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Exploring the Impact of ESG Scores on Stock Risk and Returns:

A Comparative Study on the Nordic Countries' Stock Markets

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Abstract

This study investigates environmental, social, and governance (ESG) scores' relationship to the risk and return of stocks in the Nordic countries. Data on Sweden, Denmark, Norway, and Finland stock markets is from Refinitiv Eikon, and factor model data from Kenneth's French library, between the time period 2015 to 2022. To investigate return we regress seven portfolios (one long-short portfolio) using CAPM, Fama-French three-factor model, Carhart's four-factor model, and Fama-French five-factor model. The risk was analyzed using standard deviation, portfolio beta, and VaR. Our findings are (i) a high ESG score does not yield higher returns (ii) a high ESG score leads to lower total risk (iii) ratings in each subcategory Environmental, Social, and Governance are positively related to stock return. Investors should bear in mind the implications of our findings when making investment decisions in ESG stocks on the Nordic market.

Table of contents

1. Introduction

In this thesis, we examine ESG scores' relationships to the risk and return of stocks in Nordic countries from 2015 to 2022. According to the 2022 Sustainable Development Report (SDR), Nordic countries are the top performers in sustainability activities (Sachs et al. 2022). Not only are Finland, Denmark, Sweden, and Norway ranked as the happiest countries in the world (Helliwell et al., 2022), but they also conduct a strong performance in the principal categories of sustainable development: Environmental, Social, and Governance, known as ESG (Sachs et al. 2022). Even if Nordic investors are ahead in sustainability, we find limited research on ESG in the Nordic stock market. Therefore, our study strives to offer insight into the relationship between the risk and returns of stocks in this market.

Since the International Paris Agreement 2015, the focus on companies' ESG scores and performance is rapidly increasing (Whelan et al., 2021), and continues to do so, with the implementation of the new action plan "EU taxonomy" by the European Commission (European Commission, 2019). Together, investors in Sweden, Denmark, Norway, and Finland manage 1 trillion EUR worth of assets, finding ESG investing complicated and ever-changing with investors having different opinions, and regulations being complex (Nordic Investor, 2022).

Despite the growing interest in ESG (Edmans, 2023), empirical research has struggled to establish a clear relationship between ESG and financial performance. While several meta-studies have concluded that ESG mostly has a positive relationship with financial performance (Carpenter & Wyman, 2009; Clark et al., 2015; Friede et al., 2015; Whelan et al., 2021; Lioui & Tarelli, 2022), there is also evidence of a negative relationship, such as firms with high ESG having lower returns (Luo, 2022). Additionally, some studies have found that sin stocks have higher expected returns (Fabozzi et al., 2008) because they bear the risk around sin stocks' social norms (Hong & Kacperczyk, 2009), while others have found that high-toxic firms have higher returns (Hsu et al., 2022). Furthermore, many studies are inconclusive, with different results caused by factors such as varied methodologies and measures (Fiskerstrand et al., 2020). Therefore, it is important to continue studying ESG and its relationship with stock performance to better understand the impact of ESG on

investment decisions (Bauer et al., 2005; Giese, et al., 2019; Verheyden et al., 2016; Zehir & Aybars, 2020).

We employ the Capital Asset Pricing Model (CAPM) (Sharpe, 1964), the Fama-French three-factor model (Fama & French, 1992), Carhart's four-factor model (Carhart, 1997), and the Fama-French five-factor model (Fama & French, 2015) on seven portfolios, six of which have different ESG scores. We also construct a long-short portfolio (Hong & Kacperczyk, 2009) to examine whether a high ESG score is related to higher stock returns. Our results do not provide evidence of such a relationship across models.

Further, to investigate whether firms with high ESG scores are related to lower stock risk, we use several risk measures, including standard deviation, Value-at-Risk (VaR), and portfolio beta, as well as two risk-adjusted measures, Sharpe ratio and Treynor ratio, inspired by Teti et al., (2023). Our overall results suggest that higher ESG scores are associated with lower risk in the Nordic countries. However, we observe different results between the countries separately.

To further examine the relationship between ESG and stock return, we regress the factor models on the individual pillars separately to answer if ratings in each subcategory environmental, social, and governance are positively related to stock return. Our findings propose that individual pillars are positively related to stock return, with the governance pillar showing the strongest relationship for the Full sample. Nevertheless, the findings vary across the different countries included in the sample.

This thesis contributes to the literature in four folds. First, this thesis adds to the limited research on the Nordic market by providing an analysis of the performance of companies with different ESG scores. Second, it provides insights for investors seeking to incorporate ESG factors into their investment decision. Third, the study provides investors with a more nuanced understanding of the impact of each individually ESG factor on stock performance. Forth, insights provided by this thesis can help contribute to the further development of sustainable and responsible investment practices in the Nordic market.

The thesis is sectioned as follows 2. Literature review and hypotheses, 3. Data and methodology, 4. Results and discussion, 5. Conclusion.

2. Literature review and hypotheses development

To answer the research question of how ESG scores are related to the risk and return of stocks in Nordic countries, prior literature is reviewed. This chapter is separated into four sections, first is a background section on the subject of ESG. Followed by three sections where each is developing a profound ground for our three hypotheses.

2.1 Background to responsible investment

According to Friedman (1962), companies' primary responsibility is to maximize shareholder profits, other responsibilities hinder value creation and should therefore be voluntary. Freeman (1984) argues that firms need to have stakeholders' interests at heart. Today CEOs feel an increasing personal responsibility to run a firm that has a purpose in society (Bannier et al., 2022), and adding corporate social responsibility (CSR) will achieve long-term value creation beneficial for both stakeholders and shareholders (Freeman, 2010). Early research by Freidman (1970) claims shareholders pay for CSR from their own pockets, going against their interests, and reducing firm value, further decreasing economic growth, job creation, and innovation, and offering no benefits to society.

In recent years financial studies are more related to sustainable investing than maximization of shareholder value (Maiti, 2021). Later research finds stakeholder theory increases company value and lowers financial risk (Sassen et al., 2016). Agle et al. (2008) argue it's a complex relationship, only focusing on stakeholders gives challenges to sustainable growth and holding capital, but the opposite enhances financial risk and negative reputation, claiming both theories intertwined will create value for the firm and society. However, the integration of stakeholder theory into a firm's practical and operational activities is challenging, whereas shareholder theory is more straightforward (Tse, 2011), and both groups want a payoff (Khan, 2019).

Borgers et al. (2013), to contribute to society and investment performance, the firm should integrate Environmental, Social, and Governance (ESG) with their investment decisions, explained as non-financial corporate activities focusing on sustainability and CSR (Bannier et al., 2022). Nowadays, the most sustainable investing studies are ESG (Maiti, 2021), and ESG-

aware firms want to show their ESG initiatives in their practices, e.g., through ESG scores in annual reports (Khan, 2019). Integrating ESG kind of creates a circle, aligning long-term responsible investments with broader society's interests (Friede et al., 2015). Higher sustainability orientation increases long-term thinking and stakeholder engagement processes (Eccles et al., 2014), in which collaboration and engaging input from stakeholders give longstanding value creation for the firm and society (Agle et al., 2008). This gives ESG a key role in the world economy (Luo, 2022). Investors find the relationship between stock return and ESG performance is of both shareholder and stakeholder interests. The issue is, ESG in stakeholders' interest affects financial performance and therefore shareholder value, making it difficult for companies to create a sustainable business if they cannot provide a long-term return for their shareholders (Khan, 2019). Therefore, investors need a profound understanding of ESG integration for the full potential of receiving value-enhancing results (Friede et al., 2015).

2.2 Return and ESG investment and Hypothesis 1

Khan (2019) claims ESG performance predicts stock returns potential investment value globally, and ESG-related returns can be interpreted as information about a stock's performance in the future Ni & Sun (2023). Some investors still believe ESG sacrifices return, because of short time frames to achieve better performance, even if there is support ESG can improve a company's financial return Eccles et al. (2017), or at least produce competitive returns (Verheyden et al., 2016). Friede et al. (2015) also argue that the worst-case scenario is ESG funds lose nothing compared to other funds. Bauer et al. (2005) also find ethical mutual funds to have the same return as conventional funds. However, Khan (2019) claims that a high ESG-score portfolio outperforms the global universe in terms of return. Luo (2022) finds U.K. firms with higher ESG scores earn lower returns than those with lower ESG scores. Hsu et al. (2022) argue return predictability is influenced by investor under- or overreaction to climate change news. Investors exhibit a great willingness to hold socially responsible firms and funds, driven by factors such as social reputation, which in turn have an impact on stock prices.

Meta-study of Lioui & Tarelli (2022), shows positive, negative, mixed, and nonconclusive results when studying ESG rating and stock returns. Yet, evidence suggests that high-rated ESG firms outperform low-rated ESG firms. Fiskerstrand et al. (2020) find the mean return for the high-rated-ESG portfolio in the Norwegian market, is higher than for the low-rated-ESG portfolio. Fabozzi et al. (2008) argue that sin stocks have higher returns. Hong & Kacperczyk (2009) find that sin stocks have higher expected returns because they bear the risk around sin stocks' social norms. Kempf & Osthoff (2007) argue investors get a pay-off for screening their portfolio after socially responsible criteria. Hong & Kacperczyk (2009), the effect of social norms make socially accepted investments costly. Sin stocks outperform non-sin stocks because investors neglect sin stocks and get a price not matching the fundamental value, hence, the higher expected return for sin stocks. Pástor et al. (2021) find that high-ESG-rated stocks underperform low-ESG-rate stocks. Zehir & Aybars (2020) claim there is no link between SRI and portfolio performance, that all information is reflected in stock prices.

Cornell (2021) claim investors trying to improve their portfolio with higher ESG investing will give up a higher expected return for the benefit of the firm and society (in line with Pástor, 2021). On the contrary, Maiti (2021) finds that ESG can predict returns, giving better investment performance. Similarly, Eccles et al. (2014), find more sustainable firms long-term outperform low sustainability firms in terms of stock return. Gibson et al. (2021) write that ESG is increasing in financial studies even if it is a non-financial performance and is of interest for investment decisions.

After the Paris Agreement of 2015, ESG and its impact on investments have grown increasingly, and evidence shows firms with an ESG focus get improved returns Whelan et al. (2021). In a meta-study by Friede et al. (2015), the relationship between ESG stocks and corporate financial performance (CFP) is mostly positive and stable over time across different regions, asset classes, and approaches. However, in ESG portfolios, the findings are neutral, and report a high level of mixed findings. Meaning there is a portfolio effect on corporate financial performance when you have ESG in a portfolio, that all investors have the same information and therefore the same expectations for the future. Whelan et al. (2021), ESG investing improves financial performance due to ESG becoming increasingly highlighted long-term, (Carpenter & Wyman, 2009) shows mostly a positive correlation

between ESG and companies' financial performance. However, Giese, et al. (2019) find many studies are inconclusive. (Eccles et al., 2014) find sustainable stocks outperform less sustainable firms. Borgers et al. (2013) find that the stakeholder relationship is positively related to risk-adjusted returns. However, as attention increases around stakeholders, the relation to return diminishes. Because in the end, stakeholder attention takes away mispricing in the market. Bauer et al. (2005) find no evidence that ethical mutual funds and conventional funds have different risk-adjusted returns.

The alpha value in the risk models shows a portfolio's abnormal return, SRI portfolios provide better alpha than conventional portfolios in an emerging market (Angelica & Utama, 2020). In et al. (2017) find abnormal returns when going long in carbon-efficient stocks and short in carbon-inefficient stocks. In opposite to what Bolton & Kacperzcyk (2021) find on carbon-efficient stocks, and also similar to Ni & Sun (2023), and Hsu et al. (2022) finding. Investors do not profit from going long in high ESG stocks and short in low ESG stocks Ni & Sun (2023), nor investing in low toxic emissions firms. Because firms with high emissions face greater exposure to the risk of regulatory regime changes, resulting in higher average excess returns as compensation for this risk for toxic firms Hsu et al. (2022). Ni & Sun (2023) and Hong & Kacperczyk (2009) also find unsustainable stocks are risks investors need compensation for. Contradicting Gregory et al. (2014), firms with high ESG-rating, use this as a competitive advantage to generate excess returns. ESG is used for cost-saving and to increase a firm's competitiveness in a fast-changing climate and world (In et al., 2017).

Teti et al. (2023), have one of the most recent studies on ESG in Europe and find the top and bottom ESG portfolio has negative alphas, that become more negative when adding risk factors. However, the only significant alpha is in the Fama-French five-factor model for the low ESG score portfolio. The long-short portfolio shows positive abnormal returns, though not a significant increase when adding risk factors. The conclusion from the analysis is results that are inconclusive and "noisy". Gregory et al. (2014), green and toxic stocks in the U.S. have an overall negative, and insignificant, alpha. Yet, the long-short portfolio has a positive alpha that implies that green stocks outperform. (Hsu et al. (2022) find that a long-short portfolio of high minus low toxic emission intensity firms in the U.S. has a statistically significant alpha). Similar finding to Ni & Sun (2023), Chinese firms with higher ESG scores, get a drop in monthly stock returns, and therefore, stock returns are negatively related to

ESG performance. Same, Fiskerstrand et al. (2020) find that a high-low portfolio strategy does not show a significant relationship between ESG and the Norwegian stock market performance, showing small, negative, and insignificant alphas in Carhart's four-factor model. However, the high-low-ESG portfolio for the Norweigan market has a negative and insignificant alpha in C4.

Hong & Kacperczyk (2009), the long-short portfolio of sin stocks minus comparable stocks shows all positive and significant alphas. Trinks & Scholtens (2017) find higher returns for sin stocks in several international markets, and if sin stocks are excluded it will lower financial performance. This is in line with findings from Fabozzi et al. (2008), which also show that sin stocks have higher returns. Yet, Nagy et al. (2016), argue ESG strategies outperform global benchmarks and earn higher returns when looking at alpha. Hong & Kacperczyk (2009), still find sin stocks have social pressure, risk, and therefore higher expected returns. Kempf & Osthoff (2007) have positive abnormal returns in the long-short socially responsible portfolios. Pástor et al. (2021), a long-short portfolio, long in responsible stocks, and short in irresponsible stocks, gives a negative alpha. Lioui & Tarelli (2022), changes in risk aversion and investors' preferences towards ESG factors influence the alphas. Pástor et al. (2021) find that green assets have negative alpha, and lower expected returns because investors keep them because they have lower climate risk. Edmans (2011), Kempf & Osthoff, (2007), and Gompers et al. (2003), get the opposite result of green vs. brown assets.

Zehir & Aybars (2020) finds low ESG score on portfolio performance in Turkey and Europe outperform the market. Luo (2022) finds that the low-ESG quantile gets a higher positive and significant average excess return than high-ESG gets, plus the alpha in the low-high-ESG portfolio is positive but insignificant. Friede et al. (2015) argue the reason for ESG portfolios having fewer positive findings, than non-portfolios, is that other factors crowd out the alpha ("too much noise"), portfolios with a mix of non-ESG with ESG stocks can cancel out the wanted effect. Eccles et al. (2014), high sustainability companies have a higher annual abnormal return than low sustainability firms. Angelica & Utama (2020) find portfolios formed on the Indonesian stock market based on SRI criteria provide better abnormal returns than conventional portfolios.

Gregory et al. (2014) find high performance in CSR gives lower risk factor loadings in the asset risk models. For the Norweigan market, generally SMB, HML, and MOM are significant

(Fiskerstrand et al., 2020). Ni & Sun (2023), when they add the RWA and CMA factors the alphas in the models decrease, which means those factors can explain portfolio return. Lioui & Tarelli (2022) find that high-ESG firms also have more profitability (RMW) and are conservative with their investments (CMA). In the meta-study of Harvey et al. (2016), they analyze many risk factors and find MRT(MktRF), HML, and MOM to be significant. SMB is never significant as a risk factor in their analysis. Hsu et al. (2022), the market factor (MktRF) in the CAPM model cannot explain the positive emission-return relation, because of flat market betas across the portfolios. However, the high-low portfolio carries insignificant loadings on most risk factors except the value factor.

Bannier et al. (2022) find that the CSR score is higher in the EU than the U.S. score Friede et al. (2015) argue that developed markets show the U.S. has more positive results than Europe, Asia, and Australia, the explanation is fewer portfolio studies in the U.S. Relationship between ESG and performance is more positive in emerging markets than in developed markets. Further, Bannier et al. (2022) find sustainable investments are higher in the EU than in the US. Additionally, the reporting of CSR is different and therefore the effect of CSR activities is different. Sustainability awareness is a norm for the EU, and it is a build-up culture in the firms that social and governance activities matter. In the U.S. CSR is for risk reduction so firms can achieve beneficial goals. Further, CSR reporting in the EU is more intense, even if interim reporting is more frequent in the U.S. Which makes it interesting to look more into companies in the Nordic.

The literature remains undecisive if firms with higher ESG scores get higher stock returns. Results show that companies investing in ESG have higher returns (Kempf & Osthoff, 2007; Eccles et al., 2014; Gregory et al., 2014; Edmans, 2011; Nagy et al., 2016; In et al., 2017; Fiskerstrand et al., 2020; Maiti, 2021). Even conclude Hong & Kacperczyk (2009), Bolton & Kacperczyk (2021), Hsu et al. (2022), Luo (2022), and Ni & Sun (2023), show firms with high ESG-scored firms earn lower expected returns than low ESG scored firms. Still, the overall results of the literature that higher ESG score investments give higher stocks returns, therefore the first hypothesis is:

Hypothesis 1: A high ESG score is related to higher stock returns.

We contribute to the literature by adding research on Nordic countries' and the relationship between ESG scores and stock performance. Our result enhances the result in Hong & Kacperczyk (2009), Bolton & Kacperczyk (2021), Hsu et al. (2022), Luo (2022), and Ni & Sun (2023).

2.3. Risk and ESG investment and Hypothesis 2

There are many studies on corporate social performance's impact on the financial performance of a firm, but not the impact on firm's risk (Sassen et al. (2016). Traditional risk models do not capture all risks (Dunn et al., 2017). A firm's risk is the uncertainty of future events that can lead to potentially losing value Sassen et al. (2016). It is good to use different risk measures for measuring financial risk (Hoepner & Schopohl, 2018) and Ruefli et al., (1999). Sassen et al. (2016), and Hoskisson et al (1993), focus on market-based risk measures to capture the link between firm risk and corporate social performance. There is a growing interest in ESG, and it may benefit the firm, but ESG is still an uncertain risk factor (Cornell, 2021). ESG can help forecast future risk changes and inform how risky a firm is (Dunn et al., 2017). Firms in Europe have a stronger negative relationship between CSR and risk, than the U.S. Bannier et al. (2022). However, in a highly volatile market, CSR has a risk-reducing effect in the U.S. but has no effect in the EU. Firms integrating ESG can give short-term performance benefits and long-term risk reduction, Giese et al. (2019). ESG directly influences management decisions, and neglecting ESG increases exposure to risk (Dunn et al., 2017). Hsu et al. (2022), suggest high-CSR firms have a lower risk because their reputation around corporate social responsibility helps them survive financially hard times.

Total risk is the degree to which a firm's stock returns vary over time and is measured by standard deviation, Sassen et al. (2016). Total risk is a typical risk measure in finance studies (Hoepner & Schopohl, 2018). Boutin-Dufresne and Savaria (2004) find lower total risk for socially responsible portfolios, because of no exposition of risk regarding unethical company practices. According to Nagy et al. (2016), a portfolio with more ESG stocks has lower stock volatility. Total risk is not affected when funds exclude sin stocks and unethical firms (Hoepner & Schopohl, 2018). In a long-short portfolio of the U.S. and the EU, volatility is

higher in the EU, Bannier et al. (2022). Ni & Sun (2023) find large firms with less volatility have better ESG performance. Firms with ESG scores have lower stock return volatility than those with no ESG scores, and firms with high ESG scores have higher stock return volatility than firms with low ESG scores. Giese, et al. (2019) observe that a higher ESG score gives lower volatility. Sassen et al. (2016) note higher corporate social performance lowers total risk and therefore increases firm value. Dunn et al., (2017) find a higher total risk in the low-ESG portfolio compared to the high-ESG portfolio, and the high-low portfolio has a negative total risk. For Teti et al. (2023), the bottom-ESG-score portfolio has a lower standard deviation, than the top-ESG-score portfolio. The long-short portfolio, therefore, the top-ESG portfolio has a higher total risk.

The downside risk is for measuring expectations of potential losses in return, namely risk associated with shocks (Hoepner & Schopohl, 2018). A firm with a high ESG score can use this as a hedge against climate shock Cornell (2021) and during a crisis Whelan et al. (2021).

Lööf et al. (2022) find higher ESG-rated stocks have lower downside risk (VaR). Jorion (2002) finds VaR to be an informative and standard risk measure for financial risk. Capelli et al. (2023) discover unexpected losses in a portfolio may be reduced by introducing ESG into VaR, especially in stressed situations. Measuring downside risk can give better preparation for investors because they like to know expected gains and losses. The downside risk is not affected when funds exclude sin stocks and unethical firms (Hoepner & Schopohl, 2018). In the long-short portfolio of the U.S. and the EU, VaR, is higher in the EU Bannier et al. (2022).

Gregory et al. (2014) describe systematic risk as the general market risk companies are exposed to. Systematic risk is the firm's sensitivity to changes in the market or movements in the market that are relevant to all stocks (Luo & Bhattacharya, 2009). Excluding unethical firms from funds can affect portfolio risk, giving lowers systematic risk Lee et al. (2010). Friede et al. (2015) portfolio performance can affect ESG performance with the effects of systematic risk, and extra costs for portfolio construction. CSR activities and higher ESG scores lower systematic risk (Luo & Bhattacharya, 2009) and (Giese et al., 2019). The reason is that firms with higher ESG scores are more prepared for systematic shocks in the market El Ghoul et al. (2011), Eccles et al., (2014), & Gregory et al., (2014). Teti et al. (2023) find the bottom-ESG-score portfolio to have a lower portfolio beta than the top-ESG-score portfolio. The long-short portfolio, therefore, shows that the top-decile portfolio has higher

systematic risk. Angelica & Utama (2020) find SRI portfolios have higher portfolio beta than traditional portfolios, therefore they face higher market risk.

Sharpe ratio and Treynor ratio measure a firm's performance relative to the stock market Hoskisson et al (1993). Fiskerstrand et al. (2020) find that the Sharpe ratio for the high ESG portfolio is lower than for the low ESG portfolio, and the high-low ESG portfolio has a positive Sharpe ratio. Teti et al. (2023) observe the low ESG score portfolio to have a lower Sharpe ratio and Treynor ratio than the high ESG score portfolio. The long-short portfolio, therefore, shows the top-decile portfolio gets more return per risk taken. SRI funds show a more positive Sharpe ratio and Treynor ratio than traditional portfolios Angelica & Utama (2020).

Based on the literature on total risk, systematic risk, and downside risk, and its relation to stocks ESG score we state the second hypothesis:

Hypothesis 2: Firms with high ESG scores are related to lower risk.

We add to the existing literature by shedding light on ESG relation to stock risk in the Nordic countries. We do not find the same relationship between ESG and risk as Lee et al. (2010).

2.4. Individual E, S, and G ratings, and Hypothesis 3

Lioui & Tarelli (2022) explain the environmental (E) pillar consists of the categories, emissions, resource use, and innovation. The social (S) pillar consists of community, human rights, product responsibility, and workforce, and last the governance (G) pillar has shareholder, CSR strategy, and management. In a meta-study by Carpenter & Wyman (2009), all three pillars have mostly a positive relationship to financial performance and are important in investment decisions to help predict returns (Maiti, 2021). However, Friede et al. (2015) find that neither E, S, or G score has a positive superior relation to corporate financial performance. Like Ni & Sun (2023), the pillars have an individual effect but increasing either E, S, or G scores gives a decreased monthly stock return. Contrary to a meta-study by Clark et al. (2015) where an overall positive pillar influence on stock price performance. Further, Bannier et al. (2022) notice that the EU has a higher social and environmental score, and a lower governance score, than the U.S.

Ni & Sun (2023) did not find a positive relationship between the pillars and financial performance, but the pillars have different effects in different industries. Carpenter & Wyman (2009) only find industry effects for the environmental pillar. Further, the E-pillar has a direct relationship between stock return and environmental performance (Clark et al., 2015). Evaluating environmental performance is more feasible for a firm than social and governance evaluation. Because the environmental pillar gets more attention, while the social pillar and governance pillar face challenges in measuring performance lacking proper standards (Ni & Sun (2023). This is not what Clark et al. (2015) find, corporate governance has several more in-depth studies on the effect on a stock price because it has been easier to measure than environmental and social pillars. Results from Friede et al. (2015) meta-study agree, the governance pillar is the most studied, but both the G pillar and the E pillars have a stronger relationship than the S pillar to corporate financial performance. In which the E pillar has the strongest and the S pillar has the weakest relationship. Opposing, Carpenter & Wyman (2009) observe that an improved social pillar in an investment portfolio leads to higher financial returns overall.

The majority of studies find superior governance quality leads to better financial performance because a high G score is positively valued by investors Clark et al. (2015). Carpenter & Wyman (2009) find a positive impact on the firm and portfolio performance with strong corporate governance. A high governance score portfolio outperforms the global universe (Khan, 2019), and well-governed firms outperform poor-governed firms through a long-short portfolio (Gompers et al., 2003) and (Cremers & Nair, 2005) On the contrary, Zehir & Aybars (2020) finds that low-governance portfolios outperform the market with a positive and significant alpha while the high-governance portfolio has a negative significant alpha. Luo (2022) study the alpha in the low-minus-high portfolios for each pillar where portfolio alpha is significant and more positive for the social pillar than for the environmental pillar. Further, the low-high portfolio of governance is positive yet insignificant. Agreeing with Ni & Sun (2023) that firms performing well in E-pillar, do so in S-pillar.

Lioui & Tarelli (2022) have positive and significant alphas in the factor models for the S pillar, but not for the E pillar or G pillar. Luo (2022) results show positive and significant alphas for the social, environmental, and governance pillars, where the low-score portfolios have

higher alpha than the high-score portfolios. Edmans (2011) find a positive relationship between employee satisfaction (S-pillar) and stock return internationally, giving significant results that alphas survive long-term, but this may be due to the market do not have information about S-pillar (Edmans et al. 2014).

Previous research gives ambiguous results about the relationship between individual pillar scores and stock returns. Yet, collectively, research on the area of the subcategories of environmental, social, and governance has positive findings. It is interesting to investigate this relationship further in the Nordic countries. We formulate our last hypothesis as follows:

Hypothesis 3: Ratings in each subcategory Environmental, Social, and Governance are positively related to stock return.

We contribute to the literature by giving a better understanding of the subcategories of ESG in Nordic countries, adding evidence that the governance pillar exhibits the strongest relationship. Our results add to Clark et al. (2015), Carpenter & Wyman (2009), (Khan, 2019).

3. Data and methodology

3.1 Sample selection

The sample consists of companies in the Nordic countries that have received ESG scores from Refinitiv over the time period 2015 to 2022, which coincides with the emergence of ESG regulations following the Paris Agreement. The Refinitiv ESG universe contains financial information on thousands of different companies and ESG ratings on more than 15,000 firms around the world (Refinitiv, 2023). This is why this dataset is suitable for this kind of study, and we use Refinitiv Eikon to evaluate ESG ratings.

A universe was created in Eikon by selecting public companies with all monetary values in euros. The filters used were “Country of Exchange” including Norway, Sweden, Denmark, and Finland, and “Exchange Name” including Oslo Bors ASA, Nasdaq Stockholm, Nasdaq Copenhagen, and Nasdaq Helsinki. The Nordic countries are interesting since they have the highest ESG ranks in the world, according to the 2022 SDG Index ranking and score (Sachs et al., 2022). Additionally, there is a lack of research on ESG in this market alone, which our research will contribute to.

Financial firms are excluded from our study due to their typical high leverage, which may not carry the same implications as non-financial firms. In the latter, high leverage is often associated with financial distress (Fama & French, 1992). After setting up the universe in Eikon, the collected data was ESG scores, 1 monthly total return, Company market capitalization, and ESG score for each ESG pillar; Environmental, Social, and Governance. The GICS Industry name was also retrieved to make sure no financial institutions were included in the sample.

The dataset used in this thesis is reduced through a comprehensive cleaning process, mostly done manually. As a result, there may be some minor errors that could have a small impact on the empirical results. The collected data from Refinitiv Eikon is transformed in Excel into five different datasets including each country individually, and one combining all four. Continuing in our analysis the Nordic countries are referred to as the Full sample. Some researchers have experienced issues with the data using Refinitiv, including errors in the return data. To ensure the accuracy of our data and findings, the cleaning process was

performed before dividing each observation into portfolios. We manually screened and removed all observations that lacked a stock return or market capitalization. After this process, 698 companies remained in our final dataset.

The sample may have excluded companies that have gone bankrupt or are delisted before the end of the sample period. By excluding these companies, the sample may not be representative of the full population of companies during our whole time period. Thus, the possibility of survivorship bias. This might result in a biased analysis that overestimates the performance of the surviving companies, as the worst ESG performers may have been excluded. We acknowledge this limitation and its potential impact on our results.

3.2 Data

To address our research questions and test our hypothesis, the observations were sorted into six portfolios based on the varying monthly ESG score and matched with the monthly stock return of the respective companies. Portfolio 0 consists of companies' ESG score of 0, Portfolio 1 with ESG scores of 0-20, Portfolio 2 from 20-40, Portfolio 3 from 40-60, Portfolio 4 from 60-80, and Portfolio 5 from 80-100. This was done for the full sample and countries individually.

We value weight each stock based on its market capitalization plus equally weight the stock with the total number of stocks in each portfolio. This made it possible to calculate both value-weighted and equally-weight monthly returns for all six portfolios, by taking the weights multiplied by the stock return for each stock in the portfolio per month. We choose to use the value-weighted portfolio returns in our study because they usually account for more than half of the total number of stocks, even though microchip stocks only represent a small fraction of the overall market capitalization. This is because micro-cap stocks can have an impact on portfolio returns (Fama & French, 2008). We are only continuing with the Value-weighted portfolios result because they are more relevant for performance measures (Hoepner & Schopohl, 2018). This is also the most popular approach and is in line with previous research e.g., Teti et al., (2023), Luo (2022), and Ni & Sun (2023). Equally weighted portfolios are in the appendix.

To measure the difference in ESG performance on stocks return, we construct a long-short portfolio, which is a similar approach used by e.g., Kempf & Osthoff (2007), Hong &

Kacperczyk (2009), and Teti et al. (2023). The portfolio is created by taking a long position in Portfolio 5 (score 80-100) and a short position in Portfolio 1 (score 0-20). We interpret the alpha in the regression as the abnormal return of investing in a portfolio of high ESG-rated companies while shorting a portfolio with low ESG-rated companies.

After this process, we compare the stock risk in the different portfolios with primary risk measures standard deviation and portfolio beta and risk-adjusted performance measures Sharpe ratio and Treynor ratio. This is in line with other literature, such as Teti et al. (2023) and Hoskisson et al. (1993). Along with the common risk measures we account for the potentially extreme nature of ESG risks by using the Value-at-Risk (VaR) measure (e.g., Diemont et al., 2015; Jagannathan & Sammon, 2017; Capelli et al., 2023).

In addition to analyzing the comprehensive ESG score per firm as the primary explanatory variable in our main analysis, we also examine the ratings in each subcategory environmental, social, and governance yearly in further detail in a separate analysis. This approach allows us to identify which specific ESG pillars are driving the relationship with stock returns and provides a more nuanced understanding of the impact of ESG on stock performance.

To make the factor model regressions we collected data for the factors from Kenneth R. French data library (French, 2023), which includes the risk-free rate (RF), excess market return (Mkt), size factor (SMB), value factor (HML), momentum factor (MOM), profitability factor (RWM), and investment factor (CMA). The data were collected monthly for the European market and is the same sample period as our ESG data from Refinitiv Eikon.

Table 1. Descriptives ESG portfolios the Full sample.

Table 1 present descriptives of the ESG portfolios for the Full sample. It presents the mean, minimum, and maximum ESG score, average market capitalization, and mean stock return for seven portfolios sorted after ESG score (Portfolio: 5: score 80-100, 4: score 60-80, 3: score 40-60, 2: score 20-40, 1: score 0-20, 0: 0, and 5-1 is a long-short portfolio). The sample includes 96 monthly observations in the period January 2015 to December 2022.

	ESG score			Market Capitalization	Stock Return
Portfolio	Mean	Min	Max	Average	Mean
FULL SAMPLE					
5	82,0	80,4	84,9	73 634 411 091	1,23%
4	69,3	60,0	79,8	17 796 594 225	0,93%
3	51,1	40,1	59,8	4 759 855 574	1,11%
2	32,6	22,7	39,9	1 189 563 182	1,02%
1	12,6	1,6	19,2	740 314 912	3,18%
0	0,0	0,0	0,0	333 826 599	1,20%
5-1	69,4	1,6	84,9	72 894 096 179	-1,95%

Table 1 demonstrated the descriptives mean, minimum, maximum ESG score, average market capitalization, and mean stock return for each of the seven portfolios in the Full sample. A higher ESG score means stronger performance in ESG and the best ESG performance is portfolio 5. Comparing the market capitalization, it is increasing from the non-ESG portfolio up to the highest sorted ESG portfolio implying high ESG-scored firms have a larger market share. The average stock return is positive for all portfolios except the long-short portfolio 5-1, which have a negative mean stock return of -1,95%. The highest mean stock return of 3,18% is in ESG portfolio 1, followed by portfolio 5 mean stock return of 1,23%. Descriptivies of ESG portfolios for Sweden, Denmark, Norway, and Finland are in Table 1A in the appendices.

Table 2. Descriptives E, S, and G pillar portfolios the Full sample

Table 2 present descriptives of the Environmental, Social and Governance pillar score for the Full sample. It shows the mean, minimum, and maximum for the seven portfolios sorted after E, S, og G score (Portfolio: 5: score 80-100, 4: score 60-80, 3: score 40-60, 2: score 20-40, 1: score 0-20, 0: 0, and 5-1 is a long-short portfolio). The sample includes 8 yearly observations in the period December 2015 to December 2022.

	Environmental score			Social score			Governance score		
Portfolio	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
FULL SAMPLE									
5	83,5	80,1	88,3	84,8	80,1	94,7	85,7	80,2	92,0
4	70,8	60,1	79,8	69,7	60,2	79,9	70,0	60,1	80,0
3	50,9	40,0	60,0	50,6	40,1	59,9	48,8	40,1	59,9
2	30,9	20,2	39,9	32,1	23,5	39,0	30,4	20,6	38,8
1	11,6	1,9	19,8	10,1	2,6	19,8	13,7	1,2	18,9
0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
5-1	72,0	1,9	88,3	74,6	2,6	94,7	72,0	1,2	92,0

Table 2, sorting the Full sample's firms according to the ESG score's separate three pillars Environmental pillar, Social pillar, and Governance pillar. The seven portfolios for each pillar present mean, minimum, maximum environmental (E), social (S), and governance (G) scores. The Full sample has a mean G score in portfolios 5 and 1 higher than for E and S pillars, implying the firms in the highest and lowest rated E, S, and G firms do better in governance activities than in environmental and social activities. In portfolios 4 and 3, the mean E score is higher than the other pillars. Further, portfolio 2 has a higher mean score in the S pillar. Table 2A in the appendices presents the descriptives of the E, S, and G pillar portfolios for Sweden, Denmark, Norway, and Finland.

Table 3. Average ESG, E, S and G score.

Table 3 present number of firms observations for the Full Sample, Sweden, Denmark, Norway, and Finland. The table include average annual ESG, E, S and G score from 2015 to 2022 (excluding 0 scored companies), and average ESG, E, S, and G for the full period (2015-2022).

	Companies	2015	2016	2017	2018	2019	2020	2021	2022	Full period
ESG										
Full sample	698	56,2	56,1	57,1	56,8	52,9	51,1	49,3	51,6	52,4
Sweden	313	58,5	55,6	56,7	56,6	51,6	49,2	48,0	50,8	51,2
Denmark	93	53,6	55,4	56,6	55,0	54,0	53,1	52,3	54,3	54,0
Norway	174	50,9	51,7	52,3	52,0	48,3	48,1	47,6	50,4	49,4
Finland	118	58,8	61,5	63,0	64,6	63,8	61,0	53,3	54,0	58,1
Environmental pillar										
Full sample	698	56,7	57,9	56,9	49,4	47,6	43,8	46,3	46,4	48,6
Sweden	313	56,1	57,4	56,3	47,0	44,6	41,3	44,0	43,7	45,6
Denmark	93	53,1	52,7	49,6	46,1	45,8	44,0	48,0	49,8	48,0
Norway	174	48,9	50,4	52,0	45,5	45,7	44,0	46,8	46,9	46,6
Finland	118	67,7	70,7	70,7	68,1	63,7	51,2	51,9	51,8	58,0
Social pillar										
Full sample	698	61,2	62,5	64,1	58,6	55,4	51,1	53,6	53,6	52,5
Sweden	313	61,6	62,8	65,4	57,7	52,9	49,0	51,4	51,3	53,3
Denmark	93	59,4	62,0	61,3	61,5	58,0	55,1	56,8	57,1	58,2
Norway	174	57,7	58,2	58,1	51,9	51,6	49,6	54,2	54,1	53,2
Finland	118	65,2	66,2	69,7	69,4	68,2	57,0	57,7	58,0	61,5
Governance pillar										
Full sample	698	48,1	49,3	48,8	50,2	50,3	52,9	55,1	55,1	52,5
Sweden	313	48,0	49,7	48,4	49,8	50,2	54,3	57,4	57,3	53,9
Denmark	93	48,4	49,3	49,6	51,8	51,8	55,1	56,5	56,9	53,5
Norway	174	48,3	48,9	47,5	49,5	47,5	49,2	50,3	50,2	49,3
Finland	118	47,9	48,6	50,0	50,9	53,6	50,6	51,5	52,1	51,1

Table 3, present the number of listed firms included in the samples for the Full sample, Sweden, Denmark, Norway, and Finland. Stocks included in the table have a score over 0. Sweden is the country with the most listed stocks, and Denmark has the fewest. All our samples do worst in the environmental pillar. Finland has the highest average ESG, E, and S scores, and Sweden has the highest G score, in the full periods. The year 2022 is the only year Finland is not ahead in the average ESG score. Still, Finland is always leading per year in the E pillar and S pillar, even if the country's average is sinking. The governance pillar is the only pillar that the samples are improving their scores in, comparing 2015 to 2022 (e.g., the Full sample goes from 48,1 to 55,1).

3.3 Methodology

Four models are used in this thesis to describe stock returns: the CAPM (1), Fama-French three-factor (2), Carhart four-factor (3), and Fama-French five-factor (4). The variables in the regressions are calculated for the European market and obtained from the web page of Kenneth R. French (French, 2023).

3.3.1 CAPM

The Capital Asset Pricing Model (CAPM) was developed by in the 1960s by William Sharpe (1964). The CAPM's popularity arises from its powerful and intuitive predictions regarding risk measures and its relationship with expected returns (Fama & French, 2004). CAPM is founded on the notion that not all types of risk should impact asset valuations (Perold, 2004). Even after decades, the CAPM remains a popular tool in various applications, including estimating the cost of capital for firms and assessing the performance of professionally managed portfolios (Fama & French, 2004).

The formula for the capital asset pricing model (CAPM) is:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_{it} MktRF_t + e_{it} \quad (1)$$

Where R_{it} is the expected return on the portfolio i at time t, R_{ft} is the risk-free rate at time t, α_{it} is the intercept or abnormal return (i.e., alpha), β_{it} is the beta value of a portfolio i at time t, $MktRF_t$ is the market risk premium ($R_{mt} - R_{ft}$) at time t, and e_{it} is the error term for a portfolio i at time t. The market return is determined by the value-weighted return of a European portfolio, while the risk-free rate is based on the U.S. one-month T-bill rate (French, 2023).

3.3.2 Fama-French three-factor model

Fama & French (1992) established the Fama-French three-factor model as an extension of CAPM. Two company-specific risk factor was applied, SMB and HML. These two factors are utilized to adjust for a portfolio's exposure to size and value. HML represents "High minus Low", which is a portfolio that emulates a long position in high book-to-market stocks, and a

short position in low book-to-market stocks. Also known as value and growth stocks. The HML factor accounts for a portfolio's exposure to high-value firms by measuring a value premium. SML stands for "Small minus Big", which represents a portfolio emulating a long position in small-cap stocks and a short position in large-cap stocks. By quantifying a size premium, the SMB factor takes into consideration a portfolio's exposure to small-cap stocks. The formula for the Fama-French three-factor model is:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1 MktRF_t + \beta_2 SMB_t + \beta_3 HML_t + e_{it} \quad (2)$$

Where R_{it}, R_{ft}, $\alpha_{it,}$, $MktRF_t$, and e_{it} are the same factors as mentioned above. SMB represents the size premium at time t, which is determined by computing the average returns on three small stock portfolios for Europe and subtracting the average return on three large stock portfolios. HML represents the value premium at time t, which is determined by computing the average returns on two value portfolios for Europe and subtracting the average returns on two growth portfolios (French, 2023). β_1, β_2, and β_3 are factor coefficients.

3.3.3 Carhart's four-factor model

In 1997 Mark Carhart (Carhart, 1997) decided to extend the Fama-French three-factor model based on a "cross-sectional momentum" factor exposed by Jegadeesh & Titman (1993). The result was the popular Carhart four-factor model that builds on a momentum effect. This effect occurs when the result of a stock is positively correlated with the return from previous periods. Jegadeesh & Titman (1993) demonstrated the existence of this correlation by showing significant positive returns over 3- to 12-month holding periods. This was achieved by buying stocks that have performed well in the past and selling stocks that have performed poorly. The MOM factor in the model represents the difference in returns between the two stocks.

The formula for the Carhart Four-Factor model is:

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

Where R_{it}, R_{ft}, $\alpha_{it,}$, $MktRF_t$, SMB_t,$HML_{t,}$ and e_{it} are the same factors as mentioned above. MOM is the risk premium related to the momentum factor at time t, calculated as the average return for the two high prior return portfolios for Europe minus the average return

on the two low prior return portfolios (French, 2023). β_1, β_2, β_3, and β_4 are factor coefficients.

3.3.4 Fama-French five-factor model

In their 2015 paper, "A Five-Factor Asset Pricing Model" Fama & French introduced an extension to their previous three-factor model (Fama & French, 2015). The new model includes two additional factors: profitability (RMW) and investment (CMA). They found that the five-factor model provides a better fit to asset pricing data than the three-factor model and that the new factors are significant and robust across different regions and time periods. RMW is an acronym for "Robust Minus Weak". It represents the difference in returns between a diversified portfolio of firms with robust profitability and one with weak profitability. CMA stands for "Conservative Minus Aggressive". It measures the difference in returns between a diversified portfolio of low-investment stocks and one of high-investment stocks.

The formula for the Fama-French five-factor model is:

$$R_{it} - R_{ft} = \alpha_{it} + \beta_1 MktRF_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t + e_{it} \quad (4)$$

Where Rit, Rft, $\alpha_{it,}$, $MktRF_{t,}$ HMLt, and e_{it} are the same factors as mentioned above. SMB still represents the size premium at time t but is now determined by computing the average returns on nine small stock portfolios and subtracting the average return on nine large stock portfolios. RMW is calculated as the difference between the average return of two portfolios consisting of firms with robust operating profitability and the average return of two portfolios consisting of firms with weak operating profitability for Europe. CMA represents the difference between the average return of two conservative investment portfolios and the average return of two aggressive investment portfolios. β_1, β_2, β_3, β_4 and β_5 are factor coefficients.

3.3.5 Standard deviation, Sharpe ratio, VaR, Portfolio beta and Treynor ratio

Hoepner & Schopohl (2016), the standard deviation is a typical risk measure used in the finance literature and analyses the total risk of a stock or portfolio. The formula for portfolio standard deviation with several assets is as follows:

$$SD_p = \sqrt{((1/(T-1)\ \Sigma\ (r_{xp,t} - average\ r_{xp}))}$$

where SD_p is the standard deviation of daily excess returns of portfolio p over the recent month, $r_{xp,t}$ is the daily return in excess of the risk-free rate of portfolio p on day t, r_{xp} is the average daily excess return of portfolio p over the recent month, and T is equal to the number of trading days of the recent month.

The Sharpe ratio (Sharpe, 1966) is a reward-to-risk measure that calculates the ratio of the average return to the standard deviation of the return. This ratio was estimated according to:

$$SHARPE_i = (Ri - Rf)/SD_i$$

Where Ri is the return of a stock, Rf is the risk-free rate and SD_i is the standard deviation of the portfolio of stocks' excess return.

Portfolio beta is a common measure to calculate systematic risk through the weighted average of stock betas in a portfolio (Teti et al., 2023). The formula is:

$$\beta_p = \Sigma\ (wi * \beta_i)$$

Where w_i is the weight of a stock i in the portfolio, and β_I is the stock's beta.

Portfolio theory suggests diversifying unique risk away in a large index, leaving only undiversifiable risk to be priced by the market (Collison et al., 2018). As a result, the Treynor Ratio (Treynor, 1965) was also estimated:

$$TREYNOR_i = (Ri - Rf)b_i$$

Where Ri is the return of a stock, Rf is the risk-free rate and b_i is the return relative to the market portfolio.

Along with the two common risk measures we account for the potentially extreme nature of ESG risks by using the Value-at-Risk (VaR) measure (Diemont et al., 2015; Jagannathan &

Sammon, 2017; Bannier et al., 2022). The VaR measures the predicted maximum loss over a given horizon within a specific confidence interval (Jorion, 2002).

$$VAR_i = v_m \left(v_i / v_{(i-1)} \right)$$

Where m is the number of days from which historical data is collected and v_i is the number of variables on a given day "i".

4. Results

The objective of this study is to examine ESG scores' relationship to the risk and return of stocks in Nordic countries. To achieve this goal, three hypotheses are tested. First, it is examined whether a high ESG score is related to higher stock return. Second, investigated whether firms with high ESG scores are related to lower risk. Third, explored whether ratings in each subcategory Environmental, Social, and Governance are positively related to stock return.

We applied a long-short portfolio analysis to examine whether firms with high ESG scores performed differently than firms with low ESG scores. We constructed a portfolio of long positions in high ESG firms and short positions in low ESG firms and tracked the performance of this portfolio monthly over a period of 8 years. In addition, we run multiple regression analyses using four different models: Capital Asset Pricing Model (CAPM) (Sharpe, 1964), the Fama-French three-factor model (Fama & French, 1992), Carhart's four-factor model (Carhart, 1997), and the Fama-French five-factor model (Fama & French, 2015). The same procedure is carried out in each subcategory Environmental, Social, and Governance. In this chapter, we explore the results of these analyses and study what they mean for our research question on how ESG scores are related to the risk and return of stocks in the Nordic countries.

Table 4. Factor models results Full sample.

Table 4 presents the results of the factor model regressions of CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) of the Full sample (Denmark, Finland, Norway, and Sweden). The table presents the factors: Alpha, MktRF, SMB, HML, MOM, RWA, and CMA. The data is from the countries' stock markets, and stocks are divided into seven value-weighted portfolios sorted after ESG score (Portfolio ESG 5: 80-100, Portfolio ESG 4: 60-80, Portfolio ESG 3: 40-60, Portfolio ESG 2: 20-40, Portfolio ESG 1: 0-20, Portfolio ESG 0: 0, and Portfolio 5-1 is a long-short portfolio). R-squared and Adjusted R-squared for each portfolio are presented. The sample period is from January 2015 to December 2022. Parentheses show Standard Error. Significance level: ***(1%), **(5%), and *(10%).

FULL SAMPLE								
Portfolio		ESG 5	ESG 4	ESG 3	ESG 2	ESG 1	ESG 0	ESG 5-1
CAPM	Alpha	0,0036	0,0038	0,0139**	0,0166**	0,0067	0,0256***	-0,0038
		(0,0053)	(0,0044)	(0,0067)	(0,0065)	(0,0084)	(0,0076)	(0,008)
	MktRF	0,5043***	0,5803***	0,5031***	0,4962***	0,7948***	0,5759***	-0,2902*
		(0,1069)	(0,0899)	(0,1362)	(0,1323)	(0,1704)	(0,1548)	(0,1632)
	R2	0,19	0,31	0,13	0,13	0,19	0,13	0,03
	Adj. R2	0,18	0,30	0,12	0,12	0,18	0,12	0,02
FF3F	Alpha	0,0036	0,0033	0,0126*	0,0146**	0,0043	0,0234***	-0,0015
		(0,0053)	(0,0044)	(0,0065)	(0,006)	(0,0078)	(0,007)	(0,0075)
	MktRF	0,5139***	0,5702***	0,4754***	0,4626***	0,7898***	0,5243***	-0,2754*
		(0,108)	(0,0903)	(0,1326)	(0,1222)	(0,1587)	(0,1419)	(0,1525)
	SMB	0,0914	0,2799	0,8562**	1,3385***	1,8729***	1,3557***	-1,769***
		(0,3064)	(0,2562)	(0,3761)	(0,3466)	(0,4501)	(0,4025)	(0,4325)
	HML	0,1696	-0,1054	-0,2714	-0,2701	0,2821	-0,5525**	-0,1103
		(0,1696)	(0,1418)	(0,2083)	(0,1919)	(0,2492)	(0,2229)	(0,2395)
	R2	0,20	0,32	0,20	0,28	0,32	0,29	0,18
	Adj. R2	0,17	0,30	0,17	0,26	0,30	0,27	0,16
C4	Alpha	0,0082	0,0056	0,0189***	0,0216***	0,0101	0,0244***	-0,0027
		(0,0055)	(0,0047)	(0,0067)	(0,006)	(0,0081)	(0,0074)	(0,008)
	MktRF	0,3655***	0,499***	0,2751*	0,2364*	0,6027***	0,4924***	-0,2369
		(0,1208)	(0,1033)	(0,1472)	(0,1328)	(0,179)	(0,1638)	(0,176)
	SMB	0,0803	0,2745	0,8411**	1,3215***	1,8589***	1,3533***	-1,766***
		(0,2981)	(0,2549)	(0,3633)	(0,3277)	(0,4419)	(0,4044)	(0,4345)
	HML	-0,1591	-0,2631	-0,7153***	-0,7712***	-0,1323	-0,623**	-0,0247
		(0,2113)	(0,1806)	(0,2575)	(0,2322)	(0,3132)	(0,2866)	(0,3079)
	MOM	-0,5158**	-0,2475	-0,697***	-0,7864***	-0,6502**	-0,1107	0,1343
		(0,207)	(0,177)	(0,2523)	(0,2275)	(0,3068)	(0,2808)	(0,3017)
	R2	0,25	0,34	0,26	0,36	0,35	0,29	0,18
	Adj. R2	0,22	0,31	0,23	0,34	0,32	0,26	0,15
N observations		96	96	96	96	96	96	96

Table 4. Continued. Factor models result Full Sample.

FULL SAMPLE								
Portfolio		ESG 5	ESG 4	ESG 3	ESG 2	ESG 1	ESG 0	ESG 5-1
FF5F	Alpha	-0,0015	-0,0003	0,0052	0,0101*	-0,0003	0,0185***	-0,002
		(0,005)	(0,0043)	(0,0054)	(0,0054)	(0,0074)	(0,0068)	(0,0076)
	MktRF	0,4081***	0,502***	0,1933	0,215*	0,5146***	0,3528**	-0,1051
		(0,1107)	(0,0955)	(0,1185)	(0,1196)	(0,1636)	(0,1501)	(0,168)
	SMB	-0,1231	0,1389	0,0694	0,6094*	1,028**	0,8726*	-1,1341**
		(0,3335)	(0,2877)	(0,3569)	(0,3603)	(0,4927)	(0,4519)	(0,5059)
	HML	1,4039***	0,731**	1,9599***	1,2971***	1,9182***	0,7829*	-0,5115
		(0,33)	(0,2848)	(0,3532)	(0,3565)	(0,4876)	(0,4473)	(0,5007)
	RMW	1,8025***	1,2892***	2,44***	1,3137**	1,2675*	1,544**	0,548
		(0,4853)	(0,4187)	(0,5194)	(0,5243)	(0,717)	(0,6577)	(0,7363)
	CMA	-1,2154**	-0,7862	-3,246***	-2,861***	-3,189***	-1,997**	1,9845**
		(0,5625)	(0,4854)	(0,6021)	(0,6077)	(0,8311)	(0,7624)	(0,8535)
	R2	0,34	0,41	0,50	0,46	0,43	0,38	0,22
	Adj. R2	0,31	0,37	0,47	0,43	0,40	0,34	0,18
N observations		96	96	96	96	96	96	96

4.1 ESG and return

4.1.1 ESG and return Full sample

In Table 4, the results for the Full sample display positive alphas for all portfolios in the factor models, except for the Fama-French five-factor model. However, the statistical significance of alpha is limited to Portfolios ESG3, ESG2, and ESG0 in all factor models apart from the Fama-French five-factor model, where it is significant only for portfolios ESG2 and ESG0. The highest alphas are observed in the portfolio consisting of companies with no ESG score, meaning this portfolio yields the highest excess return. In contrast, the monthly abnormal return from the long-short portfolio is negative in all factor models and suggests that the difference in ESG performance is not able to explain the observed variation in stock return in the market. However, the portfolio is not statistically significant. Our findings are in line with the negative alphas in the long-short portfolio in e.g., Ni & Sun (2023), and Hsu et al. (2022), showing low ESG stocks may have higher returns because of social pressure Hong & Kacperczyk (2009). Further, our findings contradict the results of In et al. (2017) and Teti et al. (2023). We also do not find that low and high ESG firms get compelling returns as Bauer et al. (2005) and Friede et al. (2015).

In the factor models, there are positive and statistically significant MktRF coefficients for all portfolios, except for the long-short portfolio and the Fama-French five-factor model ESG3. This result suggests that the market excess return is a significant contributor to the variation in the portfolio excess return. However, for the long-short portfolio, the market risk premium is negative across all models but is not statistically significant in the Fama-French five-factor model. The market risk exposure is highest in the ESG1 portfolio across all models, suggesting higher market risk exposure for low ESG scores than for higher ESG scores. Contradicting the findings of Hsu et al. (2016), where no portfolio showed more market risk exposure no matter the emission intensity of the portfolio.

The SMB factor coefficients for the Full sample are positive for all portfolios and models, except for portfolio ESG5 in the Fama-French five-factor model, and the long-short portfolio. The size premium is highest for the lowest ESG portfolio. Further, the coefficients are statistically significant in portfolio ESG3, ESG2, ESG1, and ESG0 in all models, except the Fama-French five-factor model ESG3. This result implies that companies included in these portfolios are tilted towards stocks with smaller market capitalization.

The long-short portfolio holds a negative and statistically significant SMB risk factor. This may suggest that the long-short portfolio is biased towards companies with a higher market capitalization. The top ESG portfolios seem to have a higher representation of companies with a larger market capitalization. Findings are in line with previous research (Teti et al. 2023) and can be inferred that larger companies have more resources to enhance their ESG standings, rather than the other way around. This observation may also imply that the significant alpha in this long-short portfolio is not simply a result of the size differences of the companies involved, but rather reflects a genuinely ESG-specific effect. The same indication Bannier et al. (2022) concluded.

All HML coefficients in the Fama-French five-factor model are statistically significant and positive for all ESG portfolios in the Full sample. This suggests that there is a tilt towards value stocks in all portfolios. Portfolios ESG3 and ESG1 have the highest coefficients. HML has no clear tendency for the rest of the models with both positive and negative coefficients that are significant and insignificant. The long-short portfolio has a negative HML coefficient but is not significant.

The MOM factor is negative for all portfolios except the long-short portfolio. Yet, only significant for portfolios ESG5, ESG3, ESG2, and ESG1. There is no clear tendency for the MOM factor but indicates that the statistically significant portfolios have a bias towards investing in companies with weak recent performance. When adding the risk factor SMB and HML to the CAPM model we see that the alphas decrease in all portfolios, which means these two factors explain return. However, after adding the momentum factor the alpha increases for all portfolios, implying MOM cannot explain portfolio return.

The RMW factor shows positive and significant coefficients which implies that companies with strong profitability tend to outperform in the future. Portfolio ESG3 has the strongest RMW factor. The long-short portfolio is positive yet not statistically significant, which is not in line with Hsu et al. (2022).

Lastly, we observe negative and significant CMA coefficients, except for portfolio ESG4. This indicates that most of the stocks within these portfolios are aggressive stocks. The positive and significant coefficient in the long-short portfolio implies that the performance of this portfolio is positively impacted by the aggressive investment strategies of the companies. The suggestion that low-investment companies have higher returns could be due to that companies with lower ESG scores have more growth opportunities, which require more capital to fund. Companies with more aggressive investment styles may be more likely to invest in these growth opportunities, which could lead to higher returns over the long term. This could also lead to these companies not incorporating ESG as their main priority and therefore not being the main driver of the portfolio return. In addition, the result is in line with Ni & Sun (2023), the Full sample's alphas decrease when adding RWA and CMA, which means those risk factors explain return in the portfolios.

An overall trend for the Full sample indicates that investing in companies with a high ESG score does not yield any significant abnormal excess return over market. However, investing in ESG portfolios with mid-to-low ratings results in a significantly positive alpha. While detecting return over market in the Full sample, none of the long-short portfolios are statistically significant. Therefore, the result cannot confirm hypothesis 1, that *a high ESG score is related to higher stock returns*. Our findings are in line with previous research (Hong & Kacperczyk, 2009; Bolton & Kacperczyk, 2021; Hsu et al., 2022; Luo, 2022; and Ni & Sun, 2023), and demonstrate the opposite of findings from Kempf & Osthoff (2007), Eccles et al.

(2014), Gregory et al. (2014), Edmans (2011), Nagy et al. (2016), In et al. (2017), Fiskerstrand et al. (2020), and Maiti (2021).

The result implies there is an ESG norm in the Nordic countries, as reported by Banner et al. (2022) for European firms. As noted by Pástor et al. (2021), investors with high ESG preference tend to experience a negative relationship with returns. Our results reveal significant alphas in the Fama-French five-factor model for portfolio ESG2 and ESG0 for the Nordic countries. Additionally, the alpha in the long-short portfolio is negative, although not significant. This implies that lower ESG and no-ESG scores give higher returns, as investors require higher compensation for the risk that unsustainable stocks pose (e.g., Hong & Kacperczyk, 2009, and Hsu et al., 2022). Although our study finds fluctuating alphas for the Nordic countries, our results are consistent with those of Teti et al. (2023), Gregory et al. (2014), and Friede et al. (2015) that risk factors and alpha in ESG portfolios are inconclusive and "noisy". Table 4A in the appendix presents the Full sample with equally-weighted ESG portfolios.

Table 5. Factor models alpha Sweden.

Table 5 presents the results of the alphas from the factor model regressions of CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Sweden. The data is from Sweden's stock market, and stocks are divided into seven value-weighted portfolios sorted after ESG score (Portfolio ESG 5: 80-100, Portfolio ESG 4: 60-80, Portfolio ESG 3: 40-60, Portfolio ESG 2: 20-40, Portfolio ESG 1: 0-20, Portfolio ESG 0: 0, and Portfolio 5-1 is a long-short portfolio). R-squared and Adjusted R-squared for each portfolio are presented. The sample period is from January 2015 to December 2022. Parentheses show Standard Error. Significance level: ***(1%), **(5%), and *(10%).

SWEDEN								
Portfolio		ESG 5	ESG 4	ESG 3	ESG 2	ESG 1	ESG 0	ESG 5-1
CAPM	Alpha	0,0017	0,0043	0,0207***	0,0146**	0,0070	0,0257***	-0,0060
		(0,0051)	(0,0046)	(0,0074)	(0,00698)	(0,00996)	(0,0085)	(0,0098)
FF3F	Alpha	0,0017	0,0039	0,0196***	0,0127*	0,0032	0,0234***	-0,0022
		(0,0052)	(0,0046)	(0,0073)	(0,0064)	(0,0087)	(0,0077)	(0,0086)
C4	Alpha	0,0064	0,0091*	0,0248***	0,0204***	0,0059	0,0265***	-0,0002
		(0,0054)	(0,0047)	(0,0076)	(0,0064)	(0,0093)	(0,0081)	(0,0092)
FF5F	Alpha	-0,0015	-0,0007	0,0121*	0,0062	0,0017	0,019**	-0,0040
		(0,0051)	(0,0043)	(0,0062)	(0,0057)	(0,0088)	(0,0075)	(0,0089)
N observations		96	96	96	96	96	96	96

4.1.2 ESG and return individual countries

The Full sample serves as the benchmark in this further analysis and is being compared to the individual countries' alphas as demonstrated in Tables 5, 6, 7, and 8. Table 5 for Sweden reveals similar significant alphas in the same portfolios as the Full sample. Except now, portfolio ESG4 is also significant in Carhart's four-factor model. Another difference is that portfolio ESG3 is statistically significant, but not portfolio ESG2 in the Fama-French five-factor model. This suggests that the portfolios may have unique risk characteristics that are specific to the Swedish market. The long-short portfolio is still negative and not statistically significant, similar to the results for the full sample. This is in line previous research (e.g., Ni & Sun, 2023, and Hsu et al., 2022), and contradicts the results of In et al. (2017) and Teti et al. (2023). Table 5A in the appendix presents the rest of the models results.

Table 6. Factor models alpha Denmark.

Table 6 presents the results of the alphas from the factor model regressions of CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Denmark. The data is from Denmark's stock market, and stocks are divided into seven value-weighted portfolios sorted after ESG score (Portfolio ESG 5: 80-100, Portfolio ESG 4: 60-80, Portfolio ESG 3: 40-60, Portfolio ESG 2: 20-40, Portfolio ESG 1: 0-20, Portfolio ESG 0: 0, and Portfolio 5-1 is a long-short portfolio). R-squared and Adjusted R-squared for each portfolio are presented. The sample period is from January 2015 to December 2022. Parentheses show Standard Error. Significance level: ***(1%), **(5%), and *(10%).

DENMARK								
Portfolio		ESG 5	ESG 4	ESG 3	ESG 2	ESG 1	ESG 0	ESG 5-1
CAPM	Alpha	0,0061	0,0093*	0,0063	0,0175**	0,0099	0,0096**	-0,0045
		(0,0046)	(0,0047)	(0,0056)	(0,007)	(0,007)	(0,0044)	(0,0071)
FF3F	Alpha	0,0058	0,0088*	0,0048	0,016**	0,0079	0,0088**	-0,0028
		(0,0045)	(0,0046)	(0,0053)	(0,0068)	(0,0065)	(0,0044)	(0,0069)
C4	Alpha	0,0067	0,0123**	0,0092*	0,0184**	0,0125*	0,0112**	-0,0066
		(0,0048)	(0,0048)	(0,0055)	(0,0073)	(0,0068)	(0,0046)	(0,0073)
FF5F	Alpha	0,0026	0,0058	0,0012	0,0126*	0,0026	0,0074	-0,0008
		(0,0045)	(0,0046)	(0,0051)	(0,0065)	(0,0062)	(0,0045)	(0,0069)
N observations		96	96	96	96	96	96	96

Table 6 for Denmark exhibit only one statistically significant alpha in the Fama-French five-factor model, portfolio ESG2. Equivalent to the full sample, positive and significant alphas are observed in portfolio ESG2 and ESG0 in the other factor models. The empirical results indicate a shift in positive alphas from portfolio ESG3 to portfolio ESG4 in both CAPM and Fama-French three-factor model, relative to the full sample. As for Carhart's four-factor

model, every portfolio except ESG5 is now statistically significant. The long-short portfolio is still negative and insignificant, contradicting results from Teti et al. (2023). Further, we have as uncompelling findings as in Fiskerstrand et al. (2020) where all alphas are negative and insignificant for the long-short portfolio. Which also are similar to the results in Pástor et al. (2021), Table 6A in the appendix presents the rest of the models results.

Table 7. Factor models alpha Norway.

Table 7 presents the results of the alphas from the factor model regressions of CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Norway. The data is from Norway's stock market, and stocks are divided into seven value-weighted portfolios sorted after ESG score (Portfolio ESG 5: 80-100, Portfolio ESG 4: 60-80, Portfolio ESG 3: 40-60, Portfolio ESG 2: 20-40, Portfolio ESG 1: 0-20, Portfolio ESG 0: 0, and Portfolio 5-1 is a long-short portfolio). R-squared and Adjusted R-squared for each portfolio are presented. The sample period is from January 2015 to December 2022. Parentheses show Standard Error. Significance level: ***(1%), **(5%), and *(10%).

NORWAY								
Portfolio		ESG 5	ESG 4	ESG 3	ESG 2	ESG 1	ESG 0	ESG 5-1
CAPM	Alpha	0,0098	0,0075	0,0061	0,0148*	0,0068	0,0245***	0,0023
		(0,006)	(0,0046)	(0,0063)	(0,0084)	(0,0088)	(0,0068)	(0,009)
FF3F	Alpha	0,0098*	0,0073	0,0048	0,0135	0,0051	0,0228***	0,0039
		(0,0059)	(0,0045)	(0,0061)	(0,0081)	(0,0082)	(0,0064)	(0,0089)
C4	Alpha	0,0138**	0,0073	0,0087	0,0185**	0,0094	0,0242***	0,0036
		(0,0062)	(0,0048)	(0,0064)	(0,0086)	(0,0087)	(0,0068)	(0,0095)
FF5F	Alpha	0,0083	0,0051	0,0009	0,0116	-0,0006	0,0168***	0,0082
		(0,0061)	(0,0046)	(0,0058)	(0,0083)	(0,0082)	(0,0061)	(0,009)
N observations		96	96	96	96	96	96	96

The results for Norway (Table 7) show fewer significant alphas in the factor models. Alpha in portfolio ESG0 is statistically significant for all four models. Similar to the full sample, portfolio ESG2 is significant, but only for CAPM and Carhart's four-factor model. The noteworthy difference observed is statistically significant alpha in the Fama-French three-factor model and Carhart's four-factor model for portfolio ESG5. This implies for the first time that companies with a high ESG score yield excess return compared to the market. Coefficients for portfolios ESG2 and ESG0 are still stronger. The long-short portfolio is now positive which indicates that a strong ESG proposition has a positive effect on risk-adjusted excess return. However, the alpha is not statistically significant. Our finding for Norway is opposite to Fiskerstrand et al. (2020), but similar to Kempf & Osthoff (2007). Table 7A in appendix presents the rest of the factor models factors for Norway's value-weighted ESG portfolios.

Table 8. Factor models alpha Finland.

Table 8 presents the results of the alphas from the factor model regressions of CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Finland. The data is from Finland's stock market, and stocks are divided into seven value-weighted portfolios sorted after ESG score (Portfolio ESG 5: 80-100, Portfolio ESG 4: 60-80, Portfolio ESG 3: 40-60, Portfolio ESG 2: 20-40, Portfolio ESG 1: 0-20, Portfolio ESG 0: 0, and Portfolio 5-1 is a long-short portfolio). R-squared and Adjusted R-squared for each portfolio are presented. The sample period is from January 2015 to December 2022. Parentheses show Standard Error. Significance level: ***(1%), **(5%), and *(10%).

FINLAND								
Portfolio		ESG 5	ESG 4	ESG 3	ESG 2	ESG 1	ESG 0	ESG 5-1
CAPM	Alpha	-0,0001	0,0091*	0,0042	0,0033	-0,0025	0,0113**	0,0016
		(0,007)	(0,0052)	(0,0041)	(0,0071)	(0,0075)	(0,0052)	(0,0089)
FF3F	Alpha	-0,0005	0,0084	0,0042	0,0018	-0,0048	0,0096**	0,0036
		(0,0071)	(0,0052)	(0,004)	(0,007)	(0,0069)	(0,0048)	(0,0085)
C4	Alpha	0,0039	0,0105*	0,0056	0,0047	0,0002	0,0133***	0,0030
		(0,0074)	(0,0055)	(0,0042)	(0,0074)	(0,0072)	(0,005)	(0,0091)
FF5F	Alpha	-0,0064	0,0041	0,0002	-0,004	-0,0101	0,0049	0,0030
		(0,0069)	(0,005)	(0,0038)	(0,0069)	(0,0068)	(0,0045)	(0,0089)
N observations		96	96	96	96	96	96	96

Table 8 presents results from Finland, which appear the most different from the Full sample. Alpha is statistically significant for portfolio ESG0 in CAPM, the Fama-French three-factor model, and Carhart's. Portfolio ESG4 shows significant alphas in CAPM and Carhart's four-factor model. We observe no significant alphas for none of the portfolios in the Fama-French five-factor model. This may suggest that the ESG scores are not providing any additional explanatory power beyond what is already captured by the Fama-French factors in Finland. Our finding is in line with Gregory et al. (2014), green stocks have positive and insignificant alphas in the long-short portfolio. Table 8A presents the rest of the factor models factors for Finland's value-weighted ESG portfolios.

The purpose of the analysis is to disclose whether a high ESG score is related to higher stock returns. Similar to the full sample, countries individually present positive and statistically significant alphas for mid to low-ESG portfolios in the Fama-French five-factor model, except for Finland. However, positive and significant alphas are observed for mid to high portfolios using CAPM, the Fama-French three-factor model, and Carhart's four-factor model. This suggests an inconclusive answer regarding returns relative to the market for high and low ESG scores, which is in line with the results of (Teti et al., 2023).

While positive alphas are detected for return over market in the Full sample and countries individually, none of the long-short portfolios are statistically significant. Therefore, the result cannot confirm hypothesis 1, that *a high ESG score is related to higher stock returns*. Findings are similar to previous research of Hong & Kacperczyk (2009), Bolton & Kacperczyk (2021) and Luo (2022), which demonstrate that low ESG stocks earn higher expected returns when compared to high ESG stocks.

Although the study did not confirm hypothesis 1, statistically significant risk factors were observed in the long-short portfolio. Finland and Sweden exhibit a negative and significant SMB factor, consistent with the Full sample. Norway and Denmark, on the other hand, display a negative significant HML factor and a positive significant CMA factor, while the Full sample only contains a positive CMA factor. (Alphas and factor models sorted with equally weighted ESG portfolios in the appendices Table 5B and 5C for Sweden, 6B and 6C for Denmark, 7B and 7C for Norway, and, 8B and 8C for Finland).

4.2 ESG and risk

This section analyzes risk measures and risk-adjusted measures of the total ESG score portfolios to answer the hypothesis; *Firms with high ESG scores are related to lower risk*. The analysis includes the Full Sample, and Sweden, Denmark, Norway, and Finland separately. The assumption is that the portfolios with higher ESG scores will have lower total risk, lower Value-at-Risk showing fewer losses, and lower systematic risk than the lower ESG-scored portfolios. Attending the analysis is also the two risk-adjusted measures Sharpe ratio and Treynor ratio.

Table 9. Risk measures result Full Sample.

Table 9 reports the risk measures result for the Full sample (Denmark, Finland, Norway, and Sweden). The data is from all countries stock markets, and the stocks are divided into seven value-weighted portfolios sorted after ESG score (Portfolio ESG 5: 80-100, Portfolio ESG 4: 60-80, Portfolio ESG 3: 40-60, Portfolio ESG 2: 20-40, Portfolio ESG 1: 0-20, Portfolio ESG 0: 0, and Portfolio 5-1 is a long-short portfolio). The table present each portfolios Mean excess return (monthly), Volatility, Sharpe ratio, Value at Risk 1%, Value at Risk 5%, Portfolio Beta and Treynor ratio. The sample period is monthly from January 2015 to December 2022.

FULL SAMPLE							
Portfolio	ESG 5	ESG 4	ESG 3	ESG 2	ESG 1	ESG 0	ESG 5-1
Mean excess return	0,85%	0,94%	1,88%	2,14%	1,45%	3,12%	-0,67%
Standard deviation	5,59%	5,08%	6,86%	6,67%	8,90%	7,80%	7,81%
Sharpe ratio	0,12	0,16	0,24	0,29	0,12	0,36	-0,13
VaR 1%	-0,12	-0,11	-0,14	-0,13	-0,19	-0,15	-0,19
VaR 5%	-0,08	-0,07	-0,09	-0,09	-0,13	-0,10	-0,14
Portfolio Beta	0,50***	0,58***	0,50***	0,49***	0,79***	0,57***	-0,29*
(Standard Error)	(0,107)	(0,09)	(0,136)	(0,132)	(0,17)	(0,155)	(0,163)
Treynor ratio	0,014	0,014	0,033	0,039	0,014	0,050	0,034

4.2.1 ESG and risk Full sample

The result for the Full sample shows the high ESG scores portfolio, ESG5, has the lowest mean returns of 0,85% and one of the lowest Standard deviations of 5,59%. Opposite to the lowest ESG portfolio, ESG1, with higher mean returns of 1,45% and with the highest Standard deviation of all portfolios of 8,90%. However, even both the highest and the lowest ESG score portfolios produce the same Sharpe ratio of 0,12, which means they get the same return per risk taken. Further, the portfolio with no ESG scores (ESG0) outperforms the others with a Standard deviation of 7,80% and a Sharpe ratio of 0,36, receiving highest returns per total risk taken among all portfolios. The Sharpe ratio in the long-short portfolio ESG5-1 is negative and indicates that the investor will not be compensated for the risk taken. This can be due to that the long and short positions cancel each other out, and the result is a loss of return. From the risk measures, you can see that the long-short portfolio has a negative Sharpe ratio and move against the market with a negative and significant beta. The result from the measure of total risk show investors will have lower uncertainty in high ESG portfolios. Nevertheless, they will therefore also not get

higher returns. This result contradicts Teti et al. (2023) finding about the European market implying that country-specific factors in the Nordic countries affect results to be different than for Europe.

The Full sample's Value at Risk show negative results for all portfolios, indicating that there are possibilities for no downside risk and positive returns beyond expectations. However, the portfolio with the highest ESG score has VaR1% and VaR5% of -0,12 and -0,08 respectively. These results are less negative than for the lowest ESG score portfolio, which has a more negative VaR1% and VaR5% of -0,19 and -0,13. The most negative VaR1% and VaR5% in portfolio ESG1, show low ESG score gives the highest potential gains in extreme market conditions. Further, the long-short portfolio has almost the same negative Vale-at-Risk as ESG1, indicating taking a long position in a high ESG portfolio, and a short position in a low ESG portfolio will gain returns beyond expectation in extreme market conditions. Summing up the results of downside risk, none of the portfolios have a great chance of experiencing negative returns in extreme market conditions, however, the higher the ESG score portfolios have a possible lower gain in extreme market conditions than the lower ESG score portfolios. This result is the opposite of Capelli et al. (2023), where ESG experiences less loss, while our results experience fewer gains beyond expectations.

The Portfolio beta is positive for all portfolios except the long-short portfolio, and all are statistically significant. The portfolio beta is 0,50 for ESG5 showing a lower beta than for ESG1 which has 0,79. The lowest Portfolio Beta of 0,49 is in the ESG2 portfolio. ESG4 has 0,58 and ESG0 has a 0,57 portfolio beta. Overall, this result demonstrates that the higher ESG score portfolios do not move as much with the market as the lower ESG score portfolio. All Treynor ratios are positive which means investments generate returns higher than the risk-free rate for all portfolios. However, the Treynor ratio is the same for both ESG5 and ESG1 (0,014), suggesting the portfolios get the same excess return per systematic risk taken. The portfolio that moves the least with the market is the long-short portfolio with a negative portfolio beta of -0,29. The Treynor ratio in the long-short portfolio does not provide an answer if the long or short portfolio is more exposed to systematic risk, only that the portfolio has not been compensated for the systematic risk it has taken on. The highest Treynor ratio is in the no ESG portfolio (ESG0). The results from the Portfolio beta, if you only analyze the results from ESG5 and ESG1, imply that high ESG gives lower systematic

risk, contradicting Teti et al. (2023). Yet, the overall results of systematic risk for the Full sample show mixed results.

Analyzing the ESG portfolios the summary of the Full sample's different risk measures is, the highest ESG score portfolios have lower total risk when comparing ESG5 and ESG4 with ESG1 and ESG0. The potential downside risk is higher in portfolios ESG5 and ESG4, because they have the least negative VaR1% and VaR5%. However, they are negative and imply return gains in extreme market conditions. Systematic risk has overall inconclusive results, but if only comparing ESG5 and ESG1, the high ESG score portfolio will give a lower portfolio beta. Further, the ratios are interesting measures but just risk-adjusted performance measures and only help with analyzing return per risk taken. They are therefore not weighted into the conclusion. Nevertheless, the results show the same Sharpe ratio and Treynor ratio for ESG5 and ESG1, meaning you get the same return per risk taken, an interesting find for investor risk preference. As determined by the majority of risk measures the analysis of the Full sample's risk measures confirms hypothesis 2, that *firms with high ESG scores are related to lower risk*. Results are in line with Ni & Sun et al. (2023), Giese et al. (2019), and Luo & Bhattacharya (2009).

Like Luo & Bhattacharya (2009) findings, ESG can reduce risk, and it is clear the Full Sample show that ESG investing pay-off in being risk-reducing, most clear regarding total risk. The evidence from the several risk measures on the Full Sample is that higher ESG can help reduce risk compared to lower ESG scores, which Sassen et al. (2016) also found for Europe as a total. The results for the Full Sample go against what Bannier et al. (2022) found, that reporting social activities has no lowering risk effect for European firms. This means that the Full Sample is more like the U.S. in that case, that ESG reporting matters for risk reduction. This can be because the firms with the highest market capitalization have the highest ESG scores, and they are more obligated to report ESG (Bannier et al. (2022) and have more social pressure on them (Dorfleitner et al., 2016). They may also have more money to invest for being more stable for future risk changes Dunn at al. (2017), which is however contradicting to the Value at Risk (VaR) results from the highest ESG score portfolio in the Full Sample.

The trade-off between risk and return still holds for ESG-rated firms in the Nordic, meaning lower risk lead to a lower return, the same finding as in Lööf et al. (2022). Lööf et al. (2022)

also mention that this finding is important for the risk preference of investors, and ESG portfolios with high ESG scores are more suitable for investors that like low risk. This finding is interesting because in the near future when the EU has integrated ESG as a standard for companies, will many investors have lower risk and therefore lower return, or will the awareness of ESG reporting give the same finding for the Nordic countries as Bannier et al. (2022) finding of CSR reporting in the European countries. The future may show that having ESG disclosure as a standard lead to less value for shareholders, ESG is costly, however, in the long term, it can create value for shareholders Luo & Bhattacharya (2009) when everyone has made it a standard it will have no effect on risk. Risk measures for the Full sample's equally weighted ESG portfolios is in Table 9A in the appendices.

Table 10. Risk measures result Sweden.

Table 10 reports the risk measures result for Sweden. The data is from Sweden's stock market, and the stocks are divided into seven value-weighted portfolios sorted after ESG score (Portfolio ESG 5: 80-100, Portfolio ESG 4: 60-80, Portfolio ESG 3: 40-60, Portfolio ESG 2: 20-40, Portfolio ESG 1: 0-20, Portfolio ESG 0: 0, and Portfolio 5-1 is a long-short portfolio). The table present each portfolios Mean excess return (monthly), Volatility, Sharpe ratio, Value at Risk 1%, Value at Risk 5%, Portfolio Beta and Treynor ratio. The sample period is monthly from January 2015 to December 2022.

				SWEDEN			
Portfolio	ESG 5	ESG 4	ESG 3	ESG 2	ESG 1	ESG 0	ESG 5-1
Mean excess return	0,71%	1,01%	2,44%	2,21%	1,54%	3,15%	-0,89%
Standard deviation	5,61%	5,27%	7,29%	7,64%	10,40%	8,66%	9,52%
Sharpe ratio	0,10	0,17	0,30	0,25	0,10	0,32	-0,14
VaR 1%	-0,12	-0,11	-0,15	-0,16	-0,23	-0,17	-0,23
VaR 5%	-0,09	-0,08	-0,10	-0,10	-0,16	-0,11	-0,17
Portfolio Beta	0,56***	0,6***	0,37**	0,77***	0,86***	0,59***	-0,3
(Standard Error)	(0,104)	(0,094)	(0,15)	(0,142)	(0,202)	(0,174)	(0,2)
Treynor ratio	0,010	0,015	0,059	0,025	0,012	0,047	0,046

4.2.2 ESG and risk individual countries

Sweden's risk measures (Table 10) show the portfolios with the highest ESG score (ESG5 and ESG4) have the lowest Standard deviation, indicating lower uncertainty for higher ESG score. VaR measures are similar to the Full sample, all portfolios have negative VaR1% and VaR5%. Though, the most negative VaR, and therefore the least downside risk, is for ESG0, followed by ESG3 and ESG2. The portfolio betas are statistically significant in all portfolios except the long-short portfolio and display that portfolios with higher ESG scores have less exposure to market risk if ESG0 is excluded, however, ESG3 has the lowest portfolio beta. Giving portfolio beta an inconclusive answer. Observing the long-short portfolio, as for the Full Sample, the long-short portfolio in Sweden gives canceling-out effects like high uncertainty and is moving against the market. The analysis of Sweden is similar to the Full Sample where most part of the risk measures confirm hypothesis 2 that *firms with high ESG scores are related to lower risk*. This is in line with the results from the studies of Sassen et al. (2016) on Europe, firms investing in social responsibility lower risk. The results are also in line with the findings from Dunn et al. (2017).

Sweden might, with most companies' weighting in the Full sample, have the same indications as for the Full sample. The country is more like the U.S. where sustainable reporting has an effect on risk contradicting Bannier et al., (2022) finding. However, Bannier et al. (2022) look at data between 2003 to 2017 and the EU has come a further way about ESG regulation and awareness since (European Commission, 2021). This show that when firms must report because of laws and regulations, the risk will be affected in a different way than firms in European firms do report more from the heart, as the finding by Bannier et al. (2022). However, we can see that ESG as a factor brings uncertainty when it comes to the effect it has on risk (Cornell, 2021). Because there are no clear answers from the analysis of Sweden and the Full sample, yes highest ESG score gives lower total risk and systematic risk than the lowest ESG score. Yet, the portfolio with companies with no ESG score do good, does this mean regulations will punish the bigger firms that have to do ESG reporting by law (European Commission, 2019). Risk measures result for Sweden's equally weighted ESG portfolios is in Table 10A in the appendix.

Table 11. Risk measures result Denmark.

Table 11 reports the risk measures result for Denmark. The data is from Denmark's stock market, and the stocks are divided into seven value-weighted portfolios sorted after ESG score (Portfolio ESG 5: 80-100, Portfolio ESG 4: 60-80, Portfolio ESG 3: 40-60, Portfolio ESG 2: 20-40, Portfolio ESG 1: 0-20, Portfolio ESG 0: 0, and Portfolio 5-1 is a long-short portfolio). The table present each portfolios Mean excess return (monthly), Volatility, Sharpe ratio, Value at Risk 1%, Value at Risk 5%, Portfolio Beta and Treynor ratio. The sample period is monthly from January 2015 to December 2022.

DENMARK							
Portfolio	ESG 5	ESG 4	ESG 3	ESG 2	ESG 1	ESG 0	ESG 5-1
Mean excess return	0,83%	1,46%	1,13%	2,05%	1,60%	1,36%	-0,84%
Standard deviation	4,53%	5,26%	5,85%	6,84%	7,35%	4,67%	7,10%
Sharpe ratio	0,16	0,25	0,16	0,27	0,18	0,27	-0,16
VaR 1%	-0,10	-0,11	-0,12	-0,14	-0,15	-0,09	-0,17
VaR 5%	-0,07	-0,07	-0,09	-0,09	-0,10	-0,06	-0,13
Portfolio Beta	0,23**	0,55***	0,51***	0,31**	0,63***	0,41***	-0,4***
(Standard Error)	(0,093)	(0,096)	(0,113)	(0,142)	(0,142)	(0,089)	(0,145)
Treynor ratio	0,032	0,024	0,019	0,059	0,021	0,031	0,028

Analyzing Table 11 of Denmark's different ESG portfolios. The results of the risk measure show portfolios with the highest ESG, plus the portfolio with no ESG score, has the lowest total risk looking at Standard Deviation. Nevertheless, Standard Deviation shows ESG5 to have the least uncertainty in its portfolio. Analyzing Value-at-Risk for Denmark, ESG1 has the least downside risk measuring VaR1% and VaR5%, closely followed by ESG2 and ESG3. The portfolio beta shows the portfolio with the highest ESG score has the lowest exposure to market risk, followed by ESG2, all statistically significant. The portfolio with the lowest ESG score (not including ESG0) has the most risk among all measures when looking at Standard deviation and portfolio beta.

The long-short portfolio of Denmark follows the Full Sample and Sweden and shows the high and the low ESG offset each other. The analysis of Denmark is more inconclusive, compared with the Full Sample. Not taking into account the portfolio with no ESG score, hypothesis 2 has support, that *firms with high ESG scores are related to lower risk*. However, the overall conclusion is that Denmark shows an inconclusive result. Agreeing with Whelan et al. (2021), it needs more research on the area to find out if ESG can serve as a risk-reducing factor., but this shows Denmark’s sample gives us fluctuating results and no clear pattern if a higher ESG score gives lower risk unless we only compare portfolio ESG5 with ESG1 then the answer is clear. Risk should move around a company's ESG rating should

depend on the overall market according to Dorfleitner et al. (2016), meaning industry effects and country-specific effects might give Denmark an unclear answer. Denmark has partly the same finding as Lee et al. (2010), screening away unethical companies decreases systematic risk.

Risk measures result for Denmark's equally-weighted ESG portfolios is in appendix Table 11A.

Table 12. Risk measures result Norway.

Table 12 reports the risk measures result for Norway. The data is from Norways's stock market, and the stocks are divided into seven value-weighted portfolios sorted after ESG score (Portfolio ESG 5: 80-100, Portfolio ESG 4: 60-80, Portfolio ESG 3: 40-60, Portfolio ESG 2: 20-40, Portfolio ESG 1: 0-20, Portfolio ESG 0: 0, and Portfolio 5-1 is a long-short portfolio). The table present each portfolios Mean excess return (monthly), Volatility, Sharpe ratio, Value at Risk 1%, Value at Risk 5%, Portfolio Beta and Treynor ratio. The sample period is monthly from January 2015 to December 2022.

NORWAY							
Portfolio	ESG 5	ESG 4	ESG 3	ESG 2	ESG 1	ESG 0	ESG 5-1
Mean excess return	1,43%	1,08%	1,28%	1,96%	1,16%	2,87%	0,20%
Standard deviation	6,18%	4,69%	6,84%	8,42%	8,70%	6,79%	8,63%
Sharpe ratio	0,20	0,21	0,15	0,19	0,09	0,39	-0,02
VaR 1%	-0,13	-0,10	-0,15	-0,18	-0,19	-0,13	-0,20
VaR 5%	-0,09	-0,07	-0,10	-0,12	-0,13	-0,08	-0,14
Portfolio Beta	0,46***	0,34***	0,69***	0,5***	0,49***	0,43***	-0,03
(Standard Error)	(0,122)	(0,093)	(0,127)	(0,171)	(0,178)	(0,137)	(0,183)
Treynor ratio	0,027	0,029	0,015	0,033	0,016	0,062	0,058

Table 12 shows Norway's risk measures. The portfolios with the highest ESG, ESG5 and ESG4, have the lowest Standard Deviation, followed closely by the no ESG score portfolio. Yet, all three portfolios also have the least negative VaR measures and therefore has the most risk in extreme market conditions. Nevertheless, the same three portfolios have the lowest portfolio beta, where ESG4 shows the lowest systematic risk, all statistically significant. ESG2 and ESG1 have the highest uncertainty in total risk, and ESG3 has the highest systematic risk. The long-short portfolio shows a positive return, which is better compared to Full Sample, Sweden, and Denmark, meaning higher ESG stocks pay off better than low ESG stocks in Norway. However the Sharpe is still negative even if it is closer to zero. Overall, the analysis of Norway is more inconclusive than the Full Sample and follows

the same conclusion as Denmark. Not taking into account the portfolio with no ESG score, the analysis confirms hypothesis 2, that *firms with high ESG scores are related to lower risk*. Still, the portfolio with no ESG scores needs addressing, and the conclusion is that Norway shows an inconclusive result. The results are the opposite of Fiskerstrand et al. (2020) finding on the Norwegian stock market, that high ESG portfolios have lower Sharpe ratio. Only having socially responsible firms in a portfolio affects the risk, contradicting Hoepner & Schopohl (2018) finding that risk was not affected in Swedish and Norwegian pension funds when unethical was screened away. This is partly the same finding as Fiskerstrand et al. (2020) because the highest ESG portfolio and the lowest ESG portfolio in Norway have a portfolio beta not far apart.

Risk measures for the equally-weighted ESG portfolios of Norway is in Table 12A in the appendices.

Table 13. Risk measures result Finland.

Table 13 reports the risk measures result for Finland. The data is from Finland's stock market, and the stocks are divided into seven value-weighted portfolios sorted after ESG score (Portfolio ESG 5: 80-100, Portfolio ESG 4: 60-80, Portfolio ESG 3: 40-60, Portfolio ESG 2: 20-40, Portfolio ESG 1: 0-20, Portfolio ESG 0: 0, and Portfolio 5-1 is a long-short portfolio). The table present each portfolios Mean excess return (monthly), Volatility, Sharpe ratio, Value at Risk 1%, Value at Risk 5%, Portfolio Beta and Treynor ratio. The sample period is monthly from January 2015 to December 2022.

			FINLAND				
Portfolio	ESG 5	ESG 4	ESG 3	ESG 2	ESG 1	ESG 0	ESG 5-1
Mean excess return	0,40%	1,40%	0,98%	0,92%	0,09%	1,77%	0,2%
Standard deviation	7,01%	5,59%	4,84%	7,44%	7,33%	5,93%	8,5%
Sharpe ratio	0,02	0,22	0,18	0,09	-0,03	0,27	-0,01
VaR 1%	-0,16	-0,12	-0,10	-0,16	-0,17	-0,12	-0,19
VaR 5%	-0,11	-0,08	-0,07	-0,11	-0,12	-0,08	-0,14
Portfolio Beta	0,43***	0,51***	0,57***	0,61***	0,34**	0,66***	0,09
(Standard Error)	(0,142)	(0,107)	(0,084)	(0,145)	(0,152)	(0,106)	(0,18)
Treynor ratio	0,004	0,025	0,015	0,011	-0,006	0,024	-0,013

Analyzing Table 13 of Finland's risk measures, the results show the ESG3 portfolio has the lowest risk when comparing Standard deviations, followed by ESG4 and ESG0. ESG1 has a negative Sharpe ratio, meaning losing return for the risk taken. ESG1, ESG5, and ESG2 have the least downside risk, gaining return in extreme market conditions. The portfolio beta is

statistically significant for all portfolios, except the long-short portfolio, and is the lowest for ESG1 followed by ESG5. The long-short portfolio for Finland has a positive abnormal return, and closer to zero Sharpe ratio just like in Norway. The only positive portfolio beta of all countries. Overall results for Finland's risk measures show no clear pattern. Concluding that the analysis of Finland does not confirm hypothesis 2, that *firms with high ESG scores are related to lower risk*. This result is in line with Bannier et al. (2022), that European companies' social responsibility reporting has no effect on risk, because of the high awareness of corporate social responsibility. Finland's result is in line with the finding of Lööf et al. (2022), that a higher ESG score lower downside risk. See the risk measures for the equally-weighted ESG portfolios of Finland in Table 13A in the appendix.

Higher ESG score showing risk-reducing effects also applies individually to Sweden, somewhat to Denmark, and Norway. Apart from Finland, where the higher ESG score portfolio did the worst compared to the rest of the country's portfolios. Finland has the highest ESG score in the world according to the SDG report from 2022 (Sachs et al., 2022), showing reputation around sustainability performance is related to risk (Salama et al., 2011). Our results may indicate the country has focused too much to keep up with the title of being the best in the world, and creating shareholder value through stakeholder value, that they overinvested in ESG (Barnea & Rubin, 2010), and therefore the results show a higher risk for higher ESG scores. Like Edmans (2022) points out, ESG is important for long-term value, but not more important than other intangible assets that also create stock and social returns. Therefore, long-term investing is not ESG investing, it is generally just good investing.

We find for the Finland the same as El Ghoul et al. (2011), Eccles et al. (2014), and Gregory et al. (2014), that the lower risk is due to high ESG gives a better preparation for shock in the market. That ESG is for climate shock preparation Cornell (2021). We conclude with the meta-study of Whelan et al. (2021), that the relationship between risk and ESG is mostly positive but also inconclusive. It makes us wonder what effect the European Corporate Responsibility Reporting Directive will have on stakeholders and shareholders, and if the companies affected by this legislation will experience risk-reducing or risk-enhancing when the focus in Europe is shifting to controlling climate risk and want investors to be the driving force and consider sustainability risk in every value of investment (European Commission,

2021). Nevertheless, if our results where the same as in Bannier et al (2022), the results would be that ESG reporting would not make a difference for firms' risk in our sample.

We have also analyzed the firms that have no ESG score, which many studies leave out, and only focus on high and low ESG scores (e.g., Ni & Sun, 2023; Teti et al., 2023, Giese et al., 2019; Dunn et al., 2017). The Full Sample and Sweden still show that portfolios with no ESG scores have just as high risk as low ESG score portfolios, which means that firms that are neglecting ESG have higher exposure to risk (Dunn et al., 2017). Still, our findings are somewhat different for our Danish and Norwegian, and Finish samples. Which makes our results inconclusive for these countries. Denmark's and Norway's no-ESG score portfolios show low risk, like the highest ESG-scored portfolios. Yet, they get higher returns for a no-ESG score portfolio investment than for a high-ESG score. For Finland the high ESG-score portfolio and the no ESG-score portfolio have both the highest risk, and if you want the lowest risk you have to invest in the companies that have middle-high ESG scores. Maybe this can be explained by that ESG rating can give long-term risk reduction but show give short-term performance Giese et al. (2019). Firms with higher ESG scores are the ones with higher market capitalization and higher pressure for being more socially responsible and thus lowering their lower risk Dorfleitner et al. (2016), and since they have high market value they can bear the extra costs for ESG portfolio construction Friede et al (2015). Also in line with the responsibility, the upcoming EU Taxonomy put on larger firms.

The summary of the risk measures for the Full sample and Sweden shows there is a relationship that higher ESG scored portfolios have a lower risk for both standard deviation and portfolio beta, even if the relationship is weak, there is confirmation of hypothesis 2, that *firms with high ESG scores are related to lower risk*. This result is not the same findings as for Denmark, Norway, and Finland. Denmark and Norway have inconclusive relationships between ESG and risk because the no-ESG portfolio is competing with the higher ESG scores portfolios about having the lowest risk. Yet, not taking into account the no-ESG score portfolio for Denmark and Norway, the results show higher ESG scores portfolios have lower Standard deviations, however, the analysis is on all the portfolios and therefore the answer is inconclusive for these two countries. Finland shows no confirmation for hypothesis 2, with no clear relationship between risk and ESG score between all the portfolios. Finland has almost as high a Standard deviation for the highest ESG score portfolio as for the lowest ESG

scored portfolio. Plus, the lowest ESG score portfolio has a lower portfolio beta than the highest ESG score portfolio.

4.3 Individual E, S, and G ratings

This section separates the total ESG score into its three individual pillars to examine the relationship between Environmental, Social, and Governance scores and stock return, answering hypothesis 3: *Ratings in each subcategory Environmental, Social, and Governance are positively related to stock return.* The analysis aims to detect which pillar matters the most for risk and return of stocks in the Full sample and individual countries by using CAPM, the Fama-French three-factor, Carhart's four-factor model, and the Fama-French five-factor model.

It is important to note that the sample of yearly observations utilized in our investigation of the third hypothesis was limited to eight years, which may have introduced small sample bias and could potentially impact the validity and generalizability of the results. While we acknowledge these limitations, we believe that the findings provide insights into the phenomenon under investigation and warrant further research with larger and more diverse samples.

Table 14. Factor models result Full sample E-pillar.

Table 14 presents the results of the factor model regressions of CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) of the Full sample (Denmark, Finland, Norway, and Sweden). The table presents the factors: Alpha, MktRF, SMB, HML, MOM, RWA, and CMA. The data is from the countries' stock markets, and stocks are divided into seven value-weighted portfolios sorted after E pillar score (Portfolio E5: 80-100, Portfolio E4: 60-80, Portfolio E3: 40-60, Portfolio E2: 20-40, Portfolio E1: 0-20, Portfolio E0: 0, and Portfolio 5-1 is a long-short portfolio). R-squared and Adjusted R-squared for each portfolio are presented. The sample period is yearly from December 2015 to December 2022. Parentheses show Standard Error. Significance level: ***(1%), **(5%), and *(10%).

FULL SAMPLE								
Portfolio		E 5	E 4	E 3	E 2	E 1	E 0	E 5-1
CAPM	Alpha	0,1546**	0,0973**	0,2129**	0,1965*	0,3100	0,4807*	-0,1645
		(0,0453)	(0,0355)	(0,0657)	(0,0804)	(0,1878)	(0,2321)	(0,1919)
	MktRF	0,6588*	0,7561**	0,8466*	1,143*	1,2171	1,8197	-0,5502
		(0,2706)	(0,2118)	(0,3922)	(0,4803)	(1,1217)	(1,386)	(1,1461)
	R2	0,50	0,68	0,44	0,49	0,16	0,22	0,04
	Adj. R2	0,41	0,63	0,34	0,40	0,02	0,09	-0,12
FF3F	Alpha	0,1627**	0,0966*	0,22003**	0,1907**	0,2752	0,5059	-0,1226
		(0,0514)	(0,0391)	(0,0705)	(0,0664)	(0,1671)	(0,2779)	(0,1738)
	MktRF	0,7495*	0,7271**	0,9006	1,0007*	0,6462	2,0854	0,0986
		(0,3287)	(0,2501)	(0,4512)	(0,4248)	(1,0695)	(1,7789)	(1,1127)
	SMB	-0,9206	-0,3553	-1,3405	-1,0083	0,0142	-3,1656	-0,8135
		(0,9877)	(0,7514)	(1,3556)	(1,2763)	(3,2133)	(5,3447)	(3,3431)
	HML	-0,3203	-0,3648	-0,7606	-1,2618	-2,1431	-1,2752	1,8616
		(0,4713)	(0,3585)	(0,6468)	(0,609)	(1,5332)	(2,5502)	(1,5951)
	R2	0,59	0,75	0,59	0,78	0,58	0,29	0,50
	Adj. R2	0,28	0,57	0,27	0,61	0,26	-0,25	0,12
C4	Alpha	0,3128	0,0737	0,1791	0,4319*	0,0019	1,2221	0,3049
		(0,1548)	(0,1362)	(0,2457)	(0,1798)	(0,5611)	(0,8698)	(0,5502)
	MktRF	0,5909	0,7512*	0,9439	0,7458	0,9350	1,3286	-0,3532
		(0,3612)	(0,3178)	(0,5734)	(0,4195)	(1,3094)	(2,0296)	(1,2838)
	SMB	-0,5043	-0,4186	-1,4540	-0,3394	-0,7436	-1,1795	0,3722
		(1,0614)	(0,9339)	(1,685)	(1,2327)	(3,8477)	(5,9642)	(3,7725)
	HML	-0,8116	-0,2902	-0,6266	-2,0513*	-1,2487	-3,6191	0,4623
		(0,6693)	(0,5889)	(1,0624)	(0,7773)	(2,4261)	(3,7606)	(2,3786)
	MOM	-1,6789	0,2551	0,4579	-2,6978	3,0563	-8,0101	-4,7819
		(1,6347)	(1,4383)	(2,5949)	(1,8985)	(5,9256)	(9,1851)	(5,8098)
	R2	0,69	0,75	0,59	0,87	0,61	0,43	0,59
	Adj. R2	0,29	0,43	0,04	0,69	0,09	-0,33	0,04
N observations		8	8	8	8	8	8	8

Table 14. Continued. Factor models result Full sample E-pillar.

FULL SAMPLE								
Portfolio		E 5	E 4	E 3	E 2	E 1	E 0	E 5-1
FF5F	Alpha	0,1502	0,0339	0,114***	0,1205	-0,0113	0,1515	0,1473
		(0,0887)	(0,0357)	(0,0073)	(0,0973)	(0,0962)	(0,3488)	(0,1335)
	MktRF	0,6364	0,4910	0,7336***	0,6996	-0,1005	0,5966	0,7153
		(0,4772)	(0,1923)	(0,0395)	(0,5236)	(0,5177)	(1,8768)	(0,7182)
	SMB	-0,8984	-0,1500	-1,195***	-0,8046	0,7730	-2,0409	-1,5322
		(1,2985)	(0,5232)	(0,1076)	(1,4245)	(1,4086)	(5,1063)	(1,9539)
	HML	0,4521	0,4432	-1,136***	0,0004	-1,2054	4,6479	1,748
		(1,2391)	(0,4993)	(0,1026)	(1,3593)	(1,3442)	(4,8727)	(1,8646)
	RMW	0,1659	1,7082	3,7618***	1,8255	8,8758**	9,1959	-8,6145*
		(1,8109)	(0,7297)	(0,1500)	(1,9866)	(1,9645)	(7,1213)	(2,725)
	CMA	-1,0568	-0,6960	1,8707***	-1,3026	1,2266	-6,0865	-2,3492
		(1,6922)	(0,6819)	(0,1402)	(1,8563)	(1,8357)	(6,6545)	(2,5464)
	R2	0,67	0,94	1,00	0,87	0,96	0,70	0,92
	Adj. R2	-0,15	0,81	1,00	0,55	0,87	-0,05	0,72
N observations		8	8	8	8	8	8	8

4.3.1 Results from the Full sample

Tables 14, 15, and 16 present the results of the Environmental (E), Social (S), and Governance (G) pillars, respectively, for the Full sample. A significant proportion of the alphas demonstrate positive coefficients for all three pillars, but the Governance pillars have to a greater extent several statistically significant positive alphas in the models.

The majority of the Full sample's environmental pillar (Table 14) exhibits significant alphas in the middle to high E score portfolios; E3 in the Fama-French five-factor model, E2 in Carhart's four-factor model, and E5, E4, E3, and E2 for Fama-French three-factor and the CAPM model. The latter also has significant alpha in the portfolio with no E score (E0).

Additionally, all risk factors in Portfolio E3 in the five-factor model are statistically significant. R^2 and Adjusted R^2 are 1,00, implying the model perfectly fits the data and explains 100% of the variance in stock returns while accounting for market risk, size, value, profitability, and investment. The equally weighted result is in Appendix Table 14A.

Table 15. Factor models result Full sample S-pillar.

Table 15 presents the results of the factor model regressions of CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) of the Full sample (Denmark, Finland, Norway, and Sweden). The table presents the factors: Alpha, MktRF, SMB, HML, MOM, RWA, and CMA. The data is from the countries' stock markets, and stocks are divided into seven value-weighted portfolios sorted after S pillar score (Portfolio S5: 80-100, Portfolio S4: 60-80, Portfolio S3: 40-60, Portfolio S2: 20-40, Portfolio S1: 0-20, Portfolio S0: 0, and Portfolio 5-1 is a long-short portfolio). R-squared and Adjusted R-squared for each portfolio are presented. The sample period is yearly from December 2015 to December 2022. Parentheses show Standard Error. Significance level: ***(1%), **(5%), and *(10%).

FULL SAMPLE								
Portfolio		S 5	S 4	S 3	S 2	S 1	S 0	S 5-1
CAPM	Alpha	0,0883*	0,1975***	0,2483	0,3602**	0,0782	0,5108	0,0011
		(0,0393)	(0,0451)	(0,1414)	(0,1301)	(0,0892)	(0,2734)	(0,06802)
	MktRF	0,6656**	0,768**	0,8406	1,1577	1,3205**	1,9300	-0,6468
		(0,2347)	(0,2695)	(0,8446)	(0,7769)	(0,5324)	(1,6324)	(0,4062)
	R2	0,57	0,58	0,14	0,27	0,51	0,19	0,30
	Adj. R2	0,50	0,50	0,00	0,15	0,42	0,05	0,18
FF3F	Alpha	0,0999**	0,1867***	0,2315	0,3313**	0,0903	0,5497	-0,0005
		(0,036)	(0,0355)	(0,1517)	(0,0785)	(0,0811)	(0,326)	(0,0651)
	MktRF	0,7963**	0,5989*	0,5529	0,6781	1,4078*	2,3865	-0,6161
		(0,2302)	(0,2275)	(0,9712)	(0,5025)	(0,5188)	(2,087)	(0,4166)
	SMB	-1,2895	0,1855	-0,2479	-0,1159	-2,3859	-3,9008	1,2176
		(0,6916)	(0,6835)	(2,9178)	(1,5099)	(1,5588)	(6,2703)	(1,2517)
	HML	-0,4346	-0,5044	-1,2633	-1,8921*	-1,3871	-1,0844	0,9914
		(0,330004)	(0,3261)	(1,3922)	(0,7204)	(0,7438)	(2,9918)	(0,5972)
	R2	0,77	0,83	0,37	0,83	0,74	0,26	0,59
	Adj. R2	0,60	0,71	-0,10	0,70	0,54	-0,29	0,28
C4	Alpha	0,1173	0,2106	0,1064	0,2958	0,3985	1,3616	-0,2871
		(0,1256)	(0,1237)	(0,5261)	(0,2742)	(0,2124)	(1,02897)	(0,1459)
	MktRF	0,7779*	0,5736	0,6851	0,7156	1,0820	1,5285	-0,3132
		(0,293)	(0,2886)	(1,2277)	(0,6399)	(0,4957)	(2,40102)	(0,3405)
	SMB	-1,2412	0,2517	-0,5947	-0,2143	-1,5310	-1,6491	0,4226
		(0,861)	(0,8481)	(3,6076)	(1,8805)	(1,4568)	(7,0556)	(1,0005)
	HML	-0,4917	-0,5826	-0,8540	-1,7759	-2,396*	-3,7417	1,9296*
		(0,5429)	(0,5347)	(2,2747)	(1,1857)	(0,9185)	(4,4487)	(0,6308)
	MOM	-0,1949	-0,2672	1,3987	0,3970	-3,4477	-9,0807	3,2061
		(1,326)	(1,3061)	(5,5558)	(2,8961)	(2,2435)	(10,8659)	(1,5408)
	R2	0,77	0,83	0,38	0,83	0,85	0,40	0,83
	Adj. R2	0,47	0,61	-0,44	0,61	0,66	-0,40	0,61
N observations		8	8	8	8	8	8	8

Table 15. Continued. Factor models result Full sample S-pillar.

FULL SAMPLE								
Portfolio		S 5	S 4	S 3	S 2	S 1	S 0	S 5-1
FF5F	Alpha	0,0609	0,1539	-0,0188	0,21899*	0,0963	0,1097	-0,0496
		(0,0294)	(0,0599)	(0,0519)	(0,0734)	(0,1059)	(0,3812)	(0,0954)
	MktRF	0,5765*	0,4971	0,0092	0,4498	1,2158	0,5566	-0,6607
		(0,1584)	(0,3221)	(0,2793)	(0,3952)	(0,5697)	(2,0512)	(0,5133)
	SMB	-1,1327	0,2560	0,2950	0,0821	-2,3488	-2,4871	1,3554
		(0,431)	(0,8764)	(0,7598)	(1,0752)	(1,5501)	(5,5809)	(1,3966)
	HML	0,7324	-0,2731	-1,2541	-1,9958	0,4496	6,1113	0,3732
		(0,4112)	(0,8363)	(0,725)	(1,026)	(1,4792)	(5,3256)	(1,3327)
	RMW	0,8744	0,9491	8,1582**	3,7195	-0,7687	11,4742	1,7385
		(0,601)	(1,2222)	(1,0596)	(1,4995)	(2,1618)	(7,7832)	(1,9477)
	CMA	-1,3904	-0,1079	2,4661	1,2775	-2,8101	-7,2851	1,3538
		(0,5616)	(1,1421)	(0,9902)	(1,4012)	(2,02005)	(7,273)	(1,82)
	R2	0,96	0,87	0,98	0,96	0,88	0,73	0,76
	Adj. R2	0,86	0,55	0,93	0,86	0,58	0,06	0,17
N observations		8	8	8	8	8	8	8

Although the social pillar (Table 15) displays the least significant alphas, it is not far behind the other pillars. A single positive alpha is significant for portfolio S2 in the Fama-French five-factor model. The Fama-French three-factor model and CAPM demonstrate positive and significant alphas in Portfolios S5, S4, and S2. The equally weighted result is in Appendix Table 15A.

Our analysis of the governance pillar (Table 16) reveals statistically significant alphas, consistent with the findings for the environmental pillar, in both the CAPM and Fama-French three-factor model. However, no significant alpha is observed in Portfolio G0. Portfolio G5 have a statistically significant alpha for both Carhart and Fama-French five-factor model. Indicating evidence of higher excess return over market in middle to high ESG scores. Alpha in Portfolio G3 is also significant in the latter model. Similar to the environmental pillar, all risk factors in Portfolio G3 in the Fama-French five-factor model are statistically significant. This implies that the model perfectly fits the data and explains 100% of the variance in stock returns while accounting for market risk, size, value, profitability, and investment. The equally weighted result is in Appendix Table 16A.

Table 16. Factor models result Full sample G-pillar.

Table 16 presents the results of the factor model regressions of CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) of the Full sample (Denmark, Finland, Norway, and Sweden). The table presents the factors: Alpha, MktRF, SMB, HML, MOM, RWA, and CMA. The data is from the countries' stock markets, and stocks are divided into seven value-weighted portfolios sorted after G pillar score (Portfolio G5: 80-100, Portfolio G4: 60-80, Portfolio G3: 40-60, Portfolio G2: 20-40, Portfolio G1: 0-20, Portfolio G0: 0, and Portfolio 5-1 is a long-short portfolio). R-squared and Adjusted R-squared for each portfolio are presented. The sample period is yearly from December 2015 to December 2022. Parentheses show Standard Error. Significance level: ***(1%), **(5%), and *(10%).

FULL SAMPLE								
Portfolio		G 5	G 4	G 3	G 2	G 1	G 0	G 5-1
CAPM	Alpha	0,1297***	0,1828***	0,1417*	0,2231**	0,4426	0,5110	-0,3219
		(0,0295)	(0,0483)	(0,0721)	(0,0897)	(0,2899)	(0,2734)	(0,3045)
	MktRF	0,4437**	0,8914**	1,1381**	0,8366	0,7663	1,9304	-0,3143
		(0,176)	(0,2885)	(0,4304)	(0,5355)	(1,7311)	(1,6324)	(1,8185)
	R2	0,51	0,61	0,54	0,29	0,03	0,19	0,00
	Adj. R2	0,43	0,55	0,46	0,17	-0,13	0,05	-0,16
FF3F	Alpha	0,1374***	0,1762**	0,1484*	0,2049*	0,3712	0,5498	-0,244
		(0,0295)	(0,0512)	(0,069)	(0,0775)	(0,2846)	(0,3261)	(0,3023)
	MktRF	0,5299**	0,783*	1,1721*	0,5446	-0,2648	2,3857	0,7901
		(0,1886)	(0,3277)	(0,4415)	(0,4959)	(1,8219)	(2,0873)	(1,9352)
	SMB	-0,8523	-0,0223	-1,6569	0,1238	3,0050	-3,8976	-3,736
		(0,5667)	(0,9846)	(1,3264)	(1,4899)	(5,4738)	(6,271)	(5,8143)
	HML	-0,2881	-0,4247	-1,0637	-1,0123	-1,7270	-1,0866	1,4778
		(0,2704)	(0,4698)	(0,6329)	(0,7109)	(2,6118)	(2,9922)	(2,7743)
	R2	0,69	0,72	0,73	0,66	0,40	0,26	0,37
	Adj. R2	0,46	0,52	0,53	0,41	-0,04	-0,29	-0,10
C4	Alpha	0,2582**	0,2569	0,1327	0,2557	-0,3922	1,3620	0,6445
		(0,0721)	(0,1725)	(0,2415)	(0,2697)	(0,8813)	(1,029)	(0,9095)
	MktRF	0,4022*	0,6977	1,1887	0,4910	0,5420	1,5274	-0,1489
		(0,1682)	(0,4025)	(0,5635)	(0,6293)	(2,0566)	(2,4012)	(2,1222)
	SMB	-0,5170	0,2016	-1,7005	0,2646	0,8876	-1,6453	-1,2718
		(0,4943)	(1,1827)	(1,6558)	(1,8493)	(6,0434)	(7,0561)	(6,2361)
	HML	-0,6838	-0,6889	-1,0122	-1,1784	0,7718	-3,7447	-1,4303
		(0,3117)	(0,7457)	(1,04402)	(1,166)	(3,8105)	(4,449)	(3,932)
	MOM	-1,3519	-0,9028	0,1761	-0,5677	8,5392	-9,0836	-9,9379
		(0,7613)	(1,8213)	(2,55001)	(2,848)	(9,307)	(10,8667)	(9,6039)
	R2	0,85	0,74	0,73	0,67	0,53	0,40	0,54
	Adj. R2	0,65	0,40	0,37	0,22	-0,09	-0,40	-0,08
N observations		8	8	8	8	8	8	8

Table 16. Continued. Factor models result Full sample G-pillar.

FULL SAMPLE								
Portfolio		G 5	G 4	G 3	G 2	G 1	G 0	G 5-1
FF5F	Alpha	0,1339*	0,1525	0,0241*	0,0871	-0,0277	0,1101	0,1474
		(0,0352)	(0,0851)	(0,0078	(0,0852)	(0,2101)	(0,3814)	(0,2436)
	MktRF	0,4346	0,6201	0,8669***	0,2045	-0,9830	0,5560	1,3961
		(0,1894)	(0,4582)	(0,0422	(0,4583)	(1,1308)	(2,0525)	(1,311)
	SMB	-0,8099	0,0758	-1,384***	0,4164	3,9327	-2,4842	-4,6033
		(0,5152)	(1,2467)	(0,1147	(1,2468)	(3,0766)	(5,5843)	(3,5669)
	HML	0,4776	0,4604	-0,652**	-0,3606	-3,2181	6,1121	3,7861
		(0,4917)	(1,1896)	(0,1095	(1,1898)	(2,9358)	(5,3288)	(3,4037)
	RMW	-0,1417	0,3813	4,0262***	3,5301	13,307*	11,4646	-13,3536
		(0,7186)	(1,7386)	(0,16003	(1,7388)	(4,2907)	(7,7879)	(4,9744)
	CMA	-1,1313	-1,2704	0,7773**	0,0217	5,9853	-7,2930	-7,1824
		(0,6715)	(1,6246)	(0,1495	(1,6248)	(4,0094)	(7,2773)	(4,6483)
	R2	0,88	0,80	1,00	0,89	0,91	0,73	0,89
	Adj. R2	0,59	0,28	1,00	0,62	0,70	0,06	0,62
N observations		8	8	8	8	8	8	8

Despite observations of positive and statistically significant alphas for several portfolios, there are no findings of significant alphas in the long-short portfolios, supporting previous studies (e.g., Bauer et al., 2012; Halbritter & Dorfleitner, 2015). However, the results do present evidence that individual Environmental, Social, and Governance ratings produce excess returns over market, confirming hypothesis 3 that *Ratings in each subcategory Environmental, Social, and Governance are positively related to stock return*. In line with Carpenter & Wyman (2009), and Clark et al. (2015). Additionally, the results from the Full sample imply that the governance pillar matters more than the environmental and social. This is somehow consistent with Friede et al. (2015).

The results propose that there is a positive relationship between E, S, and G ratings and stock return but the outcomes are not consistent across all models and portfolios. This indicates that the relationship between the individual pillars and stock return may be complex and depend on other factors.

Interestingly, the results can suggest that the total ESG score may be a more important determinant of stock returns in mid to low-ESG-rated portfolios, while the individual E, S, and G pillars may be more important determinants of stock returns in middle to high E, S, and G rated portfolios, not the same as for the results Luo (2022) or Zehir & Aybars (2020).

However, there are barely any significant risk factors for the individual pillars, while several findings are observed for the total ESG score.

The most vital discovery among the individual pillars is the results of portfolio 3 in the Fama-French five-factor model for both E and G. The portfolio outperformed the other portfolios in the other model after accounting for the risk factors. This may indicate that the environmental and governance scores of the companies in portfolio 3 positively impacted their financial performance, or that the companies in portfolio 3 had other characteristics that made them perform well in the market. The results also suggest that Portfolio 3 is performing well in terms of environmental and governance but may have varying social performance. This can indicate that the companies have room for improvement in certain areas related to social performance.

However, it is important to keep in mind that the small sample size may have introduced bias into the results.

Table 17. Factor models alpha Sweden E-pillar.

Table 17 presents results of the alphas from the factor models CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Sweden. The data is from Sweden's stock market, and stocks are divided into seven value-weighted portfolios sorted after E pillar score (Portfolio E5: 80-100, Portfolio E4: 60-80, Portfolio E3: 40-60, Portfolio E2: 20-40, Portfolio E1: 0-20, Portfolio E0: 0, and Portfolio 5-1 is a long-short portfolio). The sample period is yearly from December 2015 to December 2022. Parantheses show Standard Error. Significance level: ***, **, * (1%, 5%, 10%).

SWEDEN								
Portfolio		E 5	E 4	E 3	E 2	E 1	E 0	E 5-1
CAPM	Alpha	0,0789	0,0749*	0,1319	0,1781*	0,3401	0,5798	-0,2702
		(0,0491)	(0,03303)	(0,0909)	(0,0897	(0,2029)	(0,45099)	(0,1976)
FF3F	Alpha	0,0904	0,0722	0,1510	0,1771**	0,3073	0,6477	-0,227
		(0,0452)	(0,0406)	(0,0918)	(0,0597)	(0,1899)	(0,5365)	(0,1886)
C4	Alpha	0,2782*	0,1285	0,4712	0,2946	0,0163	2,1105	0,2559
		(0,10901)	(0,1382)	(0,2552)	(0,1966)	(0,6411)	(1,6536)	(0,5912)
FF5F	Alpha	0,0709	0,0155	0,0664	0,1260	-0,0202	-0,1037	0,0769
		(0,08296)	(0,0366)	(0,1323)	(0,0984)	(0,1069)	(0,5539)	(0,1576)
N observations		8	8	8	8	8	8	8

Table 18. Factor models alpha Sweden S-pillar.

Table 18 presents results of the alphas from the factor models CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Sweden. The data is from Sweden's stock market, and stocks are divided into seven value-weighted portfolios sorted after S pillar score (Portfolio S5: 80-100, Portfolio S4: 60-80, Portfolio S3: 40-60, Portfolio S2: 20-40, Portfolio S1: 0-20, Portfolio S0: 0, and Portfolio 5-1 is a long-short portfolio). The sample period is yearly from December 2015 to December 2022. Parantheses show Standard Error. Significance level: ***, **, * (1%, 5%, 10%).

SWEDEN								
Portfolio		S 5	S 4	S 3	S 2	S 1	S 0	S 5-1
CAPM	Alpha	0,0516	0,1481**	0,3775	0,3215*	0,1369	0,6455	-0,0943
		(0,0375)	(0,0547)	(0,27695)	(0,1483)	(0,1175)	(0,6004)	(0,1016)
FF3F	Alpha	0,0590	0,1443*	0,3328	0,2962**	0,1335	0,7532	-0,0846
		(0,0353)	(0,0548)	(0,3096)	(0,0768)	(0,0719)	(0,7025)	(0,0683)
C4	Alpha	0,20504*	0,3593*	-0,2175	0,2415	0,2433	2,6164	-0,0442
		(0,0857)	(0,1397)	(1,0312)	(0,2672)	(0,2427)	(2,1819)	(0,23797)
FF5F	Alpha	0,0573	0,1055	-0,1415	0,1755*	0,2064	-0,2777	-0,1633
		(0,0626)	(0,0896)	(0,1344)	(0,0447)	(0,0998)	(0,6701)	(0,07201)
N observations		8	8	8	8	8	8	8

Table 19. Factor models alpha Sweden G-pillar.

Table 19 presents results of the alphas from the factor models CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Sweden. The data is from Sweden's stock market, and stocks are divided into seven value-weighted portfolios sorted after G pillar score (Portfolio G5: 80-100, Portfolio G4: 60-80, Portfolio G3: 40-60, Portfolio G2: 20-40, Portfolio G1: 0-20, Portfolio G0: 0, and Portfolio 5-1 is a long-short portfolio). The sample period is yearly from December 2015 to December 2022. Parantheses show Standard Error. Significance level: ***, **, * (1%, 5%, 10%).

SWEDEN								
Portfolio		G 5	G 4	G 3	G 2	G 1	G 0	G 5-1
CAPM	Alpha	0,0960	0,129999*	0,1199	0,2151	1,4332	0,6462	-1,3462
		(0,0558)	(0,0595)	(0,0795)	(0,1192)	(1,2629)	(0,6003)	(1,2794)
FF3F	Alpha	0,1064	0,1236	0,1435*	0,1844*	1,1219	0,7536	-1,0256
		(0,0572)	(0,0644)	(0,0565)	(0,0762)	(1,3296)	(0,7025)	(1,3487)
C4	Alpha	0,4154***	0,3401	0,2815	0,2035	-2,5998	2,6175	3,0093
		(0,0672)	(0,1826)	(0,1791)	(0,2666)	(4,0653)	(2,1819)	(4,0306)
FF5F	Alpha	0,1005	0,1268	0,0633	0,0711	-0,7436	-0,2766	0,8298
		(0,1098)	(0,1032)	(0,0606)	(0,0724)	(1,1347)	(0,6707)	(1,2324)
N observations		8	8	8	8	8	8	8

4.3.2 E, S, and G scores and return individual countries

Table 17-28 presents the results of the alphas for the Environmental (E), Social (S), and Governance (G) pillars for the individual countries. Results in Sweden (Table 17, 18, 19) display a few positive and statistically significant alphas in the different factor models and pillars. However, significant alphas are observed the most for the social pillar, which is the opposite of the finding in the Full sample's pillar result. In fact, the social pillar portfolio S2 is the only pillar where we observe significance in the Fama-French five-factor model. The result about social rating giving higher returns is supported by Luo (2022) and Lioui & Tarelli (2022), and can be due e.g., employee satisfaction (Edmans et al., 2014) in Sweden. The full tables of Sweden's value-weighted pillar portfolios can be found in Tables 17A, 18A, and 19A in the appendix. Additionally, Table 17B, 17C, 18B, 18C, 19B, and 19C demonstrate Sweden's pillars equally-weighted.

Table 20. Factor models alpha Denmark E-pillar.

Table 20 presents results of the alphas from the factor models CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Denmark. The data is from Denmark's stock market, and stocks are divided into seven value-weighted portfolios sorted after E pillar score (Portfolio E5: 80-100, Portfolio E4: 60-80, Portfolio E3: 40-60, Portfolio E2: 20-40, Portfolio E1: 0-20, Portfolio E0: 0, and Portfolio 5-1 is a long-short portfolio). The sample period is yearly from December 2015 to December 2022. Parantheses show Standard Error. Significance level: ***, **, * (1%, 5%, 10%).

DENMARK								
Portfolio		E 5	E 4	E 3	E 2	E 1	E 0	E 5-1
CAPM	Alpha	0,0254	0,0059	-0,0063	-0,0018	0,0013	-0,0092	0,0151
		(0,0148)	(0,0208)	(0,0127)	(0,0178)	(0,0191)	(0,0274)	(0,0182)
FF3F	Alpha	0,0242	0,0060	-0,0108	-0,0038	0,0011	-0,0201	0,0129
		(0,0145)	(0,0238)	(0,0109)	(0,0212)	(0,0237)	(0,0212)	(0,0161)
C4	Alpha	0,0467	0,0787	-0,0081	0,0759	-0,0442	0,0479	0,08496*
		(0,0488)	(0,0707)	(0,0381)	(0,0561)	(0,0784)	(0,0615)	(0,03501)
FF5F	Alpha	0,0407	0,0064	-0,0177	-0,0193	0,0147	-0,0017	0,0119
		(0,0221)	(0,0457)	(0,0195)	(0,0301)	(0,0407)	(0,03496)	(0,0301)
N observations		8	8	8	8	8	8	8

Table 21. Factor models alpha Denmark S-pillar.

Table 21 presents results of the alphas from the factor models CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Denmark. The data is from Denmark's stock market, and stocks are divided into seven value-weighted portfolios sorted after S pillar score (Portfolio S5: 80-100, Portfolio S4: 60-80, Portfolio S3: 40-60, Portfolio S2: 20-40, Portfolio S1: 0-20, Portfolio S0: 0, and Portfolio 5-1 is a long-short portfolio). The sample period is yearly from December 2015 to December 2022. Parantheses show Standard Error. Significance level: ***, **, * (1%, 5%, 10%).

DENMARK								
Portfolio		S 5	S 4	S 3	S 2	S 1	S 0	S 5-1
CAPM	Alpha	0,1525	0,1767*	0,1905	0,3625*	0,1156	0,0963	0,0279
		(0,0945)	(0,0777)	(0,13295)	(0,1862)	(0,1047)	(0,0509)	(0,1242)
FF3F	Alpha	0,1708	0,1535**	0,1599	0,3199	0,1394	0,1429	0,0213
		(0,1026)	(0,0354)	(0,1253)	(0,1735)	(0,0752)	(0,0737)	(0,1448)
C4	Alpha	-0,0343	0,0630	0,2803	-0,2700	0,2073	0,1515	-0,2476
		(0,3369)	(0,1112)	(0,4327)	(0,4895)	(0,26032)	(0,2583)	(0,4801)
FF5F	Alpha	0,0727	0,1435**	-0,0174	0,1291	0,1520	0,0543	-0,0934
		(0,1188)	(0,0163)	(0,1553)	(0,1758)	(0,1216)	(0,0447)	(0,1603)
N observations		8	8	8	8	8	8	8

Table 22. Factor models alpha Denmark G-pillar.

Table 22 presents results of the alphas from the factor models CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Denmark. The data is from Denmark's stock market, and stocks are divided into seven value-weighted portfolios sorted after G pillar score (Portfolio G5: 80-100, Portfolio G4: 60-80, Portfolio G3: 40-60, Portfolio G2: 20-40, Portfolio G1: 0-20, Portfolio G0: 0, and Portfolio 5-1 is a long-short portfolio). The sample period is yearly from December 2015 to December 2022. Parantheses show Standard Error. Significance level: ***, **, * (1%, 5%, 10%).

DENMARK								
Portfolio		G 5	G 4	G 3	G 2	G 1	G 0	G 5-1
CAPM	Alpha	0,1692*	0,26004*	0,0966	0,10001**	0,3602	0,1751	-0,19996
		(0,0822)	(0,1095)	(0,08895)	(0,0383)	(0,2334)	(0,0935)	(0,1695)
FF3F	Alpha	0,1498**	0,2399	0,0831	0,0944**	0,2881	0,1370	-0,1488
		(0,0496)	(0,1159)	(0,0957)	(0,0312)	(0,1689)	(0,0708)	(0,1446)
C4	Alpha	-0,0557	-0,0292	-0,2252	0,1864	0,4351	0,1645	-0,5139
		(0,1185)	(0,3689)	(0,2748)	(0,0931)	(0,5815)	(0,2461)	(0,4548)
FF5F	Alpha	0,2044	0,0664	-0,0491	0,0909	0,4107	0,0543	-0,2205
		(0,0743)	(0,1168)	(0,1202)	(0,0465)	(0,1802)	(0,0447)	(0,1726)
N observations		8	8	8	8	8	8	8

The results for Denmark (Table 20, 21 and 22) display the same tendency as Sweden, where a positive and statistically significant alpha is observed in the Fama-French five-factor model

portfolio S4 for the social pillar. No significant alphas are observed in this model for the governance pillar. However, positive and significant alphas are spotted in the CAPM and Fama-French-three-factor model, which is in line with findings from Cremers & Nair (2005) and Zehir & Aybars (2020). The environmental pillar displays no significance for any of the portfolios across all models. Although the results indicate that the social pillar matters the most for Denmark, there is an interesting finding in the environmental pillar in Carhart's four-factor model. The long-short portfolio is positive and statistically significant, as observed in Luo (2022). The full tables of Denmark's value-weighted and equally weighted portfolios can be found in the appendix (E-pillar Table 20A-C, S-pillar Table 21A-C, and G-pillar 22A-C).

Table 23. Factor models alpha Norway E-pillar.

Table 23 presents results of the alphas from the factor models CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Norway. The data is from Norway's stock market, and stocks are divided into seven value-weighted portfolios sorted after E pillar score (Portfolio E5: 80-100, Portfolio E4: 60-80, Portfolio E3: 40-60, Portfolio E2: 20-40, Portfolio E1: 0-20, Portfolio E0: 0, and Portfolio 5-1 is a long-short portfolio). The sample period is yearly from December 2015 to December 2022. Parantheses show Standard Error. Significance level: ***, **, * (1%, 5%, 10%).

NORWAY								
Portfolio		E 5	E 4	E 3	E 2	E 1	E 0	E 5-1
CAPM	Alpha	0,113**	0,1148	0,1971***	0,2114*	0,0705	0,3592**	0,0335
		(0,0453)	(0,0909)	(0,0248)	(0,1067)	(0,0668)	(0,1075)	(0,0646)
FF3F	Alpha	0,1074**	0,1317	0,2005***	0,1955*	0,0571	0,3309**	0,0402
		(0,0371)	(0,0867)	(0,0288)	(0,0742)	(0,0733)	(0,1137)	(0,0455)
C4	Alpha	0,0430	-0,0740	0,1776	0,5877**	0,1263	0,3792	-0,0893
		(0,12399)	(0,2765)	(0,10002)	(0,1008)	(0,2533)	(0,3972)	(0,1384)
FF5F	Alpha	0,1448***	0,0789	0,1774**	0,2412	0,1175	0,4311	0,0131
		(0,0048)	(0,1046)	(0,0372)	(0,1337)	(0,0588)	(0,1953)	(0,0634)
N observations		8	8	8	8	8	8	8

Table 24. Factor models alpha Norway S-pillar.

Table 24 presents results of the alphas from the factor models CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Norway. The data is from Norway's stock market, and stocks are divided into seven value-weighted portfolios sorted after S pillar score (Portfolio S5: 80-100, Portfolio S4: 60-80, Portfolio S3: 40-60, Portfolio S2: 20-40, Portfolio S1: 0-20, Portfolio S0: 0, and Portfolio 5-1 is a long-short portfolio). The sample period is yearly from December 2015 to December 2022. Parantheses show Standard Error. Significance level: ***, **, * (1%, 5%, 10%).

NORWAY								
Portfolio		S 5	S 4	S 3	S 2	S 1	S 0	S 5-1
CAPM	Alpha	0,0918*	0,1835***	0,1565	0,2997**	0,0298	0,3738**	0,0531
		(0,0456)	(0,0442)	(0,0885)	(0,1201)	(0,0441)	(0,1123)	(0,0633)
FF3F	Alpha	0,0968*	0,191**	0,1647	0,2903	0,0404	0,3439**	0,0462
		(0,03996)	(0,0424)	(0,0802)	(0,1426)	(0,0479)	(0,1183)	(0,0702)
C4	Alpha	0,2344	0,2083	0,2772	0,7288	0,2211	0,3870	0,0074
		(0,1119)	(0,1481)	(0,2726)	(0,4215)	(0,1265)	(0,4138)	(0,24499)
FF5F	Alpha	0,0377	0,21003*	0,0333	0,4367	0,0980	0,4489	-0,0744
		(0,0402)	(0,0638)	(0,0306)	(0,2072)	(0,06898)	(0,2031)	(0,0329)
N observations		8	8	8	8	8	8	8

Table 25. Factor models alpha Norway G-pillar.

Table 25 presents results of the alphas from the factor models CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Norway. The data is from Norway's stock market, and stocks are divided into seven value-weighted portfolios sorted after G pillar score (Portfolio G5: 80-100, Portfolio G4: 60-80, Portfolio G3: 40-60, Portfolio G2: 20-40, Portfolio G1: 0-20, Portfolio G0: 0, and Portfolio 5-1 is a long-short portfolio). The sample period is yearly from December 2015 to December 2022. Parantheses show Standard Error. Significance level: ***, **, * (1%, 5%, 10%).

NORWAY								
Portfolio		G 5	G 4	G 3	G 2	G 1	G 0	G 5-1
CAPM	Alpha	0,1661	0,1653***	0,1550	0,1857	0,1694	0,3738**	-0,0122
		(0,088)	(0,0272)	(0,0857)	(0,1089)	(0,1199)	(0,1123)	(0,1909)
FF3F	Alpha	0,1846**	0,1639***	0,1284	0,1954	0,1644	0,3439**	0,01002
		(0,0533)	(0,0289)	(0,0651)	(0,1242)	(0,12805)	(0,1183)	(0,1651)
C4	Alpha	0,2747	0,2533*	0,4771***	0,2013	-0,1588	0,3870	0,4275
		(0,1783)	(0,0854)	(0,0815)	(0,4351)	(0,4028)	(0,4138)	(0,51897)
FF5F	Alpha	0,1328	0,1753**	0,1162	0,2850	0,1747	0,4489	-0,0561
		(0,0622)	(0,0311)	(0,1256)	(0,1259)	(0,0632)	(0,2031)	(0,0739)
N observations		8	8	8	8	8	8	8

In Norway (Table 23, 24, 25), significant and positive alphas are observed in the Fama-French five-factor model for all three pillars, portfolio E5, E3, S4 and G4. Norway is the country with the most significant alphas compared to the rest of the countries. Further, the environmental pillar excels with the most positive and significant alphas throughout models, similar to the study of (Clark et al., 2015). Implying that environmental factors matter the most for excess returns in Norway, followed closely by the other pillars. In addition, Table 23A in the appendix display that all the risk factors in Portfolio 5 are statistically significant for the environmental pillar in the Fama-French five-factor model. R^2 and Adjusted R^2 are 1,00 and 0,99. This implies that the model almost perfectly fits the data and explains nearly 100% of the variance in stock returns while accounting for market risk, size, value, profitability, and investment. However, the results need to be interpreted with caution because of the chances of small sample bias. The full tables of Norway's value-weighted and equally-weighted portfolios can be found in the appendix (E-pillar Table 23A-C, S-pillar Table 24A-C, and G-pillar 25A-C).

Table 26. Factor models alpha Finland E-pillar.

Table 26 presents results of the alphas from the factor models CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Finland. The data is from Finland's stock market, and stocks are divided into seven value-weighted portfolios sorted after E pillar score (Portfolio E5: 80-100, Portfolio E4: 60-80, Portfolio E3: 40-60, Portfolio E2: 20-40, Portfolio E1: 0-20, Portfolio E0: 0, and Portfolio 5-1 is a long-short portfolio). The sample period is yearly from December 2015 to December 2022. Parantheses show Standard Error. Significance level: ***, **, * (1%, 5%, 10%).

		FINLAND						
Portfolio		E 5	E 4	E 3	E 2	E 1	E 0	E 5-1
CAPM	Alpha	0,0606	0,1629**	0,1581	0,1650	0,0416	0,235996*	0,00996
		(0,0389)	(0,0575)	(0,0839)	(0,2518)	(0,1282)	(0,1149)	(0,1194)
FF3F	Alpha	0,0636	0,1461**	0,1451	0,2000	0,0003	0,2084*	0,0532
		(0,04705)	(0,0354)	(0,0841)	(0,3021)	(0,1224)	(0,0914)	(0,1003)
C4	Alpha	0,30302**	0,2032	0,2749	0,9946	0,2945	0,3901	0,0026
		(0,0758)	(0,1191)	(0,2837)	(0,9404)	(0,3893)	(0,3003)	(0,3501)
FF5F	Alpha	0,0221	0,1412	0,1285	-0,2000	-0,1523	0,1281	0,1603*
		(0,0801)	(0,0568)	(0,0997)	(0,29705)	(0,07303)	(0,1545)	(0,04396)
N observations		8	8	8	8	8	8	8

Table 27. Factor models alpha Finland S-pillar.

Table 27 presents results of the alphas from the factor models CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Finland. The data is from Finland's stock market, and stocks are divided into seven value-weighted portfolios sorted after S pillar score (Portfolio S5: 80-100, Portfolio S4: 60-80, Portfolio S3: 40-60, Portfolio S2: 20-40, Portfolio S1: 0-20, Portfolio S0: 0, and Portfolio 5-1 is a long-short portfolio). The sample period is yearly from December 2015 to December 2022. Parantheses show Standard Error. Significance level: ***, **, * (1%, 5%, 10%).

FINLAND								
Portfolio		S 5	S 4	S 3	S 2	S 1	S 0	S 5-1
CAPM	Alpha	0,0509*	0,2037*	0,0998	0,1486	0,1089	0,1982*	-0,0670
		(0,0254)	(0,0881)	(0,0625)	(0,1313)	(0,2108)	(0,0913)	(0,1992)
FF3F	Alpha	0,0531	0,2013	0,0981	0,1620	0,0778	0,1725**	-0,0348
		(0,03002)	(0,1087)	(0,0752)	(0,1377)	(0,2397)	(0,0593)	(0,2251)
C4	Alpha	0,1808*	0,6118	0,2700	0,0792	0,9523	0,1749	-0,7774
		(0,0705)	(0,2866)	(0,2416)	(0,4798)	(0,6476)	(0,2079)	(0,64496)
FF5F	Alpha	0,0169	0,1134	-0,0139	0,1971	-0,0845	0,1386	0,0872
		(0,0449)	(0,1793)	(0,0742)	(0,0888)	(-0,0845)	(0,0987)	(0,2588)
N observations		8	8	8	8	8	8	8

Table 28. Factor models alpha Finland G-pillar.

Table 28 presents results of the alphas from the factor models CAPM (Capital Asset Pricing Model), FF3F (Fama-French three-factor), C4 (Carhart's four-factor), and FF5F (Fama-French five-factor) for Finland. The data is from Finland's stock market, and stocks are divided into seven value-weighted portfolios sorted after G pillar score (Portfolio G5: 80-100, Portfolio G4: 60-80, Portfolio G3: 40-60, Portfolio G2: 20-40, Portfolio G1: 0-20, Portfolio G0: 0, and Portfolio 5-1 is a long-short portfolio). The sample period is yearly from December 2015 to December 2022. Parantheses show Standard Error. Significance level: ***, **, * (1%, 5%, 10%).

FINLAND								
Portfolio		G 5	G 4	G 3	G 2	G 1	G 0	G 5-1
CAPM	Alpha	0,0647	0,16599**	0,1377*	0,1889	0,0643	0,1982*	-0,0087
		(0,0469)	(0,0658)	(0,0637)	(0,1101)	(0,0554)	(0,0913)	(0,0896)
FF3F	Alpha	0,0749	0,1434**	0,1248	0,1861	0,0526	0,1725**	0,0122
		(0,0523)	(0,0373)	(0,0717)	(0,1375)	(0,0515)	(0,0593)	(0,0949)
C4	Alpha	0,2912	0,2028	0,2556	0,5051	0,0065	0,1749	0,2788
		(0,1268)	(0,1255)	(0,2381)	(0,4404)	(0,1782)	(0,2079)	(0,2898)
FF5F	Alpha	0,0232	0,1221	0,0836	0,0026	0,11796*	0,1386	-0,1089
		(0,0859)	(0,0676)	(0,1045)	(0,1824)	(0,0399)	(0,0987)	(0,1117)
N observations		8	8	8	8	8	8	8

Results for Finland (Table 26, 27, 28) display some positive and significant alphas through models and pillars. However, alpha is only statistically significant in the Fama-French five-factor model for the governance portfolio G1. On the other hand, there is an interesting

observation in the long-short portfolio in the environmental pillar. The long-short portfolio is positive and statistically significant in the Fama-French five-factor model, which is in line with previous research by Luo (2022). The risk factors MktRF, SMB, HML, and CMA are additionally significant (Table 26A in the appendix). This implies that investing in companies with high ESG scores for the environmental pillar and shorting companies with low ESG scores for the same pillar may be profitable. The significant returns of the portfolio are most likely due to market, size, value, and investment factors, rather than profitability. The full tables of Finland's value-weighted and equally-weighted portfolios can be found in the appendix (E-pillar Table 26A-C, S-pillar Table 27A-C, and G-pillar 28A-C).

When analyzing results from both the Full sample and the individual countries, there is evidence that the individual Environmental, Social, and Governance scores produce excess returns over market. Therefore, we can confirm Hypothesis 3, that *Ratings in each subcategory Environmental, Social, and Governance are positively related to stock return*. This is in line with Carpenter & Wyman (2009), and Clark et al. (2015).

Regarding individual environmental, social, and governance pillars, our study reveals different results between the countries. It suggests that the social pillar matters more in Sweden and Denmark, the environmental pillar matters more in Norway, and the governance pillar matters more in Finland. The latter is in line with the results for the Full sample.

The diverse results across countries might be explained by a variety of factors, including regulatory frameworks, cultural norms, and economic conditions. This finding is consistent with the stakeholder theory, which posits that firms operate within a complex network of stakeholders who influence their strategic decisions and performance outcomes (Sassen et al., 2016).

Our analysis reveals one positive and statistically significant long-short portfolio for Finland for the environmental pillar in the Fama-French five-factor model. The fact that investors in Finland may be able to generate higher returns by taking both long and short positions in companies with high and low environmental scores proposes that there may be a significant difference in the performance of companies with high versus low E scores. Implying that investors are better off investing in companies with high environmental scores. The link

between stock returns and environmental scores is also observed in Clark et al. (2015). We think it can be due to that environmental factors tend to have more visible results, as discovered by Friede et al. (2015). Ni & Sun (2023) suggest that companies get more attention in the E category, making it more feasible. Finland and Denmark's ranking on the UN's ESG score list also indicates that excelling in environmental issues can be profitable for investors, as Sachs et al. (2022) found. This implies that Swedish and Norwegian companies should invest more in environmental issues.

Finally, it is worth noting that the conclusions drawn from this hypothesis are limited by the small sample size, and future research with larger sample sizes is recommended to confirm and extend these findings.

5. Conclusion and implications

We study how ESG scores are related to the risk and return of stocks in the Nordic countries in the time period 2015 to 2022. The results do not exhibit abnormal returns for the long-short ESG portfolio for the Full sample in CAPM, Fama-French three-factor model, Carhart, and Fama-French five-factor model. The same results are held for each country separately. Hence, we find no evidence that companies with a high ESG score are related to higher stock returns.

The Full sample reveals lower total risk for companies with high ESG scores and a negative Value-at-Risk for all ESG portfolios. A lower systematic risk is found for the high-ESG portfolio compared to the low-ESG portfolio, but including the non-ESG portfolio makes the relation unclear. In total, high ESG scores give better preparation for shock in the market. On the other hand, the individual countries demonstrate contrasting answers. The relationship between risk and ESG is mostly positive but also mixed.

Our study also finds that ratings in each subcategory environmental, social, and governance are positively related to stock return for both the Full sample and individual countries. Specifically, the governance pillar exhibits the strongest relationship in the Full sample, but this varies across countries.

This research bridges the gap between understanding the ESG relationship to the risk and return of stocks in the Nordic market. Thus, answering the research question. Our thesis contributes to the literature by adding to the limited research on the Nordic market, providing insights for investors seeking to incorporate ESG in investment decisions, and can help in the further development of sustainable and responsible investment practices in this market.

The results suggest that ESG scores can be a valuable tool for investors seeking to predict the risk and return of stocks, implicating investors to reflect on different firms' ESG scores when taking investment decisions and thinking about a diverse portfolio for less sensitivity to shock in the market. Furthermore, our findings suggest that ESG scores may be a suitable indicator in financial analyses and policy formation. Finally, our research has practical

implications for managers and boards seeking to integrate stakeholders' interests into corporate decisions.

Future studies can compare the Nordic market to the European or U.S. market to gain a deeper understanding of why Nordic countries excel in ESG-related activities. It can also be interesting to further study idiosyncratic risk. Additionally, further research should aim to use a larger and more diverse sample.

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