,5919	22	SA2	0,0075	22	NB4	0,0079
23	SB13	0,5895	23	NB6	0,0075	23	SA5	0,0079
24	NB6	0,5717	24	SA5	0,0074	24	SA9	0,0079
25	DB6	0,5699	25	SB7	0,0074	25	DA11	0,0078
26	NA1	0,5506	26	NA1	0,0073	26	SA2	0,0076
27	SB7	0,5453	27	SA9	0,0072	27	NB8	0,0074
28	SA9	0,5318	28	DB6	0,0067	28	NB7	0,0073
29	NB2	0,4808	29	DB1	0,0065	29	DA4	0,0072
30	NA7	0,4687	30	NB2	0,0063	30	DA5	0,0072
31	DB11	0,4658	31	NA7	0,0062	31	NB3	0,0072
32	DA14	0,4584	32	DB7	0,0062	32	DA14	0,007
33	NB8	0,4561	33	DA9	0,0062	33	NA3	0,0068
34	NB7	0,4351	34	DA14	0,0061	34	DB7	0,0067
35	SB2	0,4243	35	DB8	0,0061	35	DA6	0,0066
36	SB3	0,4218	36	DA11	0,006	36	DA3	0,0065
37	DB7	0,4099	37	NB8	0,0059	37	SB3	0,0061
38	SA8	0,4012	38	DB11	0,0058	38	DB11	0,006
39	SA4	0,3965	39	NB7	0,0058	39	NB1	0,0058
40	DB8	0,3925	40	SB3	0,0058	40	NA7	0,0051
41	NB3	0,3893	41	NB3	0,0058	41	DB8	0,005
42	DA9	0,388	42	SB2	0,0054	42	SB4	0,0049
43	DA11	0,3806	43	SA4	0,0052	43	DA1	0,0048
44	SB4	0,3765	44	SB4	0,005	44	SA4	0,0047
45	SA3	0,3528	45	DB5	0,005	45	SB12	0,0047
46	NA5	0,3453	46	DA10	0,0048	46	DA13	0,0047
47	DA10	0,3335	47	DA13	0,0048	47	DB9	0,0045
48	SB12	0,3248	48	SA8	0,0046	48	DB2	0,0045
49	DA1	0,3207	49	NA5	0,0046	49	NA5	0,0042
50	DB5	0,3117	50	SB12	0,0046	50	DA10	0,004
51	DB2	0,3013	51	SA3	0,0043	51	DB14	0,0039
52	DB14	0,2875	52	DA1	0,0042	52	SB2	0,0038
53	SA12	0,2854	53	DB2	0,0041	53	DA7	0,0037
54	DA13	0,2666	54	DB14	0,0039	54	DB10	0,0036
55	SB8	0,2614	55	SA12	0,0038	55	SA12	0,0035
56	DB10	0,2553	56	NB1	0,0036	56	DB1	0,0033
57	NB1	0,2364	57	DB10	0,0035	57	DB13	0,0032
58	DB1	0,232	58	DB13	0,0034	58	SA3	0,0028
59	DB4	0,231	59	DA7	0,0033	59	DB5	0,0027
60	DB13	0,1996	60	DB3	0,0028	60	SA8	0,0026
61	DA7	0,1957	61	NA3	0,0027	61	DA12	0,0021
62	SB5	0,1446	62	SB8	0,0025	62	DA8	0,002
63	NA3	0,127	63	DB4	0,0019	63	DB4	0,0019
64	SA11	0,1248	64	SB5	0,0017	64	DA2	0,0017
65	DB3	0,108	65	DA8	0,0015	65	SB8	0,0013
66	SB11	0,0927	66	DA2	0,0015	66	SA11	0,0013
67	DA8	0,0735	67	DA12	0,0012	67	SB5	0,0011
68	DA2	0,0732	68	SA11	0,0011	68	DB3	0,0011
69	DA12	0,0682	69	DB12	0,0001	69	DB12	0,0009
70	DB12	-0,0218	70	SB11	-0,0001	70	SB11	0,0007

Note: This table presents Sharpe ratio, Treynor ratio, and Jensen's alpha for each fund ranked from best to worst.

Table 10: Ranked performance measure

Tracking error			Information ratio			M2 measure			Sortino ratio		
Rank	Fund. ref	Tracking error	Rank	Fund. ref	Information ratio	Rank	Fund. ref	M2 measure	Rank	Fund. ref	Sortino ratio
1	SB6	0,1149	1	SB6	0,581	1	SB6	0,0109	1	SB6	0,843
2	SA13	0,0979	2	SA6	0,3349	2	SA13	0,0046	2	SA13	0,472
3	NA2	0,0801	3	NB5	0,3118	3	SA10	0,0038	3	SA10	0,4226
4	SB11	0,0558	4	SA10	0,2966	4	SA1	0,0035	4	SA1	0,4126
5	DB12	0,0543	5	SA13	0,2843	5	NA4	0,0034	5	NA4	0,4055
6	SB5	0,0493	6	NA8	0,2785	6	NA8	0,0034	6	NA8	0,3943
7	SA11	0,0488	7	SA1	0,2495	7	SB1	0,0031	7	SA6	0,376
8	DB3	0,047	8	NA2	0,2105	8	SA6	0,0029	8	DA4	0,3699
9	DA2	0,0456	9	SB9	0,2003	9	SB9	0,0024	9	SB1	0,3696
10	SB8	0,0453	10	SB10	0,1714	10	NA2	0,0023	10	NB4	0,3572
11	DA12	0,0447	11	NA6	0,1501	11	NB4	0,0023	11	SB9	0,351
12	DA8	0,0441	12	NA4	0,1459	12	DA4	0,0022	12	NA2	0,3483
13	DB4	0,0428	13	NB6	0,1457	13	SB10	0,0016	13	DB9	0,3474
14	SA10	0,0369	14	SB1	0,1065	14	NB5	0,0013	14	SB10	0,3229
15	NA8	0,0359	15	NB4	0,1047	15	SA7	0,0011	15	NB5	0,3092
16	DB13	0,0309	16	SB13	0,1037	16	DA6	0,0009	16	SA7	0,3028
17	SA8	0,0307	17	SA7	0,0964	17	NA6	0,0009	17	DA6	0,2954
18	SA3	0,0305	18	NA1	0,0867	18	DA3	0,0008	18	DA3	0,29
19	SA1	0,0301	19	SA5	0,0819	19	SA5	0,0007	19	NA6	0,2879
20	DB5	0,0292	20	DA4	0,0718	20	DB9	0,0007	20	SA5	0,2822
21	DA7	0,0287	21	SB7	0,0655	21	NB6	0,0007	21	SA2	0,2801
22	DB10	0,0287	22	SA2	0,0571	22	SB13	0,0007	22	DA5	0,2799
23	SA6	0,0284	23	SA9	0,0451	23	SA2	0,0006	23	SB13	0,2789
24	SA12	0,0279	24	DB6	0,0424	24	DA5	0,0005	24	NB6	0,2787
25	SB1	0,0266	25	NB2	0,0382	25	NA1	0,0004	25	SB7	0,2769
26	DB14	0,0255	26	DA5	0,0293	26	SB7	0,0004	26	SA9	0,275
27	NA4	0,0227	27	DA6	0,0203	27	SA9	0,0003	27	NA1	0,2697
28	DB2	0,0223	28	DA3	0,0122	28	DB6	-0,0003	28	DB6	0,2517
29	DA10	0,0219	29	DA9	0,0105	29	NB2	-0,0004	29	NA7	0,2395
30	NA5	0,0214	30	DA11	-0,0009	30	NA7	-0,0007	30	NB2	0,2339
31	NA3	0,0212	31	NB3	-0,0142	31	DA14	-0,0008	31	DA14	0,2199
32	DB1	0,021	32	DB7	-0,0167	32	NB8	-0,0008	32	DB11	0,219
33	SB2	0,021	33	NB8	-0,0231	33	NB7	-0,0009	33	DA9	0,2178
34	DA1	0,0207	34	DA14	-0,0266	34	DB11	-0,001	34	NB7	0,2172
35	NB1	0,0194	35	NB7	-0,034	35	SB3	-0,001	35	SB3	0,2144
36	SB12	0,0191	36	DB9	-0,0469	36	DA9	-0,0011	36	DB7	0,2125
37	DA13	0,0186	37	NA3	-0,0481	37	DB7	-0,0014	37	DB8	0,2125
38	SB9	0,0179	38	DB8	-0,0499	38	DA11	-0,0015	38	NB8	0,2083
39	SB4	0,017	39	DA13	-0,0655	39	SA4	-0,0016	39	SB2	0,2073
40	DA4	0,0168	40	DB1	-0,0792	40	DB8	-0,0017	40	SA4	0,1929
41	SA4	0,0168	41	SB3	-0,0813	41	NB3	-0,0017	41	NB3	0,192
42	NB4	0,0153	42	DB11	-0,0851	42	SB2	-0,0018	42	SB4	0,189
43	NA6	0,0151	43	NA7	-0,089	43	SB4	-0,0018	43	SA8	0,1812
44	SB13	0,0138	44	DA10	-0,091	44	DB1	-0,002	44	DA11	0,18
45	NB6	0,0136	45	NB1	-0,1149	45	SB12	-0,0022	45	DB1	0,1778
46	SA7	0,0124	46	DA7	-0,12	46	NA5	-0,0024	46	NA5	0,1752
47	DB8	0,0119	47	SB2	-0,1238	47	SA8	-0,0025	47	SA3	0,1737
48	NA7	0,0113	48	DB13	-0,1254	48	DA1	-0,0026	48	SB12	0,1725
49	NB5	0,0112	49	DB5	-0,1286	49	SA3	-0,0026	49	DA10	0,1657
50	SB10	0,011	50	NA5	-0,135	50	DB5	-0,0026	50	DB5	0,1568
51	NA1	0,0104	51	DB2	-0,1425	51	DA10	-0,0027	51	DA1	0,1546
52	DB11	0,0085	52	SA4	-0,1515	52	DB2	-0,0028	52	SA12	0,1461
53	SB3	0,0085	53	DB3	-0,1526	53	DA13	-0,0029	53	DB2	0,1441
54	SB7	0,0085	54	DA1	-0,1565	54	SA12	-0,0029	54	DB14	0,1401
55	DB9	0,0081	55	SB4	-0,157	55	DB14	-0,003	55	DA13	0,1332
56	DB6	0,0062	56	SB12	-0,1616	56	NB1	-0,0031	56	DB10	0,1307
57	SA5	0,0061	57	SA8	-0,166	57	DB10	-0,0034	57	NB1	0,1273
58	SA9	0,0055	58	DB14	-0,1675	58	DA7	-0,0038	58	DB13	0,1106
59	SA2	0,0052	59	SB5	-0,1678	59	DB13	-0,0038	59	DA7	0,1097
60	DB7	0,0039	60	DB4	-0,1752	60	NA3	-0,0043	60	SB8	0,1074
61	NB2	0,0039	61	SB8	-0,1827	61	SB8	-0,0046	61	DB3	0,0927
62	DA5	0,0036	62	DA2	-0,1861	62	DB3	-0,005	62	NA3	0,0899
63	NB3	0,0035	63	DB10	-0,1926	63	DB4	-0,005	63	SB5	0,0726
64	DA14	0,0033	64	SA3	-0,2024	64	DA8	-0,0052	64	DB4	0,0722
65	NB7	0,0032	65	SA12	-0,2283	65	DA2	-0,0054	65	SA11	0,067
66	DA9	0,0024	66	SB11	-0,2332	66	DA12	-0,0054	66	DA8	0,0632
67	NB8	0,0022	67	DA8	-0,2385	67	SA11	-0,0055	67	DA2	0,0543
68	DA6	0,0021	68	DB12	-0,2554	68	SB5	-0,0055	68	DA12	0,0541
69	DA3	0,0014	69	DA12	-0,2813	69	DB12	-0,0064	69	SB11	0,0353
70	DA11	0,0002	70	SA11	-0,3045	70	SB11	-0,0066	70	DB12	0,022

Note: This table presents Tracking error, Information ratio, M^2 measure, and Sortino ratio for each fund ranked best to worst.

Table 11: Ranked Annual Return

Rank	Fund. ref	Funds	Annual Return
1	SB6	Ohman Global Growth	50,32 %
2	SA13	Handelsbanken Hallbar Energi (A1 EUR)	36,77 %
3	NA2	DNB Miljoinvest	27,52 %
4	SA10	SPP Global Solutions A	18,79 %
5	NA8	Storebrand Global Solutions A	18,35 %
6	SA1	Handelsbanken Global Tema (A1 SEK)	17,06 %
7	SA6	Ohman Global Hallbar A	16,40 %
8	SB1	Handelsbanken Halsovard Tema(A1 SEK)	16,09 %
9	NA4	C WorldWide Globale Aksjer Etisk	15,36 %
10	SB9	Agenta Globala Aktier	13,91 %
11	DA4	C WorldWide Globale Aktier Etik Udl	13,65 %
12	NB4	C WorldWide Globale Aksjer	13,39 %
13	NA6	PLUSS Utland Etisk	12,61 %
14	SA7	KPA Etisk Aktiefond	12,25 %
15	SB10	SPP Aktiefond Global A SEK	12,25 %
17	NB6	PLUSS Utland Aksje	12,23 %
16	SB13	Handelsbanken Multi Asset 100 (A1 SEK)	12,23 %
18	NB5	Storebrand Indeks - Alle Markeder A	12,15 %
19	NA1	Storebrand Fremtid 100 S	11,46 %
20	SB7	AMF Aktiefond Varlden	11,16 %
21	SA5	Nordea Inst Aktiefonden Varlden icke-utd	10,92 %
22	SA2	Lansforsakringar Global Hallbar A	10,74 %
23	SA9	GodFond Sverige & Varlden	10,61 %
24	DA5	Sparinvest INDEX Dow Jones Sust World KL	10,39 %
25	DB6	Danske Invest Global Indeks - Akk DKK h	10,35 %
26	DA2	Danske Invest Global Sustainable Future - Akk DKK	10,35 %
27	DA3	Danske Invest Global Sustainable Future 2 KL	10,17 %
28	NB2	DNB Global A	9,86 %
29	MSCI	MSCI World Index	9,56 %
30	DA9	Maj Invest Global Sundhed	9,10 %
31	NB8	Storebrand Global Multifactor A	8,68 %
32	DA14	Danske Invest Engros Global Eq Solution 2 FIN EUR W	8,56 %
33	DB9	Maj Invest Makro	8,53 %
34	NB7	Nordea Aksjer Verden	8,50 %
35	DB7	Nordea Invest Aktier	8,37 %
36	DA11	Nordea Invest Klima og Miljo	8,25 %
37	NB3	Fondsfinans Aktiv 60/40	7,79 %
38	DB11	Nordea Invest Globale Aktier Indeks	7,79 %
39	SB3	SEB Dynamisk Aktiefond	7,72 %
40	NA7	Nordea Stabile Aksjer Global Etisk	7,51 %
41	DB8	Nykredit Invest Globale Aktier Basis	6,92 %
42	SA4	SEB Hallbarhetsfond Global	6,34 %
43	SB4	SEB Aktiesparfond	6,19 %
44	SB2	Lansforsakringar Mix A	5,73 %
45	SB12	SEB Dynamisk Aktiefond utd	5,70 %
46	NA5	Storebrand Fremtid 50 S	5,33 %
47	DA1	AL Invest, Udenlandske Aktier, Etisk	5,21 %
48	DA10	Nordea Invest Eng Abs Return Eq II Etisk tilvalg	5,07 %
49	DA13	Nykredit Invest Baeredygtige Aktier	5,06 %
50	DB2	Danske Invest Global Indeks DKK d	4,94 %
51	NB1	Storebrand Global Verdi	4,74 %
52	DB14	Danske Invest Engros Flexinvest Aktier KL	4,51 %
53	DB5	Sparinvest INDEX Globale Aktier Min Risiko KL	4,36 %
54	SA12	SEB Hallbarhetsfond Global utd	4,33 %
55	SA8	Nordnet Hallbar Pension	4,25 %
56	SA3	SEB Halbarhetsfond Varlden	4,24 %
57	DB10	Nordea Invest Portefolje Aktier	3,95 %
58	DB4	C WorldWide Globale Aktier Klasse A	3,85 %
59	DB1	ValueInvest Global KL	3,53 %
60	DA7	Nordea Invest Global Stars 1	3,48 %
61	DB13	Nykredit Invest Globale Fokusaktier	3,34 %
62	SB8	Nordnet Forsiktig	1,98 %
63	NA3	Fondsfinans Fornybar Energi	1,97 %
64	DA8	Nykredit Invest Globale Aktier SRI	1,30 %
65	SB5	Nordea Stabil	1,23 %
66	SA11	Cicero Hallbar Mix A	1,23 %
67	DA6	Danske Invest Global Sustainable Future DKK d	1,10 %
68	DA12	Jyske Invest Globale Aktier SRI KL	0,97 %
69	SB11	Cicero World 0-50	0,35 %
70	DB3	Danske Invest Globale Virksomhedsobl DKK d	0,14 %
71	DB12	Jyske Invest Globale Aktier KL	-0,53 %

Note: This table shows the annual return for each fund ranked from best to worst.

Table 12: ESG portfolios

12 Highest ESG-rated Funds			12 Lowest ESG-rated Funds		
Fund.ref	**Funds**	**ESG**	**Fund.ref**	**Funds**	**ESG-score**
DA5	Sparinvest INDEX Dow Jones Sust World KL	81,57	DA1	AL Invest, Udenlandske Aktier, Etisk	-
DA3	Danske Invest Global Sustainable Future 2 KL	74,13	DA9	Maj Invest Global Sundhed	-
DA2	Danske Invest Global Sustainable Future DKK d	74,09	DB9	Maj Invest Makro	-
DA6	Danske Invest Global Sustainable Future - Akk DKK	73,67	NA4	C WorldWide Globale Aksjer Etisk	-
DB1	ValueInvest Global KL	73,50	NB3	Fondsfinans Aktiv 60/40	-
NB2	DNB Global A	73,20	NB4	C WorldWide Globale Aksjer	-
DB4	C WorldWide Globale Aktier Klasse A	73,10	NB7	Nordea Aksjer Verden	-
SA4	SEB Hallbarhetsfond Global	72,42	SA8	Nordnet Hallbar Pension	-
SA12	SEB Hallbarhetsfond Global utd	72,42	SB2	Lansforsakringar Mix A	-
DB13	Nykredit Invest Globale Fokusaktier	72,28	SB8	Nordnet Forsiktig	-
DA4	C WorldWide Globale Aktier Etik Udl	71,57	SB9	Agenta Globala Aktier	-
SA2	Lansforsakringar Global Hallbar A	71,56	SB11	Cicero World 0-50	-

Note: This table presents funds used in section 4.4 ESG portfolios. The left table shows the 12 funds with the highest ESG-score, and the right table shows the 12 funds with the lowest rating.

Table 13: Breusch-Pagan test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of Sustainable Funds
chi2(1) = 0.08
Prob > chi2 = 0.7814

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of Conventional Funds
chi2(1) = 0.10
Prob > chi2 = 0.7544

Note: The table shows that the probability value of the chi-square statistics. Chi2(1) is the chi-square test statistic of the test and prob > chi2 is the p-value corresponding to the chi-square test statistic.

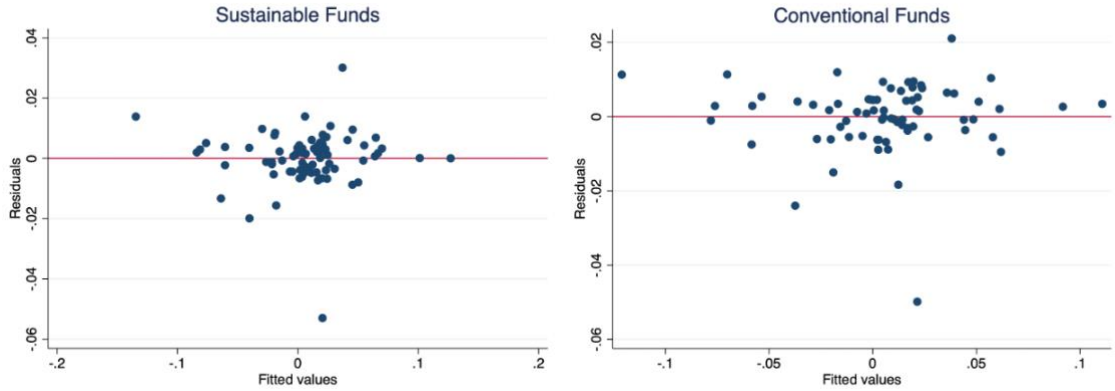
Table 14: Durbin-Watson test

Durbin-Watson for Conventional Funds: d-statistic(5, 72) = 1.908632

Durbin-Watson for Sustainable Funds: d-statistic(5, 72) = 2.055946

Note: This table is used to show the test results for autocorrelation in the residuals of our regression.

Figure 2: Scatter plot



Note: This figure shows the scatter plot of the residuals from the combined sustainable and conventional portfolios