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How sustainable investments affects financial performance: Evidence from Scandinavian ETFs

Master Thesis

by

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Abstract

We study the difference in financial performance for Scandinavian ETFs with low and high sustainability rating in the period from 2017 to 2022. We further investigate different periods of 2020 to capture the effects of the Covid stock market crash. To measure sustainability, we use the new Morningstar sustainability risk scores. We analyse the difference in ETFs' performance using tools like Fama-French regression, Sharpe ratio, difference-in-mean analysis, and a long-short portfolio. We generally find a greater financial performance for ETFs with low sustainability risk score, however, the difference is not statistically significant. Following the pandemic, we also find a shift in investor preferences towards social aspects of the corporation.

1.0 Introduction

The increased interest towards sustainable investments in the recent years has proportionally increased investor's demand for accurate and reliable rating metrics and transparency of sustainable corporate reporting. Reputational value among investors has become more important, and even though certain companies are not legally obligated to disclose the information (European Commission, 2022; EU Taxonomy Info, 2022), they might feel it is necessary to avoid being suspects of harmful business. A sustainability risk or ESG risk means "an environmental, social or governance event or condition that, if it occurs, could cause a negative material impact on the value of the investment" (European Commission, 2019).

Based on Morningstar's ESG risk ratings, namely environmental risk, social risk, governance risk, and carbon risk, our thesis aims to answer the question whether Exchange Traded Funds (ETFs) with low sustainability risk outperforms ETFs with high sustainability risk. In addition, we want to complement earlier studies of investor preferences during uncertain times by investigating the relationship between financial performance and the ESG risk ratings in the different phases of the Covid crisis, namely the stock market crash and recovery period. Our goal is to examine the stock markets incorporation of ESG risk. Further, we try to find out whether the market's reaction to shocks can be explained by the incorporation of ESG risk, and which components of ESG that drives it. We formulate our research question as follows:

Does well managed sustainability risk increase ETFs' financial performance?

Our findings show a generally higher risk-adjusted return greater financial performance for low-risk ETFs than high-risk ETFs, but this has some exceptions. In the Covid crash and recovery period, the social risk factor behaves differently from the respective others, indicating the pandemic's immediate urgency and focus on social aspects like job protection and healthcare benefits. In the Covid crash and recovery period, EFTs with low environmental risk perform statistically significant worse than the market, as well as yielding a lower excess return than high-risk ETFs, indicating a shift in investor preferences, possibly towards ETFs with low social risk. However, we do not find any statistically significant difference between low-risk and high-risk ETFs.

Our findings are interesting for three reasons. This is one of the first papers to investigate the different Morningstar risk factors under the specific sub-periods of Covid. Secondly, our findings give a clear picture of the shift in preferences during global crisis, with the social aspect being in focus during Covid. Thirdly, it provides evidence on the importance of reviewing the different dimensions of ESG, instead of analysing the ESG factor as a whole. Lastly, it reopens the debate on the trade-off between sustainable investing and risk-adjusted return, where our evidence points in the direction of higher risk-adjusted returns for low-risk ETFs.

The ESG landscape is relatively new and continuously changing. This sheds light on the importance of new research that adopts and implements new tools. While the main structure of our thesis is similar to older studies, we believe our study adds important aspects to existing literature. To the extent of our knowledge, Fabrizio and Filippo (2020) and Sun and Small (2022) is the only other relevant studies we found to make use of Morningstar's new ESG risk rating system. The different factors might drag in opposite directions as described above, and we argue it is crucial to analyse the factors separately to capture the true effects of sustainability on financial performance. Additionally, by separating into multiple sub-periods of the pandemic, we believe our thesis can better explain investor's reactions and preferences in the different phases of the pandemic, and which sustainability factor they value.

The rest of our thesis will be presented as follows. In section 2, we will review the relevant literature on how sustainable investments affects financial performance. Section 3 discusses stakeholder theory, shareholder theory, and modern portfolio theory (MPT), and its relevance to our thesis. We discuss our expected findings in section 4 and present our hypothesis. Section 5 explains the methodology used to answer our research question. Further, in section 6 we present how the data is structured and cleaned, as well as descriptive statistics. We analyse the results and discuss key findings in section 7. In section 8 we conclude the paper and suggest further research.

1.1 Table of content

2.0 Literature review

In the following section we will present and discuss relevant literature in the field. First, we present literature that finds a positive and negative relationship between sustainability and financial performance, followed by studies that analyse the relationship of sustainability and financial performance during the Covid crisis.

2.1 The relationship between sustainability and financial performance

Academic research shows evidence of a positive relationship between sustainable investing and financial performance. The introduction of stakeholder theory and notions like SRI and CSR, paved the way for researchers to quantitively analyse the sustainability effect on the stock market. McGuire et al. (1988) reports evidence on a positive relationship between corporate social responsibility and ROA. They also find that the firm's beta tends to be negatively associated with social responsibility. Thus, indicating lower risk for companies that scores high on this metric. However, the report also argues that socially responsible firms already have good financial performance. Consequently, making these firms more inclined to take on extra responsibility. Herremans et al. (1993) finds that the US manufacturing firms that are socially responsible have better stock market returns and lower risk. Gil-Bazo et al. (2009) and Schirrmann et al. (2010) finds that SRI funds preform significantly better than conventional funds. The result does also hold when adjusting for management fee.

Morgan Stanley (2015) tries to find the trade-off between choosing sustainable investing and achieving the best financial performance for fund managers. The firm analyses 10,228 open end mutual funds in the US over a 7-year period. Their results do not show any sign of a trade-off. On the contrary, sustainable investing exceeded traditional investments in terms of risk-adjusted returns. Kumar et al. (2016) achieves similar results when making a quantitative ESG risk premium mode. They find better risk adjusted returns for high ESG rated companies listed on Dow Jones. This is also consistent with more recent results from Abate et al. (2020).

There are also mixed results for studies explaining the relationship between sustainability and financial performance. Even though there is a lot of evidence of a positive link, it has been found to be weak in many cases. Several studies are also reporting a neutral or negative relationship. Revelli and Viviani (2015) does a meta-analysis on studies involving the relationship between SRI and financial performance for portfolio managers. They view 85 papers on the topic. The results do not show any sign of SRI effecting the performance of a stock market portfolio in a negative or positive way. Nofsinger and Varma (2014), and Leite and Cortez (2015) finds that SRI funds slightly underperform compared to conventional fund in normal times. Dolvin et al. (2016) finds no evidence on difference in risk-adjusted returns between US mutual fund with ESG rating and conventional funds. Also, the paper finds that fund managers gain benefits by marketing the fund as sustainable. Thus, receiving larger inflows of cash over the period and greater revenues from management fees. Further, Hartmark and Sussman (2019) do not find evidence that sustainable funds performs better than low-sustainability funds in the months that follows the first publication of Morningstar globes in 2016. They argue that some investors place intrinsic (non-monetary) value to sustainability. Thus, accepting lower returns.

2.2 Performance during the Covid market crash

Fabrizio and Filippo (2020) and Sun and Small (2022) separate EGS into the environmental factor, social factor, governance factor, and carbon risk factor, and examines the relationship between sustainability and the financial performance of ETFs in the Covid period. Fabrizio and Filippo find a positive inflow into low ESG-risk funds during the Covid crisis, and that the environmental risk factor was the main driver behind this, while Sun and Small find that portfolios with higher social risk tend to perform better in the same period. Lastly, they find that ETFs with high environmental risk, governance risk, and carbon risk are likely to experience high volatility in stock returns. Engelhardt et al. (2021) find that high ESG-rating is associated with higher abnormal returns and lower stock volatility during the Covid pandemic, where they find the social score to be the main driver of the results. Albuquerque et al. (2020), Lins et al. (2017), and Ding et al. (2020) find that firms with high Corporate Social Responsibility (CSR) ratings produce higher returns,

higher trading volumes, and lower volatilities in crisis periods. On the contrary, Bae et al. (2021), and Demers et al. (2020) find no correlation between stock performance and CSR ratings in the period after Covid unfolded, indicating that high CSR rating does not provide downside protection in crisis periods.

The overall view of research in this area seems to point in the direction that sustainability factors have some positive impact on financial performance. The majority of the papers on sustainability either get positive or neutral results. There is a broader finding that ESG investing results in higher returns and reduces downside risk in crisis periods, where the social dimension seems to play a bigger role. This is, among others, found by Broadstock et al. (2021) and Hoepner et al. (2019). However, Lööf et al. (2021) also argues that ESG investing reduces upside potential. Buch and Bassen (2015) performed a meta-study gathering over 2000 empirical studies of the relationship between ESG and financial performance. The results shows that a large part of the studies have a positive relationship. Findings also reveal that 90% of the papers have a non-negative connection between the two factors. Another meta-study by Whelan et al. (2021) found similar results by examining more recent research papers from 2015 to 2020. In terms of regression alpha and Sharpe ratio, 58% of the studies showed positive results for investing in ESG compared to conventional stocks. Only 14% of the studies had negative results in this area.

3.0 Theories

This section represents the theory we use as the fundament in the argumentation of our findings. We will first describe shareholder and stakeholder theory, whereafter we will present the modern portfolio theory (MPT) and how ESG investing effects diversification.

3.1 Shareholder theory

Shareholder theory states that the only purpose of a business is to maximize profits for its shareholders. Milton Friedman introduced this concept in 1970 and argued that a corporation has no social responsibility to society. For executives to engage in other activates than maximizing returns is the same as taking other people's money and use it for their own purpose. Friedman (1970) has the famous quote "*The business of business is business",* meaning as long corporations follow the law and engage in free competition, the only responsibility should be to increase shareholder value. The theory implies that investing in ESG will simply take value directly from the shareholders, thus harming investors, employees, and future endeavours. For instance, agency conflicts can occur when managers are investing in social causes to improve their own reputation. Barnea & Rubin (2010) find that CSR rating on US companies is negatively correlated with insider ownership and leverage. This indicates that insiders (managers) overinvest in CSR when their own cost of doing so is smaller.

3.2 Stakeholder theory

Stakeholder theory is the idea that a business needs to involve all of its affected parties (stakeholders) to function optimally. This could be different groups like employees, customers, communities, suppliers, creditors, and shareholders.

R. Edvard Freeman (1984) introduced this concept in his book "*Strategic Management: A Stakeholder Approach",* where he states that the interest of allected stakeholders should be aligned in order for the corporation to be successful. Furthermore, this is the responsibility of the management/entrepreneur to figure out. This theory is arguably more aligned with engaging in ESG. However, can being involved in ESG come at the expense of the shareholders?

The theory has slowly become more relevant since we entered into the new millennium, where more and more studies have shown sign of a positive relationship between corporate sustainability and financial results (George Kell, 2018; Whelan et al. 2021). These new results spark the question of how shareholder theory and the popular view of Milton Friedman could be outdated in the modern world.

In the perspective of stakeholder theory, ESG investing will increase the long-term financial success of the corporation. The trust from different stakeholders such as employees, communities, customers, and financial institutions is more likely to be stronger, leading to a stronger network of affected parties that ultimately determines the success of the company (Freeman, 1984). Stakeholder theory also imply high ESG rating will lead to more transparent information about the company's health, thus less stockpiling and hiding of bad news. Feng, Goodwell, and Sheng (2022) finds evidence on this. They observe that high ESG rated companies are negatively associated with the probability of stock market-price crashes.

3.3 Modern Portfolio Theory

Modern Portfolio Theory (MPT) as first introduced by Markowitz (1952) and later updated in 2010, argues that, even though individual assets in a portfolio can be highly volatile, it is possible to find an optimal risk-return portfolio through a mean-variance analysis. One of the key takeaways from MPT is the benefit of diversification and how a well-diversified portfolio can improve and optimize its risk-reward profile. The theory assumes a sufficiently large investment universe to enable the investor to create an optimal combination of assets. Consequently, a reduced investment universe will reduce possible asset combinations, reducing diversification opportunities, hence making it harder to find the optimally weighted risk-return portfolio. A fund manager or investor, constrained by ESG criteria, will have a reduced investment flexibility, and one can argue that this will reduce the portfolio's risk-adjusted return. That being said, the rapid increase in sustainable investments in the recent years has poured money in the market (The Global Sustainable Investment Alliance, 2020), forcing companies to re-think their ESG strategy. This again has increased the investment opportunities and enabled

investors to reduce systematic risk from the portfolio through diversification. In fact, Miralles-Quirós and Miralles-Quirós (2017) finds that it is possible to reduce the portfolio risk and outperform the market with an optimally weighted, well-diversified portfolio, even when SRI markets are taken into consideration. Having this in mind, we will analyse the risk-adjusted returns of our low-ESG-risk portfolios and compare it to our high-ESG-risk portfolios to see if we find similar results. We have not generated a portfolio based on the asset covariance as Markowitz proposes but argue that the general findings from our study and the MPT are comparable with regards to the relationship between risk and return.

4 Hypothesis

On the basis of the theory presented, as well as the different findings in other studies, we suspect that the ESG factor alone might not capture the complete relationship between sustainability and financial performance. Earlier studies shows that the environmental, social, and governance factors can show different properties in different stages of market downturns. We therefore find it important to analyse all the factors separately to answer our research question on whether well managed sustainability risk increases ETFs' financial performance. To further explore the drivers behind the environmental factor, we have also included carbon risk. We will first present our hypothesis, whereafter we will discuss how we expect the different factors (ESG risk, environmental risk, social risk, governance risk, and carbon risk) to affect our results.

H0: ETFs with low sustainability risk does not outperform ETFs with high sustainability risk

H1: ETFs with low sustainability risk outperforms ETFs with high sustainability risk

4.1 ESG risk

The world is getting more complex with stricter sustainability regulation such as the new EU taxonomy (EU Taxonomy Info, 2022). Customers are also getting more conscious of the products/services they are buying and consuming. Large companies are expected to be transparent about social factors, carbon footprints and

proactively deal with stakeholders. The business of business is simply not just business anymore. ESG has for many companies become an important aspect of risk management. For instance, poorly handled ESG risk can increase the likelihood of big controversies and impact performance (Franco, 2018). In the light of stakeholder theory, we believe companies with low ESG risk can reap benefits such as holding on good employees, more loyal customers, less controversies and less volatile revenues. Also, the litterateur review is pointing toward a slightly positive relationship between sustainability and performance. Hence, we expect that ETFs with low ESG risk will experience significantly better returns than ETFs with high ESG risk.

4.2 Environmental risk

Most people associate sustainability with environmental risk (Hartzmark and Sussman, 2019). As mention earlier, they also argue that ESG stocks have safe-haven properties in times of crises. We therefore believe that investors will value the environmental factor more when seeking to manage ESG risk and that it will give more protection in volatile market periods. There have been many costly controversies through the last decade. For instance, BP Deepwater Horizon had to pay a fine of $17,2 billion for the big oil spill in Gulf of Mexico (Gaworecki, 2017). Or the big Volkswagen scandal where they tricked the emissions test in believing the cars were eco-friendly. The company had to pay $7,3 billion in fine (Colvin, 2020). Thus, we believe that ETFs with low environmental risk will experience significantly better risk-adjusted returns than ETFs which don't actively manage this.

4.3 Social risk

Prior to Covid, many investors seemed to pay more attention to the environmental dimension in ESG (Hartzmark and Sussman, 2019), while the Covid crisis has created more of an urgency towards the social dimension, where stakeholders demand solid company policies, good treatment of employees, customers, and the community around them. The Covid crisis was a perfect opportunity for companies to boost their reputational value by increasing focus on frontline workers, customer safety, and better employee healthcare benefits. In fact, Patagonia's CEO

announced that, even though their stores were closed down, “the company will continue to pay all employees, leading some to conclude that the values-driven organization will survive the pandemic while other organizations will fail” (Johnson, 2020). In line with stakeholder theory, we argue that such actions will benefit the companies during the post-Covid recovery, positioning them for future growth with a reputational competitive advantage.

The pandemic has highlighted the importance of social risk management, and its effect on both businesses and its employees. Poorly handled social risk management can increase a company’s reputational risk, possibly effecting its financial performance. Companies constantly need to assess and exercise good social practice as it has several benefits for the company. It can increase employment quality, job safety and health, room for creative thinking, and diversity, which in turn can increase the long-term value to stakeholders. All else equal, we argue that an employee will choose the job that prioritize job protection, hence reducing the workforce in the company with bad job protection. This reduces its ability to rebuild, recover, and scale up production again when operations go back to normal. Additionally, poorly handled social risk management can result in lost customers and suppliers for the company (Friedman and Paton, 2021).

That being said, increased reputational value might incur higher short-term costs and losses. Patagonia’s CEO announced that they will continue to pay all their employees despite the stores being closed. This increases the costs and reduces the company’s cash flows, which again negatively affects its value. Marriott International’s CEO also sacrificed his salary and donated hotel rooms to front line workers, as well as asking their executives to cut their salary in half (Gibbons, 2020). Marriott incurred a big loss in 2020, but was clearly a hotel and an employer of choice in the recovery as the stock price is currently trading around all time high (Yahoo Finance, 2022). In line with stakeholder theory, we therefore expect ETFs with low social risk rating to yield lower returns in the immediate period of the crash but outperform those with high social risk rating in the recovery and long run.

4.4 Governance risk

"Governance encompasses the system by which an organisation is controlled and operates, and the mechanisms by which it, and its people, are held to account. Ethics, risk management, compliance, and administration are all elements of governance" (Governance Institute, 2022). Crisis periods exposes companies with poor risk management, where the associated costs can be very high (Kashyap, 2010). We argue that risk management is the key governance component when analysing ETF performance in crisis periods as it is most likely to affect the financial outcome of the crisis. ETFs with good risk management will have a low governance risk rating, and we expect them to outperform high-risk ETFs, similar to the findings of Tamuji et al. (2016).

4.5 Carbon risk

Carbon risk showcases the greenhouse gas emissions of the company. "The risk rating evaluates the degree to which a company's economic value is at risk in the transition to a low-carbon economy" (Morningstar, 2018). We believe it is interesting to supplement this measurement with the ESG factors. The environmental factor includes carbon emissions, however it is also a measure on issues like air and water pollution, waste management, water scarcity, and biodiversity. Thus, by only focusing on carbon risk, we can clearer explain how it affects financial performance. Similar to ESG and environmental risk, we argue that having low carbon risk will enhance returns through better stakeholder relationships and decrease the probability of expensive controversies. In addition, following the decrease in oil demand and negative oil prices in April 2020, we expect high carbon risk ETFs to experience a larger hit (Walker, 2020). We therefore expect that ETFs with low carbon risk outperforms ETFs with high carbon risk score, similar to the findings of Reboredo and Gonzales (2021).

5.0 Methodology

To answer our hypothesis and further our research question, we will first conduct a regression using Fama-French five factor model on our different portfolios. We will further use the same regression model on our long-short portfolio. In addition, we will analyse the portfolios risk-adjusted returns, namely their Sharpe ratio, whereafter we will answer our hypothesis using a difference-in-mean analysis.

5.1 Fama-French Five-Factor Model

The Fama-French five-factor model is an extension of the three-factor model and the asset pricing model CAPM. The model explains that the excess (abnormal) return of a portfolio is related to five factors: Market risk ($R_m - R_f$), size risk (SMB, small minus big), value risk (HML, high minus low), profitability (RMW, robust minus weak) and investments (CMA, conservative minus aggressive). Any abnormal returns will reveal itself in the shape of a positive intersection from the regression result. This also known as alpha (α) from the formula below (Fama & French, 1996). The three-factor model has received criticism for missing much of the market variation in return from profitability and investments, thus we will in this study use the five-five factor model in our analysis.

$$Y_{i,t}^{j} = \alpha + \beta_1 \left(R_{m,t} - R_{f,t}\right) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_{\ t} + \beta_5 CMA_{\ t} + \varepsilon_{i,t}$$

Where:
j = ESG, Environmental, Social, Governance, and Carbon risk

i = low-risk, mid-risk, and high-risk portfolio

5.2 Sharpe Ratio

The Sharpe ratio measures the performance of an asset/fund after adjusting for its risk. It is calculated by taking the difference between the return of a portfolio and risk-free rate and then divide it on the volatility (standard deviation) of the same portfolio (Sharpe, 1966). The ratio can reveal if high excess return is a result of taking on much risk or just smart investing. Ultimately, a larger Sharpe ratio will result in better risk-adjusted return. The formula defines risk as volatility of the investment, which assumes that returns are normally distributed. That is not always the case as financial markets can suddenly experience unexpected spikes or drops in prices. Nevertheless, the ratio can still be used as a good proxy of risk-adjusted return. The formula is given below:

$$Sharpe\ Ratio = \frac{R_p - R_f}{\sigma_p}$$

Where:
R_p *= Return of portfolio*
R_f *= Risk-free rate*
σ_p *= Standard deviation of the portfolio's excess return*

5.3 Long-short portfolio

Since our thesis tries to examine whether low-risk ETFs outperforms high-risk ETFs, it can be useful to create a long-short portfolio to capture any negative correlations and hopefully observing a "double alpha" on both the long and short side (Jacobs and Levy, 1993). The portfolio is created by subtracting the returns of the low-risk portfolio to the returns of the high-risk portfolio. When the low-risk portfolio gets large positive return and the high-risk portfolio gets large negative return, the spread widens, and the long-short portfolio return increases.

$$Y_t^j = \alpha + \beta_1 \left(R_{m,t} - R_{f,t}\right) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t + \varepsilon_t$$

Where:
j = ESG, Environmental, Social, Governance, and Carbon risk

5.4 Difference-in-mean

The difference in means is "a standard statistic that measures the absolute difference between the mean value in two groups in a clinical trial" (Higgins and Thomas, 2022). We will use the difference-in-mean analysis to compare the means of the high-risk and low-risk portfolio, and test whether their means are statistically significant different from each other. The null hypothesis is that the underlying population means are equal, whereas the alternative hypothesis is that the population means are not equal.

$$H_o : \mu_1 = \mu_2$$
$$H_o : \mu_1 \neq \mu_2$$

We first calculate the difference in mean excess returns as Y_1-Y_3. The t-stat is further calculated as shown in (1) with *n* being the number of days in the five respective periods. Since the null-hypothesis is that there is no difference in mean excess returns, the equation can be further simplified to (2). The p-value is then extracted following the methodology proposed by Wang and Liu (2016) from a two-tailed t-distribution, and presented in table 5. We will reject the null hypothesis if the p-value is above the respective significance level, or if the absolute value of the test statistic is greater or equal to the critical value.

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1}{n_1} + \frac{\sigma_2}{n_2}}} \quad (1)$$

$$t = \frac{(\bar{X}_1 - \bar{X}_2)}{\sqrt{\frac{\sigma_1}{n_1} + \frac{\sigma_2}{n_2}}} \quad (2)$$

Where:
$\overline{X_i}$ *= mean return for portfolio i*
μ_i *= population means for portfolio i*
σ_i *= standard deviation for portfolio i*
n *= 1304, 813, 28, 205, 233*

6.0 Data

This section clarifies how the data is collected and cleaned before implementing the different methods. An overview of the Morningstar risk ratings is presented before further describing how the sample size, time periods, portfolios, and variables are developed.

6.1 Morningstar ratings

The Morningstar Sustainability Score is a normally distributed 1-5 score relative to the portfolio's global category and measures a company's general positioning to its industry to address its ESG risks or opportunities. Morningstar introduced a new ranking system in July 2020 where they try to capture and measure "the degree to which ESG risk could impact a company's financial health" (Wallace, 2021). As opposed to their previous ranking described above, the new ESG risk rating measures to what degree a company is *exposed* to ESG risk, and how well the risks are *managed*, hence describing how sensitive the companies are to changes in the underlying factors. An important characteristic of this new rating is that it is an absolute measure of risk, meaning that the ratings are comparable across all companies, industries, and sectors.

Since we want to dig deeper into the potential underlying value drivers behind the ESG risk factor, we also extract the decomposed factors for environmental risk, social risk, governance risk, and carbon risk. By doing, we hope to reveal which factors effects the profitability in the different time periods, and find possible explanations for this. The new ESG risk rating measures how well the risk the company faces is managed, and it is reasonable to assume that companies with bad ESG risk ratings (high ESG risk) are worse positioned for future changes in important internal and external factors.

6.2 Data cleaning

We use the Morningstar database to download the daily prices of 3500 Scandinavian ETFs from 1st of January 2017 to 31st of December 2021, a total of 1303 trading days, with data on ESG risk rating, environmental risk score, social risk score, governance risk score, and carbon risk score. Our study is focused on

Scandinavia as it is the region in the world with the most sustainable investing assets, and their political attitude and support towards sustainability and social responsibility has been strong for a long time (Global Sustainable Investment Alliance, 2021; Alfred Berg, 2019). We further clean the data such that we only analysed the funds that had historical prices in the full five-year period. To get a more accurate analysis of our research question, we believe it is important to remove those funds that have a low risk score "by nature" but are not actively trying to match or outperform a conventional benchmark. It has been an issue with older studies that analysis of data from a pool of all investing strategies may give inconclusive results (Atz, U. et al. 2021). We therefore filter out fixed income, real-estate funds, and target date funds from our sample.

6.3 Sample size and periods

After cleaning the data and applying filters, we are left with 1326 ETFs. The majority of other similar studies have based their periods on number of global cases reaching a certain threshold (Fabrizio and Filippo, 2020), or the date of which the lockdown occurred. We choose a post-hoc approach, where we identify the different stages of the crisis (Figure 1) and set the periods, visually, based on when the shocks hit Oslo Stock Exchange Index (OSEBX). We use the following five periods in our analysis:

- The 5-year period from 1st of January 2017 to 31st of December 2021, yielding 1303 trading days.
- Period prior to Covid, representing "normal times", from 1st of January 2017 to 20th of February 2020, yielding 813 trading days.
- Covid start to bottom, from 20th of February 2020 to 23rd of March, yielding 28 trading days.
- Covid bottom to recovery, from 23rd of March to 17th of December, yielding 205 trading days.
- Whole period from Covid start to recovery, from 20 February to 17th of December, yielding 233 trading days.

Figure 1: The different stages of the crisis

Source: Euronext

It is a clear trade-off between an increased sample period and the relevance and reliability of ESG risk ratings in the data. Annual cash flow into sustainable funds has more than doubled from 2019 to 2020, and total US-domiciled Asset Under Management using ESG strategies grew more than 42% from 2018 to 2020 (The US SIF Foundation, 2020). This implies a rapid change in ESG strategies within companies, and it is reasonable to assume that a larger sample period than 5 years will result in outdated ESG ratings. We therefore argue that the total period from beginning of 2017 to end of 2021 is large enough to find any relationships between ESG and sustainability, but not too long to ensure that our ESG data is relevant and appropriate for the ETFs we analyse.

6.4 Variables

For our analysis, we want to compare low-risk ETFs with high-risk ETFs. Similar to Sun and Small (2022), and Engelhardt et al. (2021), we filter on ETFs with ESG risk rating, environmental risk score, social risk score, governance risk score. To further analyse the drivers behind the environmental risk score, we also include carbon risk score. The ETFs are then divided in three portfolios (low-risk, medium-risk, and high-risk). Due to the skewed and uneven distribution of risk scores with more ETFs on the lower end of the scale, we have divided the portfolios with the ratings relative to each other, so that we get approximately the same number of ETFs in each portfolio. This results in three portfolios for all the five factors with approximately 400 funds in each portfolio. Since our study is more focused on the

differences between high ESG risk and low ESG risk, we choose a larger interval for the medium ESG risk rating. By doing so, our regressions and difference-in-mean analysis is more focused on the extremes of the risk scale, hopefully capturing any relationship in a better way. We further average the returns over the funds in each portfolio and subtract the risk-free rate to find our dependent variables (Y_1, Y_2, Y_3). What we are left with then is the total daily excess return for three portfolios for all five factors. We use these three long-only portfolios in our regression, but we also calculate a long-short portfolio (Y_1-Y_3) in our further analysis. A long-short portfolio is self-financing, and the risk-free rate is therefore not included when subtracting the portfolio returns.

The dependent variables are now in place, and we need to find the independent variables. As described above, we regress the portfolio excess returns on the European Fama-French 5-factor model. The market return is the return on the region's value-weighted market portfolio and risk-free rate equals U.S one-month T-bill. Note that the choice of risk-free rate is less relevant as it was zero in a large period of our sample. The Sharpe ratio is calculated as the annualized average excess return for the portfolios, divided by its annualized standard deviation.

6.5 Difference in mean

To be able to answer our hypotheses whether low-risk portfolios outperform high-risk portfolios, we perform a difference-in-mean analysis between Y_1 and Y_3. The Fama-French regressions from section 5.1 describes how well the portfolios performed relative to a benchmark and the respective factors. Since our study is focused on the portfolio performances *relative to each other*, a difference-in-mean analysis will describe this relationship in a more precise way. We first calculate the difference in mean excess returns as Y_1-Y_3, representing $\overline{X_i}$ in (2) from section 5.4, with the respective standard deviations. The t-stat is then extracted and presented in table 5.

In addition to the difference-in-mean analysis from our original regressions, we want to further examine the relationship between the low-risk and high-risk portfolios. We observe a right-skewed distribution of the risk-scores, and since we

construct the portfolios relative to each other, some of the ETFs in the high-risk portfolio might in fact have a reasonably low risk score. The consequence of this can be that we compare low-risk ETFs to other relatively low-risk ETFs. To overcome this challenge, we construct two new portfolios based on the 10% highest and 10% lowest rated ETFs. By doing so, we can isolate and capture the extremes of the risk scale.

6.6 Descriptive Statistics

Table 1 reports summary statistics for our sample of 1326 ETFs and the corresponding Morningstar risk ratings. We observe that, in general, the high-risk portfolio has the highest minimum return, but also the highest maximum value. We also observe that, in general, the high-risk portfolio has the largest standard deviation. The exception is for the social risk score, where the low-risk portfolio has the highest minimum value, the highest maximum value, as well as the highest standard deviation. In addition, we observe that the distributions of returns are left-skewed, with a higher median value than its corresponding mean. We therefore suspect a non-normal distribution, which is confirmed in figure 5&6 in the appendix. The Central Limit Theorem (CLT) states that the distribution of sample means is approximately normally distributed with a sufficiently large sample size (Fischer, 2011), and we argue that our sample size of approximately 400 ETFs in each of the two groups is sufficiently large for our t-test to have statistical power.

Table 1: Descriptive statistics

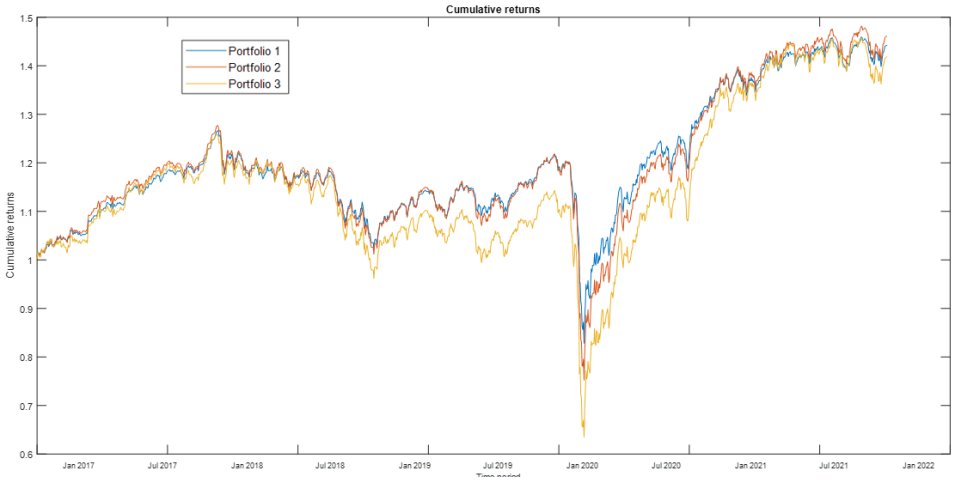
Factor		N	Mean	Median	Std	Min	Max	Skw
ESG	P1	1326	0,034	0,045	0,918	-9,280	5,360	-1,427
	P2	1326	0,035	0,530	0,883	-13,016	6,031	-2,351
	P3	1326	0,032	0,052	0,997	-11,860	6,250	-1,647
	Risk rating	*1326*	*3,38*	*3*	*1,09*	*1*	*5*	*1,046*
Environmental risk	P1	1326	0,039	0,044	0,831	-9,280	5,500	-1,359
	P2	1326	0,034	0,052	0,886	-11,713	5,460	-2,048
	P3	1326	0,028	0,039	0,993	-11,990	6,546	-1,786
	Risk rating	*1326*	*3,66*	*3,46*	*1,27*	*0*	*10*	*0,472*
Social risk	P1	1326	0,05	0,08	1,06	-12,12	6,39	-2,058
	P2	1326	0,03	0,07	0,90	-10,39	5,58	-1,498
	P3	1326	0,03	0,06	0,85	-11,15	5,68	-1,939
	Risk rating	*1326*	*7,95*	*8,16*	*1,57*	*0*	*15,52*	*-0,401*
Governance risk	P1	1326	0,043	0,076	0,932	-10,655	5,822	-1,495
	P2	1326	0,033	0,070	0,896	-10,954	5,551	-1,681
	P3	1326	0,031	0,063	0,886	-11,548	6,013	-2,021
	Risk rating	*1326*	*6,66*	*6,8*	*1,27*	*0*	*9,81*	*-0,331*
Carbon risk	P1	1326	0,036	0,067	0,863	-11,532	5,769	-2,058
	P2	1326	0,035	0,070	0,881	-10,146	5,245	1,497
	P3	1326	0,033	0,054	0,941	-11,579	6,015	-1,939
	Risk rating	*1326*	*8*	*7,9*	*2,8*	*0,36*	*24,17*	*0,107*

Note: This table shows the summary statistics for the full 5-year period.

7.0 Results and discussion of findings

Figure 2 represents the cumulative excess return over the 5 five-year period. We only present the graph for ESG risk as most of the other factors provide similar plots. Only the social risk factor reports a different pattern that will be highlighted later in the discussion. We observe that the portfolios follow each other closely in some of the periods, with larger spreads in others. From 2017 until end of 2018, the difference appears to be minimal. At the start of 2019, we begin to see a greater discrepancy in which portfolio 3 preforms worse than the two others. This is also highlighted during the Covid stock market crash where we observe that portfolio 3 falls the most. During the latest period from 2021 we see that the spread in excess return for the portfolios tightens again. Overall, we clearly observe that the high ESG risk portfolio yields the lowest excess return in the full period. This pattern is interesting for our hypothesis which is going to tested and analyzed below.

Figure 2: Historical excess return



Note: Figure 2 represent historical excess return over the 5-year period. The blue line is portfolio 1 with low ESG risk, orange line is portfolio 2 with mid ESG risk and yellow line is portfolio 3 with high ESG risk.

From table 2, disregarding carbon risk, there is a clear pattern that the low-risk portfolios yield higher alphas than the high-risk portfolios. This is further supported by the fact that the long-short portfolios yield positive alphas in the majority of the cases, although only significant in 6 out of 25 cases, with 3 of the 6 being negative. This pattern is consistent with the findings of Engelhardt et al. (2021), Albuquerque et al. (2020), Lins et al. (2017), and Ding et al. (2020), although they find more

statistically significant alphas. The positive alphas in the long-short portfolios indicates a higher return for the low-risk portfolio. In our difference-in-mean analysis, we will further investigate this relationship by examining whether the low-risk portfolio performs significantly better than the high-risk portfolio. It is worth mentioning that many of the insignificant p-values in the long-short portfolio lies in the range between 0.15 and 0.25, so they are not *highly* insignificant.

We can see that both ESG and Environmental risk has both positive and negative significant alphas. The two factors yield abnormal *negative* returns in the Covid crash periods at a 10% level, while yielding abnormal *positive* returns from Covid bottom to recovery at a 1% level, thus outperforming a conventional benchmark in the latter. All portfolios have statistically significant negative alphas in the Covid crash for the two factors, but the high-risk portfolio has the largest negative return. We also find that the high-risk portfolios have a larger drop in returns than the low-risk portfolios in the Covid crash for almost all factors.

Table 2: Regression alpha - Fama French 5 Factor

		Portfolio 1	Portfolio 2	Portfolio 3	Long-Short portfolio
ESG Risk	5 year period	-0,0020	-0,0059	-0,0090	0,0071
	3 year prior to Covid	0,0053	0,0027	-0,0069	0,0121
	Top to Covid bottom	-1,47*	-1,795*	-1,949*	0,672 *
	Covid bottom to recovery	0,267***	0,223***	0,268***	-0,079**
	Covid start to recovery	0,0203	0,0105	0,0406	-0,021
Environmental Risk	5 year period	-0,0095	-0,0049	-0,0095	0,010
	3 year prior to Covid	0,0098	0,0077	0,0048	0,006
	Top to Covid bottom	-1,561*	-1,727*	-2,059*	0.499*
	Covid bottom to recovery	0,201***	0,207***	0,247***	-0,046*
	Covid start to recovery	0,0263	0,0186	0,0187	0,008*
Social Risk	5 year period	0,0033	-0,0007	-0,0069	0,010
	3 year prior to Covid	0,0060	-0,0004	0,0018	0,004
	Top to Covid bottom	0,2917	0,2420	0,1386	0,083
	Covid bottom to recovery	0,0793	0,0397	0,0191	0,060
	Covid start to recovery	0,0022	-0,0169	-0,0451	0,047
Governance Risk	5 year period	0,0025	-0,0052	-0,0076	0,010
	3 year prior to Covid	0,0059	-0,0001	0,0025	0,003
	Top to Covid bottom	0,2680	0,1390	0,2060	0,056
	Covid bottom to recovery	0,0566	0,0372	0,0224	0,018
	Covid start to recovery	-0,0107	-0,0239	-0,0459	0,020
Carbon Risk	5 year period	-0,0044	-0,0033	-0,0042	0,000
	3 year prior to Covid	0,0036	0,0023	0,0047	-0,001
	Top to Covid bottom	0,1280	0,1651	0,2302	-0,102
	Covid bottom to recovery	-0,0660	-0,0256	-0,0297	-0,064**
	Covid start to recovery	-0,4710	-0,0093	-0,0461	-0,036

*Note: This table represent the alpha obtained from the interception in the Fama French 5 factor regression, as well as the long-short portfolio. The alpha explains excess return adjusted for market risk (abnormal return), and *, **, and *** describes degree of significance from at a 10%, 5% and, 1% level.*

MPT states that a restricted investment universe might reduce a fund's diversification opportunities, hence reducing its risk-adjusted returns. Disregarding the negative Sharpe ratios, we can in fact see from table 3 that the Sharpe ratios for the low-risk portfolio is higher than the ones for the high-risk portfolio in almost *all* cases. This indicates that, despite being restricted by only investing in low-risk portfolios, it is possible to earn higher risk-adjusted returns. This supports our expectations and the findings by Miralles-Quirós and Miralles-Quirós (2017) that the investment opportunities in sustainable assets is large enough to enable investors and fund managers to reduce their portfolio systematic risk through diversification. In addition, our findings of generally lower volatility and risk-adjusted returns in crisis periods is consistent with the findings of Zhou and Zhou (2021).

Table 3: Sharpe Ratio

		Portfolio 1	Portfolio 2	Portfolio 3	Difference
ESG Risk	5 year period	1,00	0,97	0,77	0,22
	3 year prior to Covid	0,98	0,94	0,42	0,56
	Top to Covid bottom	-2,15	-1,82	-1,73	-0,42
	Covid bottom to recovery	7,56	8,31	9,79	-2,23
	Covid start to recovery	1,19	0,97	1,39	-0,20
Environmental Risk	5 year period	1,13	0,92	0,67	0,45
	3 year prior to Covid	1,00	0,83	0,56	0,44
	Top to Covid bottom	-2,08	-1,89	-1,69	-0,40
	Covid bottom to recovery	7,92	8,17	8,62	-0,70
	Covid start to recovery	1,33	1,14	1,01	0,31
Social Risk	5 year period	1,12	0,89	0,85	0,27
	3 year prior to Covid	0,89	0,73	0,83	0,06
	Top to Covid bottom	-1,65	-1,93	-1,93	0,28
	Covid bottom to recovery	22,04	16,52	14,88	7,16
	Covid start to recovery	0,65	0,40	0,27	0,38
Governance Risk	5 year period	1,13	0,87	0,85	0,28
	3 year prior to Covid	0,96	0,71	0,86	0,10
	Top to Covid bottom	-1,87	-1,92	-1,82	-0,05
	Covid bottom to recovery	17,19	14,17	13,14	4,05
	Covid start to recovery	1,68	1,07	0,99	0,69
Carbon Risk	5 year period	1,00	0,95	0,85	0,15
	3 year prior to Covid	1,01	0,82	0,80	0,21
	Top to Covid bottom	-1,89	-2,02	-1,74	-0,15
	Covid bottom to recovery	12,91	15,29	26,22	-13,31
	Covid start to recovery	1,61	0,95	0,92	0,69

Note: All negative Sharpe ratios have been blurred out as only the positive values are interpretable.

The results discussed above indicates that in many incidents, low risk ETFs performs better than high-risk ETFs. We find that the alphas are in most cases higher for the low-risk portfolios than the high-risk portfolios, however only a few of them is significant. The Sharpe ratios describes a similar pattern in which many of the high-risk portfolios performs worse. Nevertheless, we need to test if the difference in excess returns relative to each other is significant to reject our null hypothesis.

Table 4 reports if the difference in mean for excess return between portfolio 1 and 3 is significant. We observe that the difference is positive in most cases, but none of the factors are significant with a p-value below 10%. Hence, we fail to reject any of our null hypotheses that low-risk ETFs outperforms high-risk ETFs for all factors. This is in contrast to the findings of Ferriani and Natoli (2020) and Engelhardt et al. (2021) but consistent with the findings of Hartmark and Sussman (2019). We further conduct an additional difference-in-mean analysis on the 10% top and bottom percentiles for all factors to isolate the extremes of the risk scale. The analysis results in slightly reduced p-values, but none significant enough to change the result from above.

Table 4: Difference in mean

		Difference in Mean	t-value	P-value
ESG Risk	5 year period	0,002	0,050	0,960
	3 year prior to Covid	0,011	0,347	0,729
	Top to Covid bottom	0,416	0,481	0,636
	Covid bottom to recovery	-0,077	0,656	0,513
	Covid start to recovery	-0,026	0,172	0,864
Environmental Risk	5 year period	0,011	0,293	0,770
	3 year prior to Covid	0,008	0,237	0,813
	Top to Covid bottom	0,355	0,399	0,694
	Covid bottom to recovery	-0,037	0,311	0,757
	Covid start to recovery	0,006	0,040	0,968
Social Risk	5 year period	0,018	0,468	0,640
	3 year prior to Covid	0,006	0,181	0,856
	Top to Covid bottom	-0,277	0,298	0,769
	Covid bottom to recovery	0,130	1,006	0,316
	Covid start to recovery	0,037	0,194	0,846
Governance Risk	5 year period	0,012	0,328	0,743
	3 year prior to Covid	0,003	0,080	0,936
	Top to Covid bottom	-0,106	0,119	0,907
	Covid bottom to recovery	0,073	0,514	0,608
	Covid start to recovery	0,043	0,238	0,813
Carbon Risk	5 year period	0,002	0,065	0,948
	3 year prior to Covid	0,003	0,111	0,912
	Top to Covid bottom	0,239	0,263	0,795
	Covid bottom to recovery	-0,137	2,413	0,292
	Covid start to recovery	0,007	0,038	0,970

*Note: This table represent the difference in the mean off excess return between portfolio 1 and portfolio 3. A t-test is used to report the level of significance at 10%, 5% and, 1% level with marking of *, **, and ****

7.1 ESG risk

The findings on ESG risk are not consistent with what we expected in light of stakeholder theory. The results from alpha, Sharpe ratio and difference in mean doesn't report a clear picture that actively managed environmental, social and governance risk gives superior risk-adjusted returns. That being said, does this mean that Milton Friedman's shareholder theory is more consistent in how to handle ESG risk? Our findings contradict this, as relative to the market, no trade-off or negative relationship were found in actively investing in low ESG risk companies. Table 2 shows that alphas for the low-risk portfolio were in 3/5 periods slightly positive and higher than the high-risk portfolio. This is in line with Morgan Stanely (2015) who reports no sign of trade-off for fund managers in choosing sustainable investing and financial performance. It also fits with Buch and Bassen (2015) meta-study that 90% of the papers have a non-negative connection between the two factors. Hence, our results shows that fund managers can benefit stakeholders in managing ESG risk without destroying value for its shareholders. Additionally, the non-existent of a trade-off contradicts MPT where ESG screening can lead to reduced investment flexibility, thus lower risk-adjusted return for the portfolio (Markowitz, 1952).

7.2 Environmental and carbon risk

Findings from our long-short portfolio shows a positive statistically significant alpha in the period from the top to Covid bottom, while it shows a negative statistically significant alpha in the period from Covid bottom to recovery. Prior to Covid, many investors associated sustainability with the environmental factor (Hartzmark and Sussman, 2019), while the pandemic has shifted the focus more over to the social dimension. This can be an explanation for the negative alphas from top to Covid bottom for the environmental factor. Investors realise the immediate urgency towards social aspects of the corporations, and those who previously invested in low-risk environmental companies now invest in low-risk social companies.

The world-wide lockdowns following the pandemic have displayed the importance of a well-functioning home-office work environment, which has increased the demand for smart technology solutions. Most tech companies have a low environmental risk by nature, and we therefore expected the low-risk ETFs to outperform in the recovery period following Covid. We observe that the low-risk portfolio yields a statistically significant alpha at a 1% level in the recovery period, thus outperforming the market. However, the high-risk portfolio performs slightly better, and the long-short portfolio in the period yields an abnormal *negative* excess return at a 10% level. This contradicts our expectations of outperformance by the low-risk ETFs. The carbon risk score is a sub-category of the environmental score, and the decrease in oil demand and negative oil prices in April 2020 is expected to hit this factor harder (Walker, 2020). In fact, we observe that the high-risk portfolio for carbon risk yields a negative return in the period of low and negative oil prices, while the high-risk portfolio for environmental risk yields a statistically significant positive return.

We observe from table 3 that the Sharpe ratio for the low-risk portfolio for both ESG risk and environmental risk score is 0,98 and 1,00 under the 3-year period prior to covid. This is much higher than the high-risk portfolios with Sharpe ratio of 0,42 and 0,56. The green investing trend before Covid can partly explain this. ESG funds did particularly good in 2019 as sustainable funds saw massive inflows from investors. Sustainable funds received that year $20,6 billion of new assets compared to $5,5 billion in 2018 (Lacruci, 2020). This would increase the demand of stocks with low ESG risk, thus boosting the price and excess return. The higher Sharpe ratios are also a result of lower volatility from the low-risk portfolios, demonstrated in table 8 from the appendix. This is consistent with the results from Sun and Small (2022) that finds larger volatility in ETFs with high environmental risk. During the same period, we see that there is little difference in the Sharpe ratio between the high-risk portfolio and the low-risk portfolio when we isolate for social risk and governance risk. However, the difference in environmental risk is large. One explanation for this could be that the big wave of investors into sustainable funds in 2019 where more focused on the environmental impact than the social and governance factor.

7.3 Social risk

The pandemic has arguably created a sense of urgency towards the social dimension in our society. It has highlighted the importance of social risk management, and its effect on both businesses and its employees. In line with stakeholder theory, when companies take the extra steps that improves their reputation and public perception, they will benefit from having more satisfied and loyal customers as well as more engaged, motivated, and productive employees in the recovery period. We argued excellent social risk management will impose the company short term losses, as they, for instance, keep paying their employees despite closing down their business and provide good job protection. We further argued that this short-term loss is compensated in the recovery period as their reputational value increases its returns more than the incurred short-term loss.

Figure 3: Excess returns for social risk score in the whole period

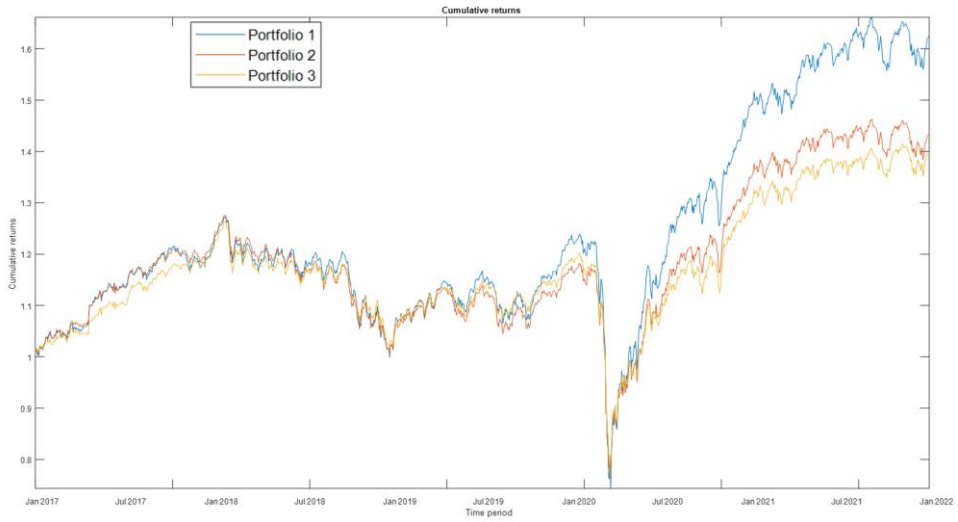
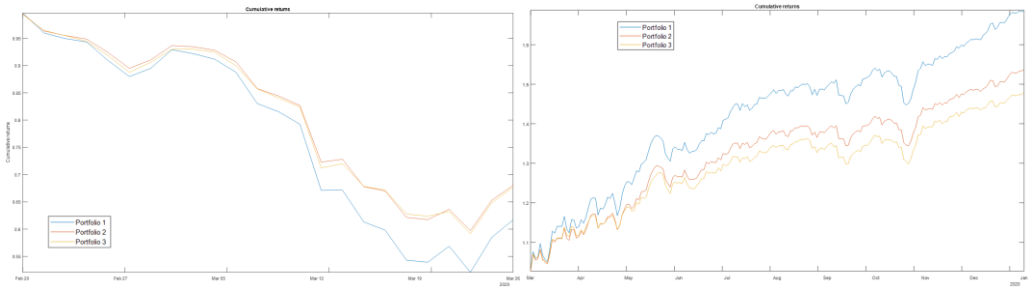


Figure 3 displays the importance of our decision to split ESG up in its underlying factors. While Figure 2 shown above for ESG risk return has the largest difference in the *pre-Covid* period, Figure 3 for social risk illustrates the big difference in the *post-Covid* period, and little difference in the pre-Covid period. We can in fact see that the largest spread happens throughout 2021, indicating a permanent shift in investor preferences towards the social dimension following the pandemic. Pastor and Vorsatz (2020) argues this increased investor interest in ESG aspects occurs because they now view sustainability as a necessity rather than a luxury good.

Although there are no significant outperformances, Figure 4 below confirms both of our expectations in the short term and the recovery period.

Figure 4: Excess return in crash and recovery period for social risk



Consistent with the findings by Sun and Small (2022), low social risk ETFs has the largest loss in the immediate period of the Covid crash, and the largest return in the recovery period. It is also interesting to observe that the returns are sorted such that the medium-risk portfolio is always between the high-risk and the low-risk. This indicates that there is a direct relationship between social risk score and ETF excess return. This complements the findings of Choi and Wang, (2009), Engelberg et al. (2011), and Hillman and Keim (2001) that better stakeholder relations can lead to better performance. A possible explanation for the lower excess return for low-risk ETFs on the Covid crash can be that investors view low social risk less desirable during periods of crisis. Strong employee protection can disable companies to reduce salaries or fire employees, which in turn can hurt their profitability.

Tech-companies are more likely to have a higher social risk score than other industries. The pandemic and the following world-wide lockdowns have displayed the importance of a well-functioning home-office work environment. This has increased the demand for smart technology solutions, and tech companies experienced a positive relationship between their high social risk and short-term excess returns. Our finding shows a larger return for high-risk companies in the crash period, which might be driven by the performance of technology stocks.

7.4 Governance risk

Our regressions from Table 3 provide evidence that the low-risk portfolio for the governance factor yields a higher regression alpha than the high-risk portfolio in all cases. It also performs significantly better than the market in the Covid crash (although not statistically significant). Further, we observe that the low-risk

portfolio for the governance factor yields a higher risk-adjusted return on all cases *except* the Covid crash. This contradicts our expectations that good risk management will perform better in crisis periods and experience a lower risk-adjusted return. That being said, table 8 in the appendix displays that the low-risk portfolio has a lower volatility in the Covid crash than the high-risk portfolio. Crisis periods exposes companies with poor risk management, and the lower volatility for ETFs with good risk management can be a consequence of this.

8.0 Conclusion

Our findings show that ESG risk has different impacts on the ETFs' performance in the sub-periods of Covid. In line with most existing literature, we generally find that well managed sustainability risk increases ETFs' financial performance in terms of excess return, as well as a higher risk-adjusted return. However, we fail to reject our null hypothesis that low-risk ETFs significantly outperform high-risk ETFs. Our findings contribute to existing literature and the findings of Hartzmark and Sussman (2019) as we find the ESG and environmental factor to possess safe haven properties. This is illustrated in Figure 8, where low-risk ETFs have the lowest drop in the Covid market crash, but also the slowest recovery. The results further emphasise the importance of diving into the dimensions of ESG, instead of analysing the ESG factor as a whole. Prior to Covid, we find a preference towards the environmental factor, while the Covid crisis has shifted investor preferences to the social dimension. In fact, we find that the social preference is still dominant throughout 2021, indicating a possible permanent shift in the way investors value ESG. This is valuable insight for companies as investors now seem to value well managed social risk and is therefore important to take into account when evaluating the company's vision and social practises. In addition, our findings are interesting for fund managers as it shows that there is no significant trade-off between sustainable investing and risk-adjusted returns. The latter also applies for investors, as our results shows that low-risk portfolios yield better risk-adjusted returns than high-risk portfolios.

8.1 Possible improvements

We acknowledge that our study has some shortcomings that the researcher optimally should include to describe the relationship in a more precise way. First, our study does not consider the excess returns net of management fee. As the management fee is imposed on the investor, this is a metric that directly reduces the excess return. One might argue that since ESG funds have a smaller investment universe, the managers must do extra research to find stocks to invest in, hence management fee is higher. However, Gil-Bazo et al. (2009) and Schirrmann, et al. (2010) found that SRI funds preformed significantly better than conventional funds, also when adjusting for management fee. Secondly, our thesis does not analyse and

discuss, to a large degree, macroeconomic factors that could provide additional explanations of differences in the factors. For instance, the negative oil prices in April 2020 are likely to have affected the returns of stocks included in our portfolios for environmental risk and carbon risk. Thirdly, since our thesis analyse the portfolio returns in sub-periods of Covid, some of the regressions might be subject of a small sample period, where the smallest period is over 28 trading days from Covid start to bottom, but since we have a large sample size, this is less likely to have a negative impact on the robustness of our results. Lastly, the Morningstar risk ratings are only based on the ETFs *latest* score, without historical development, meaning that the score an ETF has today did not necessarily apply two years ago. That being said, our thesis is focused on a narrow time-horizon, and any significant changes to the ESG ratings are less likely.

8.2 Future research

For future research, we suggest using data from other ESG providers. For instance, the MSCI ESG and Bloomberg ESG disclosure score are well recognized in the industry. This would give more insight in potential differences in rating methods and if that significantly change the results for high/low scoring ETFs. Furthermore, the new EU taxonomy in 2022 will lead to stricter disclosure requirements on company's sustainability efforts. Consequently, this will make it harder to 'greenwash' and lead to more transparent ESG reporting. We therefore believe it would be interesting to replicate this study in a few years to analyse how this effects ESG ratings and its relationship to financial performance.

9.0 Appendix

Table 6: Regression alpha - Fama French 3 factor

		Portfolio 1	Portfolio 2	Portfolio 3
ESG Risk	5 year period	0,0031	-0,0013	-0,0047
	3 year prior to Covid	0,0061	0,0034	-0,0062
	Top to Covid bottom	-1,374*	-1,795*	-1,916**
	Covid bottom to recovery	0,1862***	0,2212***	0,2676***
	Covid start to recovery	0,0245	0,0170	0,0474
Environmental Risk	5 year period	0,0048	0,0001	-0,0050
	3 year prior to Covid	0,0077	0,0055	0,0018
	Top to Covid bottom	-1,431*	-1,601*	-1,879**
	Covid bottom to recovery	0,1989***	0,2055***	0,2455***
	Covid start to recovery	0,0308	0,0241	0,0253
Social Risk	5 year period	0,0033	-0,0007	-0,0022
	3 year prior to Covid	0,0066	0,0004	0,0026
	Top to Covid bottom	-0,0180	-0,0073	-0,1154
	Covid bottom to recovery	0,1210	0,0813	0,0585
	Covid start to recovery	0,0316	0,0064	-0,0258
Governance Risk	5 year period	0,0077	-0,0009	-0,0026
	3 year prior to Covid	0,0064	0,0006	0,0034
	Top to Covid bottom	-0,0680	-0,0756	0,0759
	Covid bottom to recovery	0,0957	0,0799	0,0606
	Covid start to recovery	0,0165	-0,0038	-0,0237
Carbon Risk	5 year period	0,0006	0,0015	0,0009
	3 year prior to Covid	0,0044	0,0029	0,0056
	Top to Covid bottom	-0,0897	-0,1002	-0,0594
	Covid bottom to recovery	-0,0566	-0,0171	-0,0216
	Covid start to recovery	-0,3360	0,0143	-0,0164

*Note: This table represent the alpha obtained from the interception in the Fama French 3 factor regression. The alpha explains excess return adjusted for market risk (abnormal return) and *, ** and *** describes degree of significance at 10%, 5%, and 1%.*

Table 7: Daily excess return in (%)

		Portfolio 1	Portfolio 2	Portfolio 3	Mkt-rf
ESG Risk	5 year period	0,034	0,035	0,032	0,053
	3 year prior to Covid	0,024	0,024	0,013	0,040
	Top to Covid bottom	-1,381	-1,686	-1,797	-1,161
	Covid bottom to recovery	0,230	0,263	0,307	0,396
	Covid start to recovery	0,067	0,066	0,093	0,040
Environmental Risk	5 year period	0,039	0,034	0,028	0,053
	3 year prior to Covid	0,024	0,021	0,017	0,040
	Top to Covid bottom	-1,406	-1,556	-1,761	-1,161
	Covid bottom to recovery	0,242	0,253	0,279	0,396
	Covid start to recovery	0,076	0,070	0,070	0,040
Social Risk	5 year period	0,048	0,033	0,030	0,053
	3 year prior to Covid	0,027	0,020	0,021	0,040
	Top to Covid bottom	-1,806	-1,509	-1,529	-1,161
	Covid bottom to recovery	0,498	0,398	0,367	0,396
	Covid start to recovery	0,058	0,032	0,021	0,040
Governance Risk	5 year period	0,043	0,033	0,031	0,053
	3 year prior to Covid	0,026	0,019	0,023	0,040
	Top to Covid bottom	-1,653	-1,557	-1,547	-1,161
	Covid bottom to recovery	0,447	0,395	0,375	0,396
	Covid start to recovery	0,102	0,067	0,062	0,040
Carbon Risk	5 year period	0,036	0,035	0,033	0,053
	3 year prior to Covid	0,025	0,021	0,022	0,040
	Top to Covid bottom	-1,501	-1,533	-1,740	-1,161
	Covid bottom to recovery	0,370	0,409	0,507	0,396
	Covid start to recovery	0,094	0,059	0,062	0,040

Table 8: Annualized Standard Deviation in (%)

		Portfolio 1	Portfolio 2	Portfolio 3	Mkt-rf
ESG Risk	5 year period	13,23	14,27	16,10	15,51
	3 year prior to Covid	9,27	9,63	11,28	9,84
	Top to Covid bottom	46,26	54,71	57,78	68,60
	Covid bottom to recovery	17,36	19,40	21,08	26,27
	Covid start to recovery	23,26	27,83	29,07	36,56
Environmental Risk	5 year period	13,42	14,31	16,05	15,51
	3 year prior to Covid	9,25	9,79	11,26	9,84
	Top to Covid bottom	47,77	52,82	59,20	68,60
	Covid bottom to recovery	17,90	18,52	20,43	26,27
	Covid start to recovery	23,98	25,65	28,54	36,56
Social Risk	5 year period	17,06	14,49	13,80	15,51
	3 year prior to Covid	11,59	10,20	9,53	9,84
	Top to Covid bottom	60,47	51,68	51,59	68,60
	Covid bottom to recovery	23,23	19,75	18,90	26,27
	Covid start to recovery	36,42	30,81	29,99	36,56
Governance Risk	5 year period	15,06	14,48	14,32	15,51
	3 year prior to Covid	10,14	9,94	10,13	9,84
	Top to Covid bottom	53,35	51,81	54,63	68,60
	Covid bottom to recovery	23,85	22,70	22,21	26,27
	Covid start to recovery	32,34	30,94	31,20	36,56
Carbon Risk	5 year period	13,94	14,23	15,20	15,51
	3 year prior to Covid	9,58	9,92	10,40	9,84
	Top to Covid bottom	52,70	49,29	57,25	68,60
	Covid bottom to recovery	22,05	22,41	23,67	26,27
	Covid start to recovery	30,52	30,16	33,35	36,56

Figure 5: Distribution for the whole period

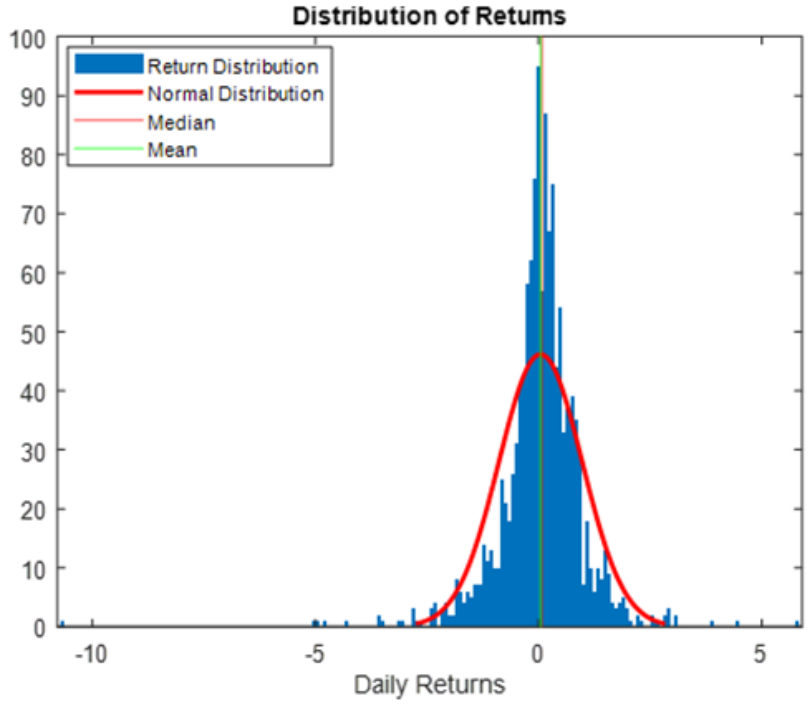


Figure 6: Distribution before Covid

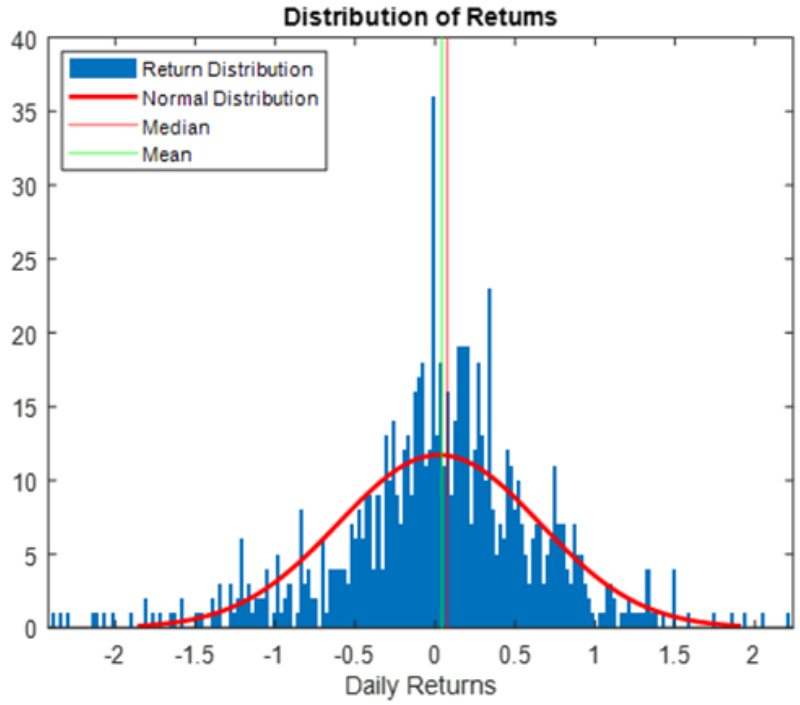


Figure 7: ESG Top to bottom

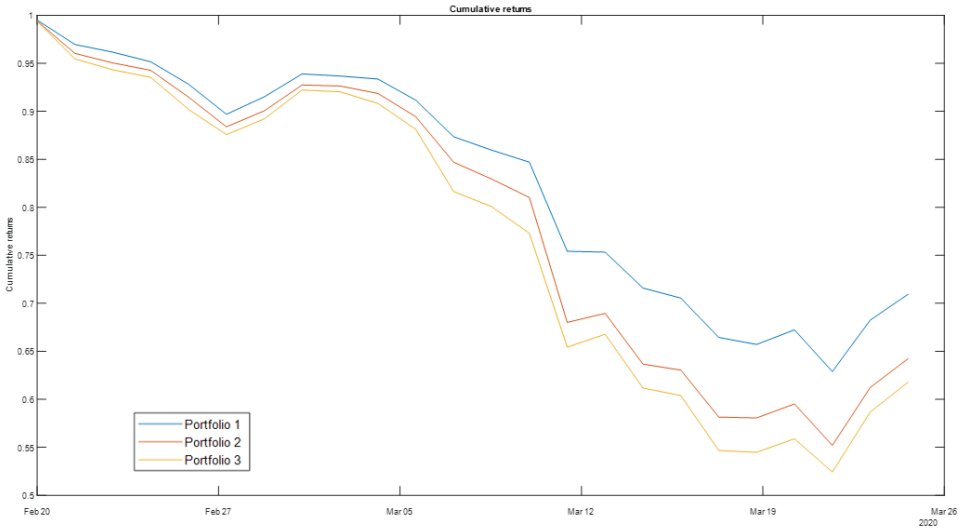


Figure 8: Top to recovery

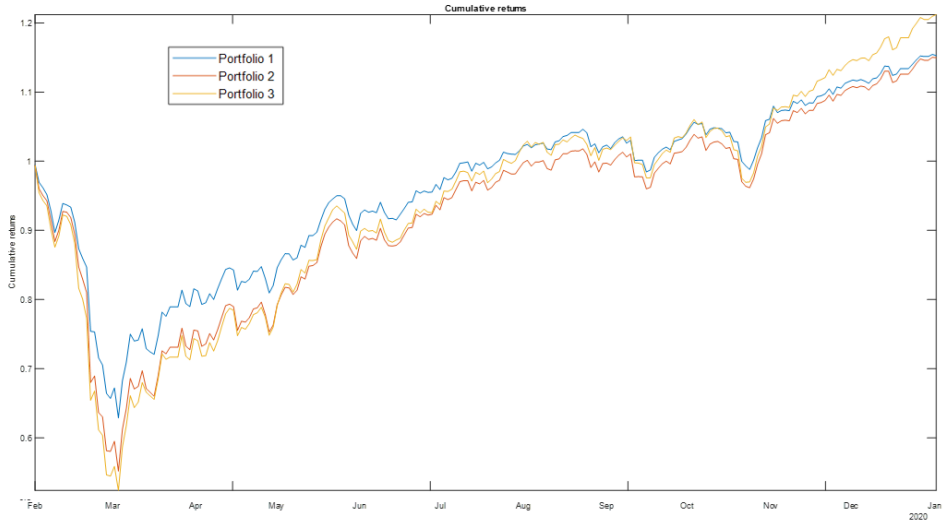
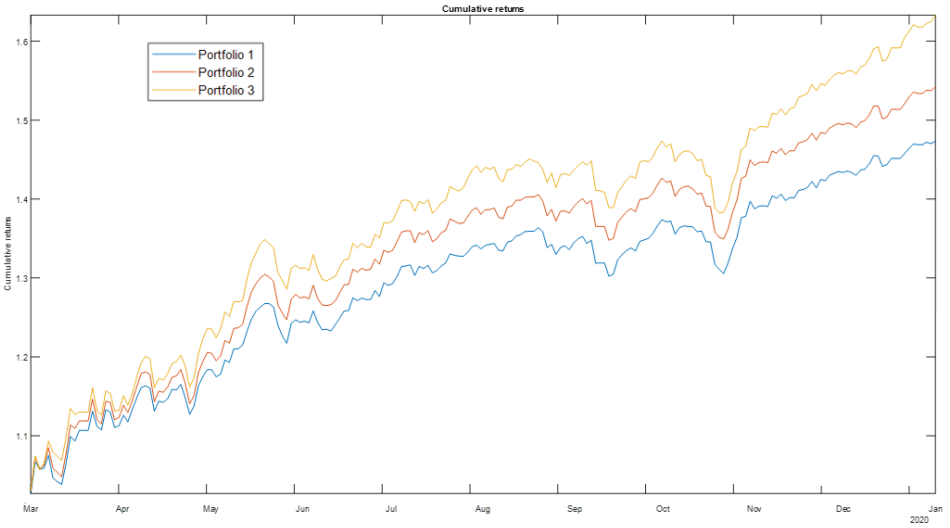


Figure 9: Bottom to recovery



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