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The Impact of ESG Performance on Stock Returns: Nordic Countries

School of Accounting and Finance
Master's Thesis in Finance
Master's Degree Programme in Finance

Vaasa 2026

UNIVERSITY OF VAASA
School of Accounting and Finance
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Title of the thesis: The Impact of ESG Performance on Stock Returns: Nordic Countries
Degree: Master of Finance
Discipline: Finance
Supervisor: Rizwan Ahmed
Year: 2026 **Pages:** 67

ABSTRACT:
This thesis investigates the relationship between Environmental, Social, and Governance (ESG) performance and risk-adjusted stock returns in Nordic equity markets from 2015 to 2024. Drawing on firm-level ESG scores from LSEG Workspace and market data for publicly listed non-financial firms in Denmark, Finland, Norway, and Sweden, the study constructs ESG-based portfolios and evaluates their performance using the Capital Asset Pricing Model (CAPM), the Fama-French three-factor model, and the Fama-French five-factor model. To assess whether market stress alters the ESG-return relationship, the analysis distinguishes between non-crisis periods and two crisis episodes: the COVID-19 pandemic (2020-2021) and the European energy crisis (2022-2023). The results show that high ESG portfolios do not generate superior risk-adjusted returns relative to low ESG portfolios, and the High-Low ESG strategy produces a negative alpha across the main specifications. Pillar-level analysis reveals heterogeneous effects, with the social pillar exhibiting the strongest negative association with risk-adjusted returns, a weaker negative effect for the environmental pillar, and no statistically significant effect for governance. Overall, the findings suggest that in advanced sustainability-oriented markets, ESG performance is largely priced by investors and does not generate a positive return premium.

Keywords: Environmental, Social and Governance (ESG), ESG Score, Stock Returns, Nordic Markets, asset pricing, Fama-French, crisis periods, portfolio sorting

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ABBREVIATIONS

ESG	Environmental, Social, and Governance
E	Environmental Pillar
S	Social Pillar
G	Governance Pillar
CSR	Corporate Social Responsibility
SRI	Socially Responsible Investing
MktRF	Market Excess Return
CAPM	Capital Asset Pricing Model
FF3	Fama-French Three-Factor Model
FF5	Fama-French Five-Factor Model
SMB	Small Minus Big
HML	High Minus Low
RMW	Robust Minus Weak
CMA	Conservative Minus Aggressive

1 Introduction

Over the last decade, Environmental, Social, and Governance (ESG) performance has become an essential element of both corporate strategy and investment decision-making. In addition to financial indicators, investors now rely on ESG information to evaluate long-term business resilience, potential risks, and overall corporate behavior. At the same time, whether ESG performance results superior risk-adjusted returns remain contested. Specifically, existing research have reported positive, neutral, and negative relationships between ESG performance and stock returns, depending on market characteristics, time periods, and measurement approaches. This indistinctness motivates an examination in the Nordic region. Therefore, Denmark, Finland, Norway, and Sweden offer a unique setting for this analysis. These Nordic equity markets are characterized by strong institutions, high transparency, and advanced sustainability standards. In Nordic countries, ESG practices are widely adopted and often represent baseline expectations rather than a differentiator. This raises an important question whether ESG performance contains incremental pricing power in equity markets when sustainability is already embedded in business practice.

Despite extensive global research on ESG and financial performance, empirical evidence from Nordic equity markets remains comparatively limited and mixed. The role of ESG during periods of market stress is even less clear. Crisis periods may alter how investors interpret ESG information, as firms with stronger stakeholder relationships and credible disclosures may be perceived as more resilient. However, in markets with strong institutional frameworks and widespread ESG adoption, any incremental financial advantage associated with ESG may already be incorporated into prices, reducing its observable impact on returns.

This study examines the relationship between ESG performance and risk-adjusted stock returns in Nordic equity markets from the period 2015 to 2024, covering both crisis and non-crisis periods. The analysis focuses on two major crisis periods: the COVID-19 pandemic (2020-2021) and the European energy crisis (2022-2023). Composite ESG scores, individual pillars score, market capitalization, and stock market data for publicly listed

non-financial firms in Denmark, Finland, Norway, and Sweden are obtained from LSEG Workspace (formerly Refinitiv). Risk-free rates and Fama-French risk factors (MktRF, SMB, HML, RMW, and CMA) are sourced from Kenneth French's European dataset. Methodologically, the empirical analysis is conducted employing annual portfolio sorting and standard asset pricing regression models. Specifically, portfolio returns are evaluated using the Capital Asset Pricing Model (CAPM), the Fama-French three-factor model, and the Fama-French five-factor model. The analysis further examined the environmental, social, and governance pillars separately to account for potential heterogeneity across ESG dimensions.

The thesis addresses three research questions. First, is ESG performance associated with risk-adjusted stock returns in Nordic equity markets over the period 2015-2024? Second, does the relationship between ESG performance and stock returns differ between crisis and non-crisis periods? Third, do the individual ESG pillars-environmental, social, and governance exert differential effects on stock returns? Based on prior literature and the institutional characteristics of Nordic markets, this study proposes three hypotheses. First, firms with higher ESG scores are expected to generate superior risk-adjusted stock returns. Second, the relationship between ESG performance and stock returns is expected to be stronger during crisis periods. Third, the environmental, social, and governance pillars are expected to have distinct effects on stock returns.

The remainder of this thesis is structured as follows. Chapter 2 reviews the relevant literature and discusses key concepts related to ESG and financial performance. Chapter 3 outlines the theoretical framework, and Chapter 4 presents the conceptual framework. Chapter 5 describes the data and methodology, including portfolio construction and factor model specifications. Chapter 6 reports and discusses the empirical results for full sample, crisis and non-crisis subsamples, and pillar-level analyses. Finally, Chapter 7 concludes the study by summarizing the key findings and discussing their implications, limitations, and suggestions for future research.

1.1 Motivation and Context

The Nordic countries-Denmark, Finland, Norway, and Sweden are widely recognized for their strong sustainability practices, transparent governance structures, and high levels of ESG adoption. As a result, ESG factors play a key role in corporate strategy and investment decision-making across the region. However, despite this advanced ESG environment, empirical evidence on whether strong ESG performance improves financial outcomes remains limited and inconclusive. This gap creates a unique research opportunity to examine whether ESG performance provides measurable financial benefits in highly developed and sustainability-oriented markets.

In addition, the occurrence of major economic disruptions, including the COVID-19 pandemic and the European energy crisis, offers an opportunity to evaluate ESG performance under conditions of heightened uncertainty. These periods of market stress allow for an assessment of whether ESG contributes to stock return resilience when firms are exposed to external shocks. By analyzing Nordic firms over a decade-long period, this study contributes to the ESG literature by examining the financial relevance of ESG performance in advanced markets using risk-adjusted asset pricing models and disaggregated ESG pillar analysis.

1.2 Research Problem

Despite the growing integration of Environmental, Social, and Governance (ESG) criteria in investment decision-making, empirical evidence on the relationship between ESG performance and stock returns remains mixed. Prior studies report mixed findings, ranging from positive to neutral and even negative effects, depending on market structure, time horizons, and the ESG measurement methods. These inconsistencies raise fundamental questions about whether ESG performance generates financial value in capital markets or primarily reflects ethical preferences and regulatory compliance. This question is particularly relevant in the Nordic region, where ESG adoption and sustainability standards are widely implemented. Although Nordic firms are regarded as global leaders in responsible business practices, empirical findings on the financial impact of ESG performance

in these markets remain limited and fragmented. Moreover, it is unclear whether the relationship between ESG performance and stock returns varies across different market conditions, especially during periods of heightened uncertainty such as the COVID-19 pandemic or the European energy crisis.

Consequently, the question remains whether ESG performance enhances financial resilience in markets that are already sustainability-oriented, or whether its impact on stock returns diminishes once ESG practices become widespread and institutionalized. Addressing this research problem requires a systematic and risk-adjusted analysis that considers temporal variation and evaluate ESG both as a composite measure and through its individual environmental, social, and governance dimensions.

1.3 Research Questions

From the identified research problem, this study addresses the three research questions. First, is ESG performance associated with risk-adjusted stock returns of publicly listed companies in the Nordic countries over the period 2015-2024? Second, does the relationship between ESG performance and risk-adjusted stock returns vary across different time periods, particularly during the COVID-19 pandemic and the European energy crisis? Third, do the individual ESG pillars - environmental, social and governance - exert differential effects on risk-adjusted stock returns in Nordic countries?

1.4 Research Objectives

To address the stated research questions, this study pursues the objectives to examine the relationship between ESG scores and risk-adjusted stock returns in Nordic markets, to assess how the ESG-stock returns relationship varies across different market conditions, with particular emphasis on crisis periods COVID-19 pandemic and the European energy crisis and finally to analyze the differential impact of the environmental, social, and governance pillars on risk-adjusted stock returns.

1.5 Research Gap and Hypotheses

Although the relationship between ESG performance and financial outcomes has been widely examined, existing findings remain far from conclusive. Prior research across global markets reports positive, neutral, and negative associations between ESG performance and stock returns, often depending on methodological choices, regional characteristics, and differences in ESG rating methodologies (Friede et al., 2015; Billio et al., 2021). These mixed results highlight the challenge of generalizing ESG's financial relevance across different market environments.

A notable gap in the existing literature pertains to the Nordic context. Nordic countries are widely recognized as global leaders in sustainability, characterized by high levels of corporate ESG adoption, strong regulatory frameworks, and strong investor demand for responsible investment. Despite these characteristics, only few empirical studies have systematically examined whether ESG performance accounts for variation in stock returns in Nordic equity markets. Given the advanced and institutionalized nature of ESG practices in this region, the relationship between ESG performance and stock returns may differ from evidence observed in global or U.S. focused studies.

Another important gap in the literature relates to the role of ESG during periods of economic and financial stress. While most of the existing studies focus on normal market conditions, limited research has examined whether ESG performance enhances financial resilience during crisis such as the COVID-19 pandemic or the European energy crisis. Analyzing ESG performance across both crisis and non-crisis periods offers a valuable insight into whether sustainability-related attributes help firms withstand adverse market environments. Finally, the primary reliance on composite ESG scores in prior studies may obscure heterogeneous effects across the environmental, social, and governance pillars. Disaggregating ESG into its individual pillars enables a more nuanced analysis of which aspects of sustainability are most influential for stock market performance in Nordic markets.

Based on these research gaps, the following hypotheses are proposed:

- **Hypothesis 1 (H1):** Firms with higher ESG scores are expected to generate superior risk-adjusted stock returns in Nordic equity markets.
- **Hypothesis 2 (H2):** The relationship between ESG performance and stock returns is expected to differ between crisis and non-crisis periods, with ESG-related effects potentially more pronounced during periods of market stress.
- **Hypothesis 3 (H3):** The environmental, social, and governance pillars are expected to exert distinct effects on stock returns, reflecting differences in their economic roles and stakeholder relevance.

1.6 Limitations of the Study

This study is subject to several limitations. First, the analysis relies on ESG scores provided by LSEG/Refinitiv, which, although widely used in academic research, may not capture all dimensions of ESG performance in Nordic firms. Differences in methodologies across rating agencies further complicate ESG cross-provider comparisons. Second, the sample only includes firms listed in the Nordic stock markets. While this ensures a focused regional perspective, the findings may not be directly generalized to markets with different institutional, cultural, or regulatory environments. Third, the analysis is constrained by data availability and time coverage from 2015 to 2024. ESG disclosures practices have evolved significantly during this period, and changes in definitions or reporting standards may introduce inconsistencies in the data measurement. Moreover, data is not uniformly available for all countries and years, which may affect the robustness of results. Fourth, the CAPM, Fama-French three and five-factor models applied capture traditional risk-return dynamics but may not fully account for emerging market anomalies or investor sentiment effects associated with ESG. Fifth, survivorship bias may influence the findings, as delisted or bankrupt firms are excluded from the dataset, potentially leading to an overestimation of stock performance and ESG effects. Finally, while the study explores crisis periods such as COVID-19 and the European energy crisis, the possibility to isolate ESG effects from other macroeconomic shocks remains challenging, which may affect the interpretation of results.

2 Literature Review

To answer the research question of how ESG performance is related to the risk-adjusted stock return in Nordic markets, it is essential to review the existing literature on Corporate Social Responsibility (CSR), Environmental, Social, and Governance (ESG) practices, empirical evidence on ESG and financial performance in both global and Nordic contexts. This chapter highlights mixed findings on the financial implications of ESG, with evidence of positive, neutral, and negative effects depending on market characteristics, institutional environments, and time periods. With this, research gap was identified related to market context, crisis periods, and ESG pillar level effects, which motivate the empirical analysis in this thesis.

2.1 From Corporate Social Responsibility to ESG

Although this thesis focuses on Environmental, Social, and Governance (ESG) performance, it is useful to briefly consider the concept of Corporate Social Responsibility (CSR), from which the concept of ESG has emerged. CSR generally refers to firms' voluntary efforts to act ethically and responsibly toward society, social welfare, and environmental protection. Early discussions on CSR were strongly influenced by Friedman (1970), who claims that firm's primary objective is to maximize profitability for shareholders and expressed concerns that socially responsible activities could impose additional costs and reduce profitability resulting in lowering the shareholder value. While later research challenged this view by emphasizing the long-term benefits CSR generates for the firms. Studies show that CSR practices can enhance corporate reputation, strengthen relationships with stakeholders, and support long-term sustainability, thereby contributing to firm value over time (Cruz & Boehe, 2010; Kim et al., 2012). These arguments shifted the understanding of CSR debate from a narrow shareholder-focused perception toward a broader stakeholder-oriented view of corporate performance.

According to the World Business Council for Sustainable Development (2000) CSR is defined as a commitment to sustainable economic development that improves the quality

of life for employees, local communities, and society at large. Despite its conceptual foundation importance, CSR is often characterized by qualitative narratives, voluntary initiatives, and firm-specific disclosures. This lack of standardized measurement resulted in limiting its usefulness for systematic financial analysis and cross-firm comparison. Therefore, the development of ESG frameworks represents an evolution of CSR by translating broad social and ethical commitments into measurable and comparable indicators. By providing standardized metrics across environmental, social, and governance dimensions, ESG enables researchers and investors to assess sustainability performance for empirical studies examining the relationship between ESG and financial outcomes. In this sense, ESG builds on the foundations of CSR while offering a more structured and data-driven approach that is better suited to financial market studies.

2.2 Environmental, Social, Governance (ESG)

Building on the earlier concept of Corporate Social Responsibility, Environmental, Social, and Governance (ESG) provides a more structured and data-oriented framework for evaluating corporate sustainability. ESG refers to a set of measurable criteria used to assess firms' environmental practices, social responsibility, and governance structures. ESG frameworks translate sustainability practices into standardized indicators that can be generally incorporated into financial analysis and asset pricing models. Conceptually, ESG is closely related to, but distinct from, Socially Responsible Investing (SRI). SRI primarily reflects investors' ethical values and preference and is often implemented through positive or negative screening of firms or industries. ESG integration, by contrast, focuses on firm-level characteristics that may be financially material and relevant for assessing risk and return. As noted by US SIF (2021), ESG integration has become a core element of modern sustainable investment strategies, combining traditional financial analysis with standardized sustainability metrics.

The increasing importance of ESG in capital markets has led to the development of specialized ESG rating agencies that assess firms' sustainability performance. Prominent data providers include LSEG/Refinitiv, MSCI, EIRIS, and Bloomberg which is also widely

used in subsequent ESG empirical research (Dorfleitner et al., 2015). While the availability of these datasets has enabled large-scale empirical analysis, prior studies emphasize methodological differences across rating agencies which can lead to variation in ESG assessments, raising concerns regarding comparability and measurement consistency. Such differences represent an important consideration in ESG-related financial research.

The significance of ESG is particularly pronounced in the Nordic region, where sustainability standards, regulatory frameworks, and investor awareness are highly developed. In this study, ESG scores are obtained from LSEG ESG (formerly Refinitiv Asset4), selected due to their broad firm coverage, historical depth, and widespread use in academic research. These scores provide the empirical foundation for studying the relationship between ESG performance and risk-adjusted stock returns in Nordic equity markets.

2.3 Global Evidence on ESG and Financial Performance

The relationship between ESG performance and financial outcomes has been extensively examined across global markets, resulting in mixed but increasingly nuanced findings. Friede, Busch, and Bassen (2015) in a comprehensive meta-analysis of more than 2,000 empirical studies, report that majority of the existing research identifies either positive or neutral relationships between ESG performance and corporate financial outcomes. However, the strength and direction of this relationship vary considerably across studies, reflecting differences in geographic regions, industry contexts, methodological approaches, and the ESG measures employed. Several studies highlight the importance of firm-specific and contextual factors in shaping ESG-related financial effects. Khan (2019), using global datasets and factor-based asset pricing models, shows that ESG impacts are strongest when sustainability issues are financially material to a firm's fundamental operations. This finding underlines the role of economic relevance in determining whether ESG information is incorporated into stock prices.

In addition, the context-dependent nature of the ESG-performance relationship is further supported by regional evidence. Shanaev and Ghimire (2022) find that changes in ESG ratings significantly affect stock returns in the United Kingdom, while Zehir and Aybars (2020) report positive relationship between ESG scores and portfolio performance

in European and Turkish markets. The research in an emerging market like South Africa-Johannesburg Stock Exchange, Short and Ndlovu (2025) find that portfolios with higher ESG scores outperformed during the COVID-19 period, suggesting that ESG characteristics may contribute to return resilience during periods of heightened market stress.

A key methodological challenge in the empirical ESG literature relates to the measurement of ESG performance rather than its conceptual definition. Billio et al. (2021) emphasize that substantial methodological differences among major ESG rating agencies such as LSEG/Refinitiv, MSCI, EIRIS, and Bloomberg can result in divergent ESG scores for the same firm. Such inconsistencies complicate cross-study comparisons and empirical efforts to identify a consistent and standardized relationship between ESG performance and stock returns. Moreover, the use of composite ESG scores may conceal heterogeneous effects across environmental, social, and governance pillars, limiting insight into standardized procedures through which ESG characteristics affect financial performance.

More recent studies adopting portfolio-based and factor-adjusted approaches provide further nuance. Teti et al. (2023) analyzed ESG-sorted portfolios across European markets and found that both high and low-ESG portfolios resulted in negative alphas. While some long-short ESG portfolios suggest positive abnormal returns, these effects are generally statistically weak and sensitive to model specification. Fiskerstrand et al. (2020) for the Norwegian market reported similar findings, where ESG-based long-short strategies yield small and statistically insignificant alphas. In contrast, studies from Pástor et al. (2021), Luo (2022), and Ni and Sun (2023) show that high ESG-score rated firms earn lower expected returns than low ESG rated firms.

Overall, the global literature suggests that ESG performance can influence stock returns but that ESG-related return effects are highly dependent on regional context, market structure, firm characteristics, methodological selection, and data reliability. In developed and information-efficient markets, where ESG practices and standards are high and widespread, ESG-related information may already incorporate into prices, limiting its ability to generate abnormal returns. This highlights the importance of region-specific

analyses or research in Nordic region, where ESG adoption is widespread and sustainability standards are well institutionalized. Consequently, the existing literature motivates further investigation into whether ESG performance conveys risk-adjusted returns in Nordic equity markets, particularly across different market conditions and ESG dimensions.

2.4 ESG and Financial Performance in Nordic Countries

Empirical research examining the relationship between ESG performance and financial outcomes in Nordic countries has produced mixed but informative findings. Despite the region's advanced sustainability standards and widespread ESG adoption, existing studies suggest that the financial implications of ESG performance are not uniform across firms, time periods, or ESG dimensions.

Vaihekoski and Yahya (2023) examined publicly listed firms in Finland, Sweden, Norway, and Denmark over the period 2010-2020 and find that both composite ESG scores and individual pillar scores are generally positively associated with firm profitability and valuation. However, their results also indicate heterogeneity across pillars, with the governance dimension exhibiting a negative relationship with profitability. Similarly, Saha and Khan (2024) reported a positive association between ESG integration and corporate financial performance among Nordic firms, highlighting that sustainability-oriented companies tend to outperform similar companies over longer investment periods. Their findings highlighted the role of governance mechanisms in supporting ethical decision-making and efficient resource allocation, reinforcing the importance of ESG in shaping long-term firm value creation.

In contrast, other studies report more neutral or limited financial effects of ESG performance in Nordic markets. Shrestha and Spahiu (2025) examined ESG ratings and stock performance among Nordic firms and found no statistically significant relationship between ESG scores, individual pillars, and short-term stock returns. Their results suggest that in highly efficient markets and widespread sustainability adoption, ESG related in-

formation may already be adjusted into stock prices, resulting in reduction of its incremental explanatory power. Similarly, Bansal, Wu, and Yaron (2022) observed that the performance of socially responsible investment portfolios varies across economic conditions, with stronger performance during expansions and weaker performance during downturns.

Overall, this Nordic based research suggests that ESG performance may impact financial outcomes, but its effects are highly context-dependent and sensitive to market efficiency, firm characteristics, time horizons, and measurement approaches. These mixed findings highlight the need for further research that explicitly accounts for risk adjustment, temporal variation, and heterogeneity across ESG dimensions. Building on this literature, the present study examines the relationship between ESG performance and risk-adjusted stock returns in Nordic equity markets using a portfolio-based asset pricing framework. By employing LSEG ESG data, which offers broad coverage and methodological consistency, and by distinguishing between crisis and non-crisis periods as well as individual ESG pillars, this study aims to provide new evidence on whether ESG performance conveys incremental financial information in a region characterized by sustainability leadership and strong institutional environments.

3. Theoretical Framework

The relationship between ESG performance and financial outcomes can be examined through several complementary theoretical frameworks. This study primarily draws on Stakeholder Theory and Signaling Theory, which together offer a structured explanation of how ESG-related corporate practices may influence firm risk, expected returns, and investor decision-making. Rather than predicting a uniformly positive effect of ESG, these theories highlight potential trade-offs and information channels through which ESG performance is incorporated in stock prices.

3.1 Stakeholder Theory

Stakeholder Theory, introduced by Freeman (1984), argues that firms generate value by effectively managing relationships with a wide range of stakeholders, including employees, customers, suppliers, communities, and regulators. According to this framework, ESG-related initiatives are viewed as strategic investments aimed at maintaining trust, legitimacy, and long-term cooperation with key stakeholder groups.

From a financial perspective, stakeholder-oriented practices can reduce firm-specific risk by lowering regulatory exposure, mitigating reputational damage, and enhancing operational stability. However, these practices may also involve additional costs, such as increased compliance expenditure or investments with uncertain short-term returns. As a result, Stakeholder Theory does not necessarily predict higher stock returns for firms with strong ESG performance. Instead, it suggests a potential risk-return trade-off, whereby improved risk characteristics may be accompanied by lower expected returns, particularly in markets where ESG practices are widely adopted. This trade-off is especially relevant in advanced markets such as the Nordic region, where sustainability standards are high and ESG-related practices may represent baseline expectations rather than sources of competitive advantage. In such contexts, ESG performance may contribute more to risk mitigation and stability than to return enhancement.

The theory further implies that the effects of ESG performance may differ across dimensions. Environmental, social, and governance dimensions engage different stakeholder groups and may therefore influence firm outcomes through different channels. This provides a theoretical basis for examining ESG pillars separately rather than relying solely on composite ESG measures.

3.2 Signaling Theory

Signaling Theory, introduced by Spence (1973), examines how firms communicate information to markets when information asymmetries exist. In capital markets, investors often have limited insight into firms' non-financial characteristics, such as risk management quality, long-term strategic orientation, or ethical standards. Accordingly, ESG performance and disclosure may act as signals through which firms convey aspects of quality and credibility to external stakeholders. From this perspective, strong ESG performance may indicate superior managerial capability, transparency, and long-term commitment to sustainable business practices. These signals can influence investor perceptions of risk and reliability, potentially affecting valuation and cost of capital. However, the signaling value of ESG depends on its credibility and informational content. In the Nordic region whose markets are characterized by strong disclosure requirements and widespread ESG adoption, the incremental information conveyed by ESG signals may be limited as investors already expect firms to meet high sustainability standards.

Signaling Theory also suggests heterogeneity across ESG pillars. Different ESG dimensions convey different types of information to investors, implying that environmental, social, and governance performance may not be equally priced in financial markets. This insight supports a pillar-level analysis of ESG effects on stock returns. Moreover, periods of heightened uncertainty such as economic or financial crisis may amplify the importance of credible ESG signals by reducing investor uncertainty and enhancing perceptions of resilience. However, when ESG information is widely disclosed, standardized,

and already incorporated into stock prices, it signaling value diminishes, limiting its ability to generate abnormal returns even during crisis periods.

Together, Stakeholder Theory and Signaling Theory suggest that ESG performance may affect stock returns through both risk-related and informational channels. These theories do not unambiguously predict a positive ESG return premium but instead motivate empirical testing of whether ESG performance, both overall and across individual pillars, is associated with differential risk-adjusted returns under varying market conditions. Based on these theoretical perspectives, the following chapter presents the conceptual framework that links ESG performance, market conditions, and risk-adjusted stock returns in Nordic equity markets.

4. Conceptual Framework

This study examines the relationship between Environmental, Social, and Governance (ESG) performance and risk-adjusted stock returns in Nordic equity markets. The conceptual framework is grounded in Stakeholder Theory and Signaling Theory, which jointly propose that ESG-related corporate practices influence financial outcomes through risk mitigation, stakeholder relationships, and information disclosure. ESG performance serves as the primary independent variable and is measured using ESG scores from LSEG workspace. Both the composite ESG score and its individual pillars Environmental, Social, and Governance are analyzed to capture potential heterogeneity in the financial performance of different sustainability dimensions. The dependent variable is firms' risk-adjusted stock returns, calculated from annual portfolio returns and evaluated using the Capital Asset Pricing Model (CAPM) and Fama-French three- and five-factor models.

The framework incorporates crisis periods as a moderating factor that may influence the strength and direction of the relationship between ESG performance and stock returns. Crisis periods are operationalized as discrete time intervals corresponding to the COVID-19 pandemic (2020-2021) and the European energy crisis (2022-2023). Empirically, moderation is examined through subsample analyses that compare ESG-related return effects during crisis and non-crisis period, enabling an evaluation of whether ESG performance exhibits differential pricing or resilience under heightened market uncertainty. To isolate the ESG performance effects, the framework controls conventional sources of systematic risk using established asset pricing models. Market risk, size, value, profitability, and investment factors are included to ensure that estimated abnormal returns reflect ESG-related effects rather than exposure to known risk premia.

Overall, this conceptual framework provides a structured link between theory and empirical analysis by specifying how ESG performance, its individual dimensions, and crisis-related market conditions jointly influence risk-adjusted stock returns. It guides hypothesis testing by clarifying the role of ESG as an explanatory variable, crisis periods as a moderator, and asset pricing factors as controls in evaluating financial performance in Nordic markets.

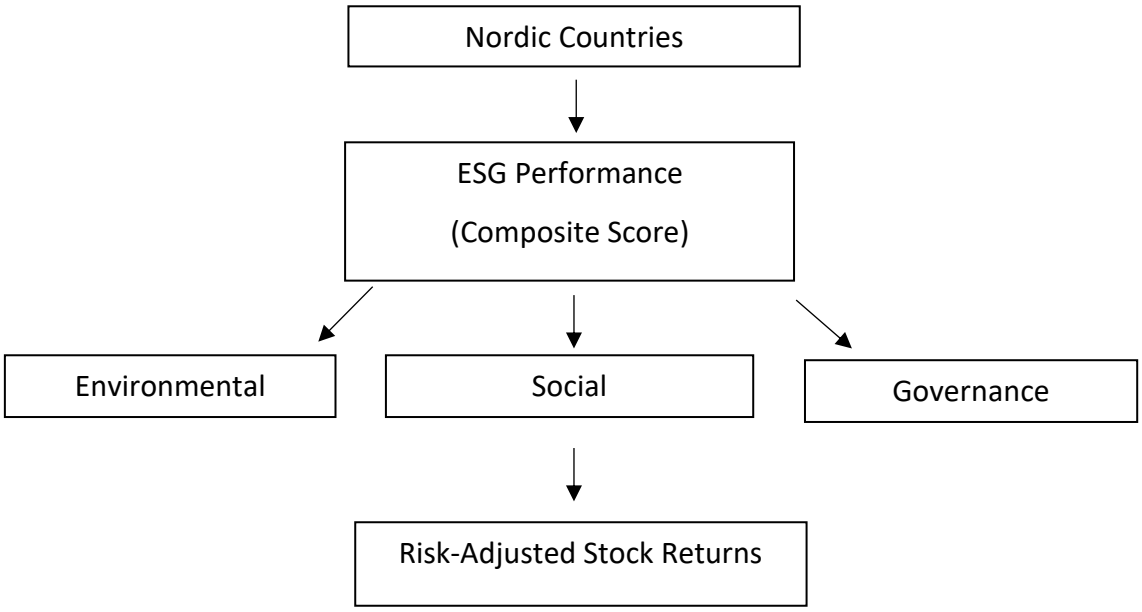

Figure 1 Conceptual Framework

Figure 1 illustrates conceptual framework illustrating the relationship between ESG performance and risk-adjusted stock returns in Nordic markets. ESG performance is analyzed both as a composite score and by individual pillars. Crisis periods (COVID-19 pandemic and European energy crisis) act as moderating factors, while conventional risk factors are controlled for using CAPM and Fama-French asset pricing models.

5. Data and Methodology

This chapter describes the data, sample construction, and empirical methodology used to examine the relationship between ESG performance and risk-adjusted stock returns in Nordic equity markets. The analysis combines firm-level ESG data with stock return and market factor data over the period 2015-2024. ESG performance is evaluated through portfolio sorting and asset pricing regressions using the CAPM and Fama-French multi-factor models. The chapter proceeds by outlining the research design, data sources, sample selection criteria, portfolio construction procedures, and regression-based analysis methods employed to test the study's hypotheses.

5.1 Research Design

This study employs a quantitative research design to examine the relationship between ESG performance and risk-adjusted stock returns in the Nordic region. The analysis focuses on publicly listed non-financial firms in Denmark, Finland, Norway, and Sweden from 2015 to 2024. The research is theoretically grounded in stakeholder theory and signaling theory, which suggests that firms with strong ESG profiles may experience superior financial outcomes through enhanced reputation, stakeholder trust, and reduced risk exposure (Freeman, 1984; Spence, 1973). A quantitative approach is appropriate given the study's objective of evaluating ESG-related return patterns using portfolio-based asset pricing models. The empirical analysis tests three hypotheses developed earlier in the thesis. These hypotheses examine the relationship between ESG performance and risk-adjusted stock returns, the differential effects of the environmental, social, and governance pillars, and lastly whether the ESG-return relationship varies across market conditions, particularly during crisis periods.

5.2 Data Sources

Financial and ESG data for publicly listed non- financial firms in Denmark, Finland, Norway, and Sweden were collected for the period 2015-2024. ESG scores were obtained

from LSEG Workspace and include both the composite ESG score and the individual pillar scores: Environmental (E), Social (S), and Governance (G). LSEG workspace (formerly Refinitiv) data source was selected due to its broad coverage, methodological transparency, and widespread adoption in academic and professional research. The dataset provides consistent, standardized measures of ESG performance across firms and countries, making it particularly suitable for cross-country analysis in the Nordic region. In addition, LSEG ESG scores are primarily based on publicly disclosed and verifiable information, which enhances transparency and reduces subjectivity compared to some alternative ESG data providers such as MSCI or Sustainalytics or Bloomberg. Although LSEG ESG scores are widely used in academic research, it is important to acknowledge that ESG ratings may differ across providers due to variations in methodology and disclosure practices, which can affect comparability. The availability of both composite scores and disaggregated pillar-level data supports the study's objective of examining heterogeneous ESG effects on risk-adjusted returns.

The original ESG data are reported monthly. To ensure consistency with the annual frequency of stock return data, monthly ESG scores along with individual pillars for each firm were averaged over the calendar year, producing annual average ESG, E, S, and G scores. This approach reduces short-term fluctuations arising from reporting timing differences, mitigates measurement noise, and facilitates robust portfolio construction and regression analysis. Stock returns were calculated using adjusted closing prices from the first and last month of each year, reflecting a buy-and-hold investment strategy over the annual period. Market capitalization data was collected annually and used to compute value-weighted portfolio returns, ensuring larger firms have proportionally greater influence on portfolio performance. Equal-weighted returns were also calculated as a robustness check.

To estimate risk-adjusted returns, the analysis incorporates standard asset pricing factors. Annual Risk-free rates and Fama-French factors (MktRF, SMB, HML, RMW, CMA) were sourced from Kenneth French's European dataset and employed within CAPM and Fama-French three and five-factor models. These factors allow for an evaluation of the relationship between ESG performance and stock returns under both normal market

conditions and crisis periods, including the COVID-19 pandemic and the European energy crisis.

5.3 Sample Selection and Screening

This study examines publicly listed non-financial companies in the Nordic countries Denmark, Finland, Norway, and Sweden over the period 2015-2024. The primary selection criterion was the availability of ESG scores, reflecting the study's focus on ESG performance as the key explanatory variable. Firms with available ESG data were subsequently matched with stock price and market capitalization data to enable the calculation of stock returns and portfolio weights.

Firm-year observations were included in the sample if three conditions were satisfied: (i) availability of ESG scores, (ii) availability of stock price data, and (iii) availability of market capitalization data. Observations that did not meet any of these criteria were excluded from the corresponding year's sample only. Financial firms were excluded due to their distinct capital structures and regulatory environments, which may result in systematically different return dynamics (Fama & French, 1992).

All stock prices were adjusted for dividends and stock splits and converted to a common currency to ensure cross-country comparability. Market capitalization was calculated for all firms meeting the data availability requirements and was used to construct value-weighted portfolio returns. The resulting dataset forms an unbalanced panel, as firms may enter or exit the sample across years due to listing changes, delistings, or variations in ESG and financial data availability. This structure is common and methodologically appropriate in financial research and helps reduce survivorship bias by allowing firms to appear in the sample only when relevant data are available (Baltagi, 2021).

Between 2015 and 2024, the annual sample size varied due to changes in ESG coverage and financial data availability across firms and years. Table 1 below summarizes the final cleaned sample sizes used in the empirical analysis.

Table 1 Final Sample Size by Year

Year	Sample Size
2015	121
2016	126
2017	141
2018	218
2019	271
2020	453
2021	461
2022	469
2023	462
2024	237

5.4 Portfolio Construction

To examine the relationship between ESG performance and stock returns, firms were sorted annually based on their annual average ESG scores. Monthly ESG scores were aggregated into annual averages to ensure consistency with annual stock return data and to minimize short-term fluctuations arising from reporting noise. Firms were then ranked and grouped into three ESG-based tercile portfolios based on the rankings, with the top 30% classified as High ESG, the middle 40% Medium ESG, and the bottom 30% as Low ESG. This tercile approach is particularly suitable for the Nordic market where the equity universe is relatively small and diverse. Annual firm counts vary considerably across the sample period, ranging from 121 firms in the early years to 469 firms in later years. Using finer portfolio partitions, such as quintiles or deciles, would have resulted in very small portfolios in several years, reducing statistical reliability and increasing volatility in returns.

Portfolio returns were calculated using value-weighted averages based on firms' market capitalizations, ensuring that the results reflect investor exposure in practice. In addition, a long-short ESG strategy was constructed by taking a long position in the High ESG portfolio and a short position in the Low ESG portfolio, which allows for direct assessment of return differentials associated with ESG performance.

The Nordic equity market is characterized by relatively high and clustered ESG scores, reflecting advanced sustainability practices and strong regulatory standards. This limits cross-sectional variation in ESG performance and further reduces the effectiveness of finer portfolio sorts. Tercile sorting therefore provides a balance between meaningful differentiation in ESG performance and sufficiently large portfolio sizes, ensuring robust portfolio construction and reliable estimation of risk-adjusted returns.

Environmental, Social, and Governance pillar scores often exhibit significant correlation, raising concerns regarding multicollinearity when estimating their individual effects on financial outcomes. To address this issue, the analysis does not include multiple ESG pillars simultaneously within the same regression model. Instead, each pillar is analyzed separately through independent portfolio sorts and asset pricing regressions. To isolate the return effects of each pillar, distinct High-Low portfolios were constructed for the environmental, social, and governance pillars. This approach avoids collinearity among explanatory variables, ensures stable coefficient estimates, and facilitates clearer interpretation of pillar-specific effects. Pairwise correlations among ESG pillars were examined and found to be moderate to high, reinforcing the decision to analyze pillars separately. This methodology is consistent with prior empirical ESG research that emphasizes disaggregated analysis of sustainability dimensions.

5.5 Data Analysis Procedures

Following portfolio construction, the empirical analysis proceeded in three stages. First, descriptive statistics were computed for ESG scores, portfolio returns, and firm characteristics to provide an overview of the sample and ESG-based portfolio properties. Second, risk-adjusted returns were estimated using the CAPM, Fama-French three-factor, and five-factor models. Portfolio alphas were used to evaluate whether ESG performance is associated with abnormal returns after controlling conventional risk factors.
Third, subsample analyses were conducted to compare ESG-related return effects during crisis periods (2020–2023) and non-crisis periods. This approach allows assessment of whether ESG performance exhibits differential pricing under conditions of heightened market uncertainty.

To examine whether ESG performance exhibits differently during periods of heightened market stress, this study explicitly identifies and operationalizes crisis periods based on major exogenous economic disruptions affecting European and Nordic financial markets. Two crisis windows are defined. The first corresponds to the COVID-19 pandemic during 2020-2021, a period reflecting severe market volatility, economic contraction, and unprecedented policy interventions. The second crisis window captures the European energy crisis during 2022-2023, marked by sharp increases in energy prices, inflationary pressures, and heightened geopolitical uncertainty following the Russia-Ukraine conflict. The remaining years in the sample (2015-2019 and 2024) are classified as non-crisis periods and serve as a benchmark for comparison.

Empirically, crisis effects are examined through subsample analyses that compare ESG-related portfolio performance during crisis and non-crisis periods. This approach provides a transparent assessment of whether the relationship between ESG performance and risk-adjusted stock returns differs under conditions of heightened market uncertainty, without imposing additional parametric assumptions.

5.6 Robustness Checks

To ensure the robustness of the empirical findings, several additional analyses were conducted. First, portfolio returns were recalculated using equal-weighted returns as an alternative to the primary value-weighted specification. This test examines whether the results are driven by large firms dominating portfolio performance. The findings remained qualitatively similar, suggesting that the main conclusions are not driven by firm size effects. Detailed results are presented in Appendix A. Second, robustness was evaluated through pillar-level analyses. Separate portfolio constructions and asset pricing regressions were conducted for the Environmental, Social, and Governance dimensions individually. This approach ensures that the findings are not solely driven by the aggregation of ESG components into a composite score and provides insight into whether specific ESG dimensions contribute differently to stock returns. Third, the analysis was conducted separately for crisis and non-crisis periods to verify whether the observed

ESG-related return patterns differ under conditions of heightened market uncertainty. This subsample approach offers an additional robustness check on the sensitivity of ESG effects to periods of heightened uncertainty.

Overall, these robustness checks confirm that the main findings are not dependent on portfolio weighting assumptions, ESG aggregation choices or prevailing market conditions. These results reinforce the validity of empirical approach and suggest that the observed relationship between ESG performance and stock returns is not a distortion of methodological choices or specific market environments. This consistency strengthens confidence in the study's conclusions and supports their relevance for both academic research and practical investment decision making.

5.7 Methodology

To examine the relationship between ESG performance and risk-adjusted stock returns, this study applies three widely recognized asset pricing models: the Capital Asset Pricing Model (CAPM), the Fama-French three-factor model, and the Fama-French five-factor model. To ensure consistency with the annual portfolio return data, risk-free rates and factor data for the mentioned period for the European market were obtained from Kenneth R. French's data library (French, 2023).

These models are particularly appropriate for the Nordic context, as Nordic equity markets are relatively small, highly integrated with European financial markets, and characterized by high transparency and informational efficiency. Building on the baseline of CAPM framework, the Fama-French three-factor model introduces size (SMB) and value (HML) factors, which prior research has shown to be significant in explaining return variation in Nordic equity portfolios (Hoepner & Schopohl, 2018). Extending this approach, the Fama-French five-factor model incorporates profitability (RMW) and investment (CMA) factors, which are especially relevant in Nordic markets given firms' strong governance structures, emphasis on sustainable investment practices, and widespread ESG adoption. By progressively expanding the factor structure, these models enable a more

comprehensive control of traditional risk sources, ensuring that ESG-related return effects are evaluated against a well-specified risk-adjusted benchmark.

Portfolio-level regressions were estimated using these models to obtain abnormal returns (alphas) for ESG-sorted portfolios. These alphas serve as the primary measure of ESG-related financial performance and are used to evaluate whether firms with higher ESG scores generate superior risk-adjusted returns relative to lower-ESG firms. The models are applied across the full sample period as well as across crisis and non-crisis subsamples to assess whether ESG related return effects vary under different market conditions.

5.7.1 Capital Asset Pricing Model (CAPM)

The Capital Asset Pricing Model (CAPM), introduced by Sharpe (1964), provides a foundational framework for understanding the relationship between risk and expected returns. It posits a linear relationship between a portfolio's expected excess return and its exposure to systematic market risk. Its theoretical clarity and empirical tractability, CAPM remains one of the most widely applied models in asset pricing research for estimating risk-adjusted returns (Fama & French, 2004).

In empirical applications, CAPM relates realized portfolio excess returns to the market risk premium, allowing for the estimation of abnormal performance after controlling for market risk. The model is specified as follows.

$R_{it} - R_{ft} = \alpha_{it} + \beta_{it} MktRF_t + e_{it}$

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 (Rmt – Rft) at time t, and e_{it} is the error term for a portfolio i at time t.

In this study, CAPM is estimated using annual portfolio returns alongside European market factors. The resulting alpha coefficient serves as an indicator of whether ESG-sorted portfolios generate abnormal returns beyond what is explained by systematic market risk. This provides a baseline assessment of ESG-related performance before incorporating additional risk factors.

5.7.2 Fama-French Three-Factor Model

Building on the limitations of CAPM, Fama and French (1992) introduced the three-factor model to capture additional sources of return variation beyond market risk. A key insight of this model is that stock returns are not solely influenced by market risk but also by systematic differences related to firm size and book-to-market characteristics. To account for these effects, the model incorporates two additional factors SMB (Small Minus Big) and HML (High Minus Low). The SMB factor reflects the size premium by measuring the return difference between portfolios of small-cap and large-cap firms. The HML factor on the other side captures the value premium by measuring the return difference between portfolios of high book-to-market (value) stocks and low book-to-market (growth) stocks. Thes factors have been shown to play a significant role in explaining cross-sectional return patterns, particularly in markets where size and value effects persist despite high information efficiency.

The three-factor model is expressed as:

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

where R_{it} denotes the return on portfolio i at time t, R_{ft} is the risk-free rate, α_i represents the abnormal return (alpha), MktRF_t is the market risk premium, and SMB_t and HML_t represent the size and value risk factors, respectively. The coefficients β_1, β_2, and β_3 measure the portfolio's exposure to these risk factors.

In this study, the SMB and HML factors are sourced from Kenneth French's European factor dataset (French, 2023). The model is estimated using annual ESG-sorted portfolio excess returns to evaluate whether these portfolios generate abnormal returns after accounting for market, size, and value risks.

5.7.3 Fama-French Five-Factor Model

Fama and French (2015) further extended their earlier three-factor framework by introducing the five-factor model, which adds two additional factors related to profitability and investment. This extension reflects growing evidence that firms' operating profitability and investment behavior systematically affect stock returns beyond market, size, and value effects. The two additional factors are RMW (Robust Minus Weak) and CMA (Conservative Minus Aggressive). The RMW factor captures the return differential between firms with strong profitability and those with weak profitability, while the CMA factor captures the return differential between firms that invest conservatively and those that invest aggressively. Fama and French (2015) show that incorporating these factors improves the model's explanatory power and provides a more comprehensive description of return variation across firms.

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

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

where R_{it} denotes the return on portfolio i at time t, R_{ft} is the risk-free rate, α_i represents the abnormal return (alpha), and MktRF_t, SMB_t, HML_t, RMW_t, and CMA_t represent the market, size, value, profitability, and investment risk factors, respectively. The coefficients β_1 through β_5 measure the portfolio's exposure to each factor.

In this study, the Fama-French five-factor model is estimated using annual ESG-sorted portfolio excess returns and European factor data. The resulting portfolio alphas provides a comprehensive measure of ESG-related abnormal performance after controlling for market, size, value, profitability, and investment risks. Taken together, CAPM, Fama-French three-factor and five factor model enable a layered assessment of ESG effects, progressively accounting for market, size, value, profitability, and investment effects.

6 Results

This chapter presents the empirical findings of the study. The analysis proceeds in several stages. First, descriptive statistics are reported to summarize ESG scores, stock returns, and portfolio characteristics. Second, value-weighted ESG-sorted portfolio returns are examined. Third, risk-adjusted performance is evaluated using CAPM, Fama-French three-factor, and five-factor models. Finally, results are compared across crisis and non-crisis periods and across individual ESG pillars. All regression results are based on annual portfolio returns, which limits the number of time-series observations and constrains statistical inference.

6.1 Descriptive Statistics

This section presents descriptive statistics for ESG scores, stock returns, and market-based variables used in the empirical analysis.

Table 2 Descriptive Statistics

Variable	Mean	Median	St Dev	Min	Max
ESG	52.38	53.63	23.97	1.32	196.62
E	46.44	46.59	29.77	0.00	194.25
S	55.50	57.36	27.35	0.39	227.13
G	52.13	52.28	25.06	1.24	201.96
Return	0.09	0.01	0.63	-1.00	18.06
Market Cap	5389727.76	986861.00	17713344.89	1432.00	418381708.00

Table 2 reports descriptive statistics for ESG scores, stock returns, and key market-based variables for 2,959 firm-year observations from Nordic equity markets during the period 2015-2024. The mean composite ESG score is 52.38, with a median of 53.63, indicating a broadly symmetric distribution of ESG performance across firms. Environmental, Social, and Governance pillar scores exhibit similar dispersion, with standard deviations ranging from 25.06 to 29.77. This suggests meaningful cross-sectional variation in sustainability practices despite the generally high ESG standards that characterize the Nordic markets. Among the individual pillars, the social pillar records the highest average

score of 55.50, reflecting strong labor protections, social welfare systems, and stakeholder-oriented business practices prevalent in the Nordic regions. The wide range of ESG and pillar scores underscores substantial heterogeneity across firms, supporting the use of ESG-based portfolio sorting in subsequent analyses.

Annual stock returns display considerable variability, with a mean of 9.39% and a median of 0.84%, indicating a right-skewed distribution driven by a small number of extremely high-return observations. The large standard deviation of 0.63 further highlights the volatility of equity returns over the sample period. Market capitalization is highly skewed, as evidenced by the large divergence between the mean EUR 5.39 million and median EUR 0.99 million, reflecting the coexistence of a few very large firms alongside many smaller firms. This pronounced size dispersion reinforces the need for value-weighted portfolio returns and controls for firm size in asset pricing models. Overall, the descriptive statistics reveal sufficient variation in ESG scores, stock returns, and firm size to justify meaningful portfolio construction and regression-based analysis of ESG-related return differences.

6.2 Descriptive Statistics by Portfolio

This section reports descriptive statistics for firms sorted into ESG-based portfolios, providing insight into differences in firm size, ESG performance, and raw returns across portfolios.

Table 3 Descriptive Statistics by Portfolio

Portfolio Group	Average of Market Cap	Average of Avg ESG score	Average of Return	Observations (N)
High	13478383.78	77.67	0.06	889.00
Low	849820.38	26.79	0.11	888.00
Medium	2716819.59	52.58	0.11	1182.00

Table 3 summarizes pooled firm-year observations from 2015-2024, grouping firms into High, Medium, and Low ESG portfolios based on annual ESG score terciles. The average

ESG score increases monotonically from 26.79 in the Low ESG portfolio to 52.58 in the Medium ESG portfolio and 77.67 in the High ESG portfolio, confirming that the sorting procedure effectively differentiates firms based on ESG performance. This monotonic pattern validates the construction of ESG-based portfolios used in subsequent analyses. Substantial differences in firm size are also observed across ESG portfolios. Firms in the High ESG portfolio are considerably larger, with an average market capitalization of EUR 13.48 million, compared to EUR 2.72 million for Medium ESG firms and EUR 0.85 million for Low ESG firms. This pattern suggests a strong positive association between firm size and ESG performance in Nordic equity markets and reinforces the need for value-weighted portfolio returns and size controls in the asset pricing models.

In terms of raw returns, the Low and Medium ESG portfolios exhibit higher average returns of 11% than the High ESG portfolio average of 6%. However, these unconditional return differences do not account for systematic differences in firm size, risk exposure, or broader market conditions. Consequently, raw returns alone are insufficient to draw conclusions about the financial implications of ESG performance. The subsequent analysis therefore focuses on portfolio-level, risk-adjusted returns estimated using CAPM and Fama-French multi-factor models to assess whether ESG performance is associated with abnormal stock returns after controlling for conventional risk factors.

6.3 Mean and Standard Deviation of Value-Weighted Portfolio Returns

This section summarizes the mean and volatility of value-weighted ESG portfolio returns to provide an initial assessment of return patterns prior to risk adjustment.

Table 4 Mean and Standard Deviation of VW Portfolio Returns

Portfolio	Mean Return	St.Dev
High ESG	0.10	0.12
Medium ESG	0.16	0.21
Low ESG	0.27	0.26
High-Low	-0.17	0.25

Table 4 presents summary statistics for ESG-sorted portfolio over the period 2015-2024. The Low ESG portfolio records the highest average annual return of 27%, but also exhibits the highest return volatility, with a standard deviation of 0.26. In contrast, the High ESG portfolio generates a lower average return of 10% alongside substantially lower volatility of 0.12, indicating a more stable return profile. The Medium ESG portfolio falls between these extremes, with an average return of 16% and volatility of 0.21. These patterns suggest a trade-off between return and risk across ESG categories, where lower ESG firms deliver higher raw returns at the cost of increased volatility.

The High-Low ESG portfolio shows a negative average return of -17% and considerable volatility of 0.25, indicating that, on an unconditional basis, firms with higher ESG scores underperform those with lower ESG scores during the sample period. However, these raw return differences do not account for systematic risk exposures or firm characteristics such as size, value, profitability, and investment behavior. Overall, the result suggests that observed return gaps may reflect underlying risk factors rather than ESG performance itself, underscoring the importance for risk-adjusted analysis using CAPM and Fama-French multi-factor models in the subsequent regression framework.

6.4 Capital Asset Pricing Model (CAPM) Result

This section reports CAPM time-series regression results for the value-weighted High-Low ESG portfolio over the period 2015-2024. The regression is specified as:

$$(R_t^{H-L} - R_{f,t}) = \alpha + \beta \cdot \text{MktRF}_t + \varepsilon_t$$

Table 5 CAPM Result for the High-Low ESG Portfolio

Regression Statistics	
Multiple R	0.09133123
R Square	0.00834139
Adjusted R Square	-0.11561593
Standard Error	1.96314874
Observations	10

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.259342	0.259342	0.067292	0.801871104
Residual	8	30.83162	3.853953		
Total	9	31.09097			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-1.93006063	0.654872	-2.94723	0.018504	-3.44019783	-0.41992	-3.4402	-0.41992
MktRf	0.01087255	0.041913	0.259408	0.801871	-0.085778901	0.107524	-0.08578	0.107524

Table 5 presents the CAPM regression results for the High-Low ESG value-weighted portfolio. The estimated intercept (alpha) is -1.93 and statistically significant at the 5% level ($p = 0.019$). Since portfolio returns are expressed in percentage terms, this result indicates that the High ESG portfolio underperforms the Low ESG portfolio by approximately 1.9 percentage points per year on a risk-adjusted basis when controlling only for market risk. The estimated market beta value is 0.011 and is statistically insignificant, suggesting that the return differential between High and Low ESG firms is not driven by exposure to overall market movements. This finding aligns with the market-neutral nature of the long-short ESG strategy.

The explanatory power of the CAPM is very low, with an R^2 of 0.008, suggesting that market risk explains little of the variation in the ESG long-short portfolio's returns. This

highlights the limitations of the single-factor CAPM in explaining ESG-related return dynamics and motivates the use of multi-factor asset pricing models. Accordingly, the subsequent analysis employs Fama-French three-factor and five-factor models to assess whether the negative ESG-related alpha persists after controlling for additional sources of systematic risk.

6.5 Fama and French Three Factor Result

This section reports the results of Fama-French three factor regression for the value weighted High-Low portfolio over the period 2015-2024. The regression is specified as:

$\left(R_t^{H-L} - R_{f,t}\right) = \alpha + \beta_1 \text{MktRF}_t + \beta_2 SMB_t + \beta_3 HML_t + \varepsilon_t$

Table 6 Fama-French Three-Factor Regression Results for High-Low ESG Portfolio

Regression Statistics	
Multiple R	0.677168
R Square	0.458556
Adjusted R Square	0.187835
Standard Error	1.675013
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	14.25696	4.752321	1.693829	0.266601
Residual	6	16.834	2.805667		
Total	9	31.09097			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-1.93182	0.559323	-3.45385	0.013569	-3.30043	-0.5632	-3.30043	-0.5632
MktRf	-0.01224	0.037801	-0.32381	0.75707	-0.10474	0.080255	-0.10474	0.080255
SMB	0.229989	0.10907	2.108641	0.079522	-0.0369	0.496873	-0.0369	0.496873
HML	0.0439	0.051727	0.848681	0.428613	-0.08267	0.170472	-0.08267	0.170472

With reference to Table 6, the estimated intercept (alpha) is -1.93 and statistically significant at the 5% level (p = 0.014), indicating that firms with higher ESG scores underperform firms with lower ESG scores by approximately 1.9 percentage points per year on a risk-adjusted basis, even after controlling for market, size, and value factors.

The loading on the market factor (MktRF) remains small and statistically insignificant, reinforcing the CAPM finding that the ESG return differential is not driven by overall market movements. The size factor (SMB) shows a positive coefficient of 0.23 and marginally significant (p = 0.080), indicating that the ESG long-short portfolio tilts toward small-cap stocks. This result is consistent with descriptive evidence that low ESG firms tend to be smaller than high ESG firms. In contrast, the value factor (HML) loading is positive but statistically insignificant, implying that value characteristics do not play a significant role in explaining the ESG return spread.

The model explains approximately 46% of the variation in the ESG portfolio returns (R^2 = 0.459), a substantial improvement over the single-factor CAPM. However, the persistence of a negative and significant alpha suggests that additional factors may be relevant. These results motivate the use of the more comprehensive Fama-French five-factor model to assess whether profitability and investment risk factors account for the observed ESG-related return differential.

6.6 Fama and French Five Factor Result

This section reports Fama-French five-factor regression results for the value-weighted High-Low ESG portfolio over the period 2015-2024. By incorporating profitability and investment factors alongside market, size, and value, this model provides a more comprehensive assessment of whether ESG-related return differentials persist after controlling for a broad set of systematic risk sources. The regression is specified as:

$$\left(R_t^{H-L} - R_{f,t}\right) = \alpha + \beta_1 \text{MktRF}_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 RMW_t + \beta_5 CMA_t + \varepsilon_t$$

Table 7 Fama-French Five-Factor Regression Results for the High-Low ESG Portfolio

Regression Statistics	
Multiple R	0.893255
R Square	0.797904
Adjusted R Square	0.545285
Standard Error	1.253331
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Signifi-cance F*
Regression	5	24.80762	4.961523	3.158521	0.143983
Residual	4	6.28335	1.570837		
Total	9	31.09097			

	Coeffi-cients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-2.36506	0.45255	-5.22608	0.006401	-3.62154	-1.10858	-3.62154	-1.10858
MktRf	-0.04146	0.031156	-1.33065	0.254092	-0.12796	0.045046	-0.12796	0.045046
SMB	0.206389	0.082507	2.501483	0.066661	-0.02269	0.435464	-0.02269	0.435464
HML	0.141804	0.087623	1.61833	0.180902	-0.10148	0.385085	-0.10148	0.385085
RMW	0.218915	0.088978	2.460331	0.069667	-0.02813	0.465956	-0.02813	0.465956
CMA	-0.08679	0.119643	-0.7254	0.508373	-0.41897	0.245393	-0.41897	0.245393

From the Table, the estimated intercept (alpha) is -2.37 and statistically significant at the 1% level (p = 0.006), indicating that firms with higher ESG scores underperform those with lower ESG scores by approximately 2.4 percentage points per year on a fully risk-adjusted basis. This result suggests that the negative ESG premium observed under the CAPM and the three-factor model remains robust even after accounting for profitability, and investment factors.

Factor loadings provide additional insights. The market factor (MktRF) beta is negative but statistically insignificant, suggesting that the ESG return differential is not driven by

systematic market exposure. The ESG long-short portfolio exhibits positive and marginally significant loadings on the size factor (p = 0.067) and the profitability factor (p = 0.070), indicating a tilt toward smaller and more profitable firms. This finding is consistent with earlier descriptive evidence that low ESG firms tend to be smaller and exhibit stronger profitability. In contrast, the coefficients on the value (HML) and investment (CMA) factors are statistically insignificant, implying that valuation and investment behavior do not meaningfully explain the ESG-return spread.

The five-factor model explains approximately 80% of the variation in the ESG portfolio returns ($R^2 = 0.798$), reflecting a substantial improvement in explanatory power relative to simpler models. Despite this improved fit, inference is constrained by the limited number of annual observations (N = 10). Nevertheless, the persistence and increasing magnitude of the negative alpha across progressively richer asset pricing models provides strong evidence against the hypothesis that higher ESG performance is associated with superior risk-adjusted stock returns in Nordic equity markets.

6.7 ESG Performance During Crisis Periods

This study identifies two major crisis periods as COVID-19 pandemic (2020-2021) and the European energy crisis (2022-2023), consistent with prior literature examining market stress and systemic shocks. As the crisis-period analysis is based on only four annual observations (2020-2023), the results should be interpreted as suggestive rather than conclusive.

6.7.1 Crisis Regression Results - CAPM

Due to the limited number of annual observations during the crisis period (2020-2023), the empirical analysis for this subsample is restricted to the Capital Asset Pricing Model (CAPM). Applying multi-factor asset pricing models is not feasible in this context, as the inclusion of several explanatory variables would approach or exceed the available de-

grees of freedom, leading to unreliable coefficient estimates and invalid statistical inference. The CAPM therefore provides the most parsimonious and statistically appropriate framework for assessing ESG-related abnormal returns during crisis periods.

Table 8 Crisis Regression Results - CAPM

Regression Statistics	
Multiple R	0.142443
R Square	0.02029
Adjusted R Square	-0.46956
Standard Error	2.471018
Observations	4

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.25291	0.25291	0.04142	0.857557
Residual	2	12.21186	6.105931		
Total	3	12.46477			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-1.72163	1.317698	-1.30655	0.321406	-7.39123	3.947963	-7.39123	3.947963
MktRf	-0.01796	0.088264	-0.20352	0.857557	-0.39773	0.361804	-0.39773	0.361804

Table 8 reports CAPM regression results for the High-Low ESG value-weighted portfolio during the crisis periods (2020-2023). The estimated alpha is negative (-1.72), indicating that high ESG firms underperformed low ESG firms on a risk-adjusted basis during these crisis periods. However, this coefficient is not statistically significant, reflecting the limited statistical power of the small sample size. The market beta is close to zero and statistically insignificant, suggesting that differences in ESG-related returns during crisis periods are not driven by exposure to overall market movements.

The results show that the explanatory power of the model is low ($R^2 = 0.02$), which is expected for a market-neutral long-short portfolio. This does not indicate misspecification but rather reflects the construction of the ESG spread strategy, which removes common market variation by design.

6.7.2 Non-Crisis Regression Results - CAPM

To establish a benchmark for comparison, the Capital Asset Pricing Model (CAPM) is estimated for the non-crisis period from 2015 to 2019 and 2024. This subsample reflects relatively stable market conditions, providing a basis for assessing whether the ESG-return relationship differs outside periods of heightened uncertainty. Estimating the CAPM over the non-crisis period provides a more reliable inference, as the larger number of observations reduces sampling variability. These results therefore serve as a useful reference point for evaluating whether ESG-related abnormal returns are primarily crisis-driven or indicative of persistent market dynamics.

Table 9 Non-Crisis Regression Results - CAPM

Regression Statistics	
Multiple R	0.233696
R Square	0.054614
Adjusted R Square	-0.18173
Standard Error	2.096748
Observations	6

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.015883	1.015883	0.231074	0.655838
Residual	4	17.58541	4.396352		
Total	5	18.60129			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-2.04638	0.897483	-2.28013	0.084774	-4.53819	0.44543	-4.53819	0.44543
MktRf	0.026844	0.055843	0.480702	0.655838	-0.1282	0.181889	-0.1282	0.181889

Table 9 reports the CAPM regression for the High-Low ESG value-weighted portfolio during non-crisis years. The results show a negative alpha of -2.05, suggesting that high ESG firms underperformed low ESG firms by approximately 2 percentage points per year on a risk-adjusted basis under normal market conditions. However, this estimated alpha is not statistically significant at conventional levels ($p = 0.085$), indicating limited evidence for a systematic ESG premium outside crisis periods. The market beta is positive but statistically insignificant, implying that ESG-related return differences are not explained by exposure to overall market movements. The model's explanatory power remains low ($R^2 = 0.055$), which is consistent with the market-neutral construction of the long-short ESG portfolio and the simplicity of the CAPM.

When compared to crisis-period results, ESG-related underperformance is observed in both subsamples. However, statistical significance weakens during crisis periods, likely due to heightened market volatility and the smaller sample size. Overall, these findings

suggest that ESG-related return differences persist across market conditions, but their magnitude and precision vary over time, offering only limited support for Hypothesis 2.

6.8 ESG Pillar-Level Regression Analysis

To examine whether the individual components of ESG performance have distinct effects on stock returns, separate analyses were conducted for the Environmental (E), Social (S), and Governance (G) pillars. Firms were sorted annually into tercile portfolios based on each pillar score, following the same portfolio construction procedure applied in the composite ESG analysis. For each pillar, High-Low value-weighted portfolios were formed, and risk-adjusted returns were estimated using the Fama-French five-factor model.

Examining ESG pillars individually helps mitigate multicollinearity concerns arising from the high correlation among Environmental, Social, and Governance scores and enables for clearer interpretation of pillar-specific effects. The five-factor model was selected to provide comprehensive controls for market, size, value, profitability, and investment factors, which are closely linked to sustainability characteristics. This approach reduces omitted-variable bias and aligns with prior empirical ESG research that emphasizes disaggregated analysis to identify the channels through which sustainability dimensions may influence financial performance.

6.8.1 Environment Pillar - Fama-French Five-Factor Result

To evaluate whether environmental performance is associated with abnormal stock returns after controlling for conventional risk factors, the Fama-French five-factor model is estimated for the High-Low Environmental (E) pillar value-weighted portfolio over the period 2015-2024. The model includes market, size, value, profitability, and investment factors and is estimated using annual portfolio excess returns.

Table 10 Environment Pillar - Fama-French Five-Factor Result

Regression Statistics	
Multiple R	0.942775
R Square	0.888824
Adjusted R Square	0.749854
Standard Error	0.212592
Observations	10

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	5	1.445302	0.28906	6.395805	0.048191
Residual	4	0.180781	0.045195		
Total	9	1.626083			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.19692	0.076762	-2.56536	0.062284	-0.41005	0.016204	-0.41005	0.016204
MktRf	0.003576	0.005285	0.6766	0.535766	-0.0111	0.018249	-0.0111	0.018249
SMB	-0.01268	0.013995	-0.90628	0.416042	-0.05154	0.026173	-0.05154	0.026173
HML	0.011969	0.014863	0.805278	0.465802	-0.0293	0.053235	-0.0293	0.053235
RMW	0.010218	0.015093	0.677	0.535538	-0.03169	0.052121	-0.03169	0.052121
CMA	0.020269	0.020294	0.998748	0.374439	-0.03608	0.076614	-0.03608	0.076614

Table 10 reports a negative alpha (-0.20) and marginally significant at the 10% level (p = 0.062), indicating weak evidence that firms with higher environmental scores underperform firms with lower environmental scores on a risk-adjusted basis. However, the lack of statistical significance at conventional levels suggests that environmental performance does not generate robust abnormal returns once standard risk factors are considered. Factor loadings are also statistically significant, indicating that the Environmental High-Low portfolio does not exhibit systematic exposure to market, size, value, profitability, or investment factors. Despite this, the model explains a substantial proportion

of return variation (R^2 = 0.889), reflecting strong overall model fit, although inference remains constrained by the limited number of annual observations.

Overall, these findings suggest that environmental performance is largely priced into stock returns in Nordic markets and does not constitute a source of persistent excess returns. While strong environmental practices may contribute to risk management and regulatory compliance, they do not translate into superior risk-adjusted performance. Consequently, the Environmental pillar results provide no strong empirical support for Hypothesis 3, in the context of environmental performance.

6.8.2 Social Pillar - Fama-French Five-Factor Result

To evaluate whether social performance influences stock returns after accounting for conventional risk factors, the Fama-French five-factor model was applied to the High-Low Social (S) pillar value-weighted portfolio for the period 2015-2024. The model includes market, size, value, profitability, and investment factors and is estimated using annual portfolio excess returns.

Table 11 Social Pillar - Fama-French Five-Factor Result

Regression Statistics	
Multiple R	0.869705
R Square	0.756387
Adjusted R Square	0.451871
Standard Error	0.183879
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	0.419921	0.083984	2.483901	0.199382
Residual	4	0.135246	0.033811		
Total	9	0.555167			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.21255	0.066395	-3.20125	0.032862	-0.39689	-0.0282	-0.39689	-0.0282
MktRf	0.004676	0.004571	1.022877	0.364191	-0.00802	0.017367	-0.00802	0.017367
SMB	-0.01014	0.012105	-0.83765	0.449359	-0.04375	0.023469	-0.04375	0.023469
HML	0.018945	0.012855	1.473734	0.214558	-0.01675	0.054638	-0.01675	0.054638
RMW	-0.00528	0.013054	-0.40456	0.706503	-0.04153	0.030963	-0.04153	0.030963
CMA	-0.01507	0.017553	-0.85831	0.439111	-0.0638	0.033669	-0.0638	0.033669

Table 11 presents a negative and statistically significant alpha at the 5% level ($\alpha = -0.21$, $p = 0.033$), indicating that firms with higher social scores underperform firms with lower social scores by approximately 0.2 percentage points per year on a fully risk-adjusted basis. This result suggests that, within the Nordic context, superior social performance is not associated with positive abnormal stock returns. Furthermore, none of the factor loading on the market (MktRF), size (SMB), value (HML), profitability (RMW), and investment (CMA) are statistically insignificant, indicating that the return differential between

high and low social performance portfolios is not driven by systematic exposure to conventional risk factors. The absence of significant factor loadings reinforces the interpretation that the negative alpha reflects a residual return component rather than compensation for known risk premia.

The model explains approximately 76% of the variation in the Social High-Low portfolio returns ($R^2 = 0.756$), suggesting strong overall explanatory power. However, statistical inference remains constrained by the limited number of annual observations. Overall, these results indicate that higher social pillar scores are associated with lower risk-adjusted returns in Nordic equity markets, providing evidence against Hypothesis 3, in the context of social performance.

6.8.3 Government Pillar - Fama-French Five-Factor Result

To assess whether corporate governance performance has a distinct effect on stock returns, the High-Low Governance (G) value-weighted portfolio was analyzed using the Fama-French five-factor model. Consistent with the approach for the Environmental and Social pillars, governance portfolios were constructed annually based on tercile sorting of governance scores, and risk-adjusted returns were estimated to isolate abnormal performance beyond conventional risk factors.

Table 12 Government Pillar - Fama-French Five-Factor Result

Regression Statistics	
Multiple R	0.858573
R Square	0.737148
Adjusted R Square	0.408582
Standard Error	0.174298
Observations	10

ANOVA

	Df	*SS*	*MS*	*F*	*Significance F*
Regression	5	0.34079	0.068158	2.243533	0.226887
Residual	4	0.121519	0.03038		
Total	9	0.462309			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.09172	0.062935	-1.45743	0.218732	-0.26646	0.083012	-0.26646	0.083012
MktRf	0.003815	0.004333	0.880461	0.428332	-0.00821	0.015845	-0.00821	0.015845
SMB	-0.01137	0.011474	-0.99107	0.377753	-0.04323	0.020485	-0.04323	0.020485
HML	0.006902	0.012186	0.56641	0.601384	-0.02693	0.040735	-0.02693	0.040735
RMW	-0.01487	0.012374	-1.20175	0.295742	-0.04923	0.019485	-0.04923	0.019485
CMA	-0.00367	0.016638	-0.22085	0.836027	-0.04987	0.042521	-0.04987	0.042521

The results presented in Table 12 show a negative alpha of -0.09 which is statistically insignificant. This indicates that firms with higher governance scores do not earn abnormal risk-adjusted returns relative to firms with lower governance scores once conventional risk factors are controlled for. In other words, governance quality does not appear to constitute an independent source of excess returns in Nordic equity markets. Furthermore, all factor loadings are statistically insignificant, implying that the governance-based long-short portfolio does not exhibit systematic exposure to market, size, value,

profitability, or investment factors. The absence of significant factor sensitivities indicates that governance-related return differences are not driven by conventional sources of systematic risk. The model explains approximately 74% of the variation in portfolio returns ($R^2 = 0.74$), reflecting reasonable explanatory power. However, statistical inference remains constrained by the limited number of annual observations.

Overall, these findings suggest that governance practices are largely priced into stock valuations in the Nordic region, where corporate governance standards are already high and strongly enforced through institutional and regulatory frameworks. Taken together with the Environmental and Social pillar analyses, the evidence provides no empirical support for Hypothesis 3, which predicted that individual ESG pillars would exert distinct positive effects on stock returns. Instead, the results indicate that while governance performance may contribute to firm stability and transparency, it does not translate into persistent abnormal stock returns in highly developed and sustainability-oriented markets.

6.8.4 ESG Pillar-Level Regression Results

To facilitate comparison across ESG dimensions, Table 13 summarizes the estimated alphas from the Fama-French five-factor regressions for the Environmental, Social, and Governance pillar-based High-Low portfolios. This consolidated view highlights the magnitude, statistical significance, and economic interpretation of pillar-specific abnormal returns, enabling a clearer assessment of which ESG dimensions, if any, drive the overall ESG-return relationship in Nordic equity markets.

Table 13 Summary of ESG Pillar Effects on Stock Returns (Fama-French Five-Factor Model)

ESG Pillar	Alpha	t-Statistic	Significance	Interpretation
Environmental	-0.197	-2.57	*	Weak negative effect
Social	-0.213	-3.20	**	Strong negative effect
Governance	-0.092	-1.46	n.s.	No significant effect

Notes: This table reports estimated alphas from Fama-French five-factor regressions of value-weighted High-Low ESG pillar portfolios for Nordic firms over the period 2015-2024. Alpha represents risk-adjusted abnormal returns. *, ** denotes statistical significance at the 10% and 5% levels respectively and n.s. indicates not statistically significant.

The summary results in Table 13 reveal substantial heterogeneity across ESG pillars. The Social pillar exhibits a statistically significant negative alpha at the 5% level, indicating that firms with higher social performance underperform those with lower scores on a risk-adjusted basis. The Environmental pillar shows a weaker negative effect that is marginally significant at the 10% level, while the Governance pillar displays no statistically significant abnormal return.

Overall, these findings suggest that ESG performance in Nordic markets does not generate positive risk-adjusted excess returns at the pillar level. Instead, the negative alpha particularly for the social pillar indicates that sustainability characteristics may already be priced into stock valuations or reflect a trade-off between risk reduction and expected returns. Consequently, Hypothesis 3, which predicted distinct and positive effects across ESG pillars, is not supported by the evidence.

7 Discussions

This chapter discusses the empirical findings of the study in relation to the research questions, hypotheses, and theoretical framework. The results provide new evidence on the financial relevance of ESG performance in Nordic equity markets and contribute to the broader debate on whether sustainability-oriented practices generate abnormal stock returns in advanced and highly regulated market environments.

7.1 ESG Performance and Risk-Adjusted Stock Returns

The primary objective of this study was to examine whether firms with higher ESG performance generate superior risk-adjusted stock returns in Nordic markets. Contrary to Hypothesis 1, the empirical results consistently point to a negative ESG premium. Across the full sample period from 2015 to 2024, High-Low ESG portfolios exhibit negative and statistically significant alphas under the CAPM, Fama-French three-factor, and five-factor models. The magnitude of the negative alpha increases as additional risk factors is incorporated, suggesting that the underperformance of high-ESG firms is not driven by exposure to conventional risk premia.

These findings imply that stronger ESG performance does not earn excess returns once market, size, value, profitability, and investment risks are accounted for. Instead, the results suggest a risk-return trade-off, where ESG characteristics may reduce firm-specific risks but also lower expected returns. This interpretation aligns with Stakeholder Theory, which emphasizes risk mitigation and long-term stability rather than short-term return maximization. While ESG investments can reduce operational, regulatory, and reputational risks, they may involve additional costs that reduce expected returns. In highly developed markets where ESG practices are widely adopted, these costs may outweigh potential return benefits, reinforcing the view that ESG integration serves as a risk management tool rather than a source of abnormal returns.

7.2 Crisis Periods and ESG-Related Performance

One of the key contributions of this study is the explicit examination of ESG performance during periods of heightened market uncertainty. Crisis periods were defined as the COVID-19 pandemic (2020-2021) and the European energy crisis (2022-2023). The crisis-period analysis reveals that the High-Low ESG portfolio continues to exhibit negative abnormal returns during crises; however, the estimated alphas are not statistically significant. The absence of statistical significance during crisis periods contrasts with some prior studies that document ESG outperformance during market stress. In the Nordic context, this finding suggests that ESG does not provide a distinct return advantage during crises beyond what is already reflected in stock prices. The weakened statistical power is partly attributable to the limited number of annual observations during crisis periods, but the direction of the effect remains consistent with the full-sample results.

Comparing crisis and non-crisis periods, the magnitude of ESG-related underperformance appears larger during normal market conditions. This pattern provides limited support for Hypothesis 2, indicating that while ESG-related return differences persist over time, they are not systematically amplified during crises in Nordic equity markets. One possible explanation is that strong institutions, government interventions, and investor confidence in Nordic markets reduce the marginal value of ESG as a crisis-resilience signal.

7.3 ESG Pillar-Level Effects

The pillar-level analysis offers important insights into the drivers of the composite ESG results. The findings reveal substantial heterogeneity across ESG dimensions. Among the three pillars, the social pillar exhibits the strongest and most statistically robust negative alpha, indicating that firms with higher social performance underperform lower-rated firms on a risk-adjusted basis. The Environmental pillar shows a weaker and marginally significant negative effect, while the Governance pillar does not display a statistically significant relationship with stock returns.

These results suggest that the negative composite ESG premium is primarily driven by the social dimension. Investments in social initiatives such as employee welfare, community engagement, and social responsibility programs may generate long-term benefits that are not immediately reflected in stock returns and may involve ongoing costs that reduce expected returns. In contrast, governance practices appear to be largely standardized and expected in Nordic markets, limiting their ability to generate return differentiation.

Overall, the pillar-level evidence does not support Hypothesis 3, which anticipated a positive and distinct effect for environmental performance. Instead, the findings indicate that environmental and governance practices are largely priced into stock valuations, consistent with Signaling Theory in markets characterized by high transparency and strong regulatory oversight.

7.4 Comparison with Prior Literature

The findings of this study are broadly consistent with prior research indicating that the financial implications of ESG performance vary across institutional settings, market structures, and time periods. While global meta-analyses suggest that ESG performance is often associated with non-negative financial outcomes (Friede et al., 2015), they also highlight substantial variation across markets, time periods, and methodologies.

In the Nordic context, the results align with studies suggesting that ESG-related information may already be incorporated into stock prices in highly efficient and sustainability-mature markets (Shrestha & Spahiu, 2025). The negative ESG premium observed in this study extends this literature by indicating that, after accounting for established sources of systematic risk, higher ESG performance may be associated with lower expected returns. The results also differ from studies documenting ESG outperformance during crisis periods in other markets (Albuquerque et al., 2020; Short & Ndlovu, 2025). This divergence may reflect differences in institutional quality, government interven-

tion, and baseline level of ESG adoption across markets. In Nordic countries, strong regulatory frameworks and public support mechanisms may reduce the marginal signaling value of ESG during periods of market stress.

At the pillar level, the findings are consistent with prior Nordic evidence reporting mixed effects across individual ESG Pillars (Vaihekoski & Yahya, 2023). The absence of a significant governance effect is particularly plausible in a region where governance standards are relatively uniform and largely anticipated by investors.

7.5 Practical Implications

The findings of this study have several practical implications for investors, corporate managers, and policymakers operating in Nordic equity markets. By documenting a negative association between ESG performance and risk-adjusted stock returns, the results challenge the assumption that higher ESG performance generally translates into superior financial outcomes, particularly in mature, highly transparent, and institutionally strong markets.

For investors, the results suggest that ESG-based investment strategies in Nordic markets should be implemented with clear and realistic objectives. While ESG integration may remain valuable for risk management, ethical alignment, and long-term sustainability considerations, the findings indicate that investors should be cautious about expecting a systematic ESG-return premium. Portfolio managers may benefit from adopting more nuanced ESG approaches, for example by emphasizing downside risk mitigation, long-term resilience, or selective exposure to specific ESG dimensions rather than relying solely on aggregate ESG scores.

Moreover, for corporate managers, the results imply that investments in ESG initiatives are unlikely to yield immediate stock market rewards in the form of higher risk-adjusted returns. Instead, ESG engagement appears more closely related to long-term strategic positioning, regulatory compliance, and stakeholder relationships. The relatively strong negative association observed for the social pillar suggests that social investments in

areas such as employee welfare and community engagement, while enhancing long-term value and legitimacy, may involve costs that are not immediately offset by higher stock returns. Managers should therefore ensure that ESG initiatives are closely aligned with operational efficiency and broader corporate strategy.

Furthermore, for policymakers, the findings highlight that widespread ESG adoption and robust regulatory frameworks may reduce cross-firm variation in sustainability performance, thereby limiting its pricing relevance in capital markets. While ESG regulation remains essential for promoting environmental protection, social welfare, and good governance, the results suggest that policymakers should be cautious in assuming that financial markets will automatically reward firms with higher ESG performance. Regulatory initiatives may thus be more appropriately justified on societal, environmental, and long-term stability grounds rather than expectations of short-term stock market outperformance.

Overall, the practical implications of this study underscore the importance of adopting a balanced perspective on ESG performance. In the Nordic context, ESG appears to operate primarily as a mechanism supporting risk management, institutional legitimacy, and sustainable business conduct rather than as a guaranteed source of superior financial returns.

8 Conclusion

This thesis examined the relationship between Environmental, Social, and Governance (ESG) performance and risk-adjusted stock returns in Nordic equity markets over the period 2015-2024. Motivated by the growing integration of ESG criteria in investment decision and the mixed evidence in prior research, the study focused on a region characterized by high sustainability standards, strong institutions, and advanced market efficiency. Using ESG and stock return data from LSEG Workspace, the analysis employed portfolio sorting techniques alongside asset pricing models, including the Capital Asset Pricing Model (CAPM) and the Fama-French three- and five-factor models.

The empirical findings from this paper provide consistent evidence of a negative ESG return premium in Nordic markets. Across all model specifications, portfolios with higher ESG scores underperformed portfolios with lower ESG scores on a risk-adjusted basis, even after controlling conventional risk factors related to market exposure, size, value, profitability, and investment. This result does not support the hypothesis that higher ESG performance is associated with superior risk-adjusted stock returns in Nordic equity markets. Further analysis of crisis periods focusing on the COVID-19 pandemic and the European energy crisis periods revealed that ESG-related underperformance persisted during episodes of market stress, although the effects were not statistically significant. The results suggest that in the Nordic context, ESG performance does not provide a robust return advantage during crises once systematic risk is accounted for, offering limited support for the hypothesis that ESG effects strengthen during periods of heightened uncertainty.

At the pillar level, the results highlight heterogeneity across ESG dimensions. The social pillar exhibited the strongest and most statistically robust effect, while the environment pillar showed a weaker, marginally significant effect, and governance pillar displayed no significant relationship with returns. These findings support the hypothesis 3 that ESG pillars exert distinct effects on financial outcomes and underscore the importance of disaggregating ESG measures rather than relying solely on composite scores.

Taken together, the results suggest that in highly developed and sustainability-oriented markets such as the Nordic region, ESG performance is likely already embedded in firm valuations. High levels of ESG adoption, regulatory oversight, and investor awareness may limit cross-sectional variation in ESG quality and reduce its ability to generate abnormal returns. While ESG practices remain crucial for long-term risk management, stakeholder relations, and regulatory compliance, they do not appear to constitute a source of persistent excess returns in Nordic equity markets.

This study contributes to ESG literature by providing new evidence from Nordic markets, incorporating crisis-period analysis, and examining ESG pillar individually to capture heterogeneous effect. However, several limitations should be acknowledged. The use of annual data and the small number of observations during crisis periods constrain statistical power and limit the feasibility of more complex models. In addition, ESG scores are based on reported and disclosed information, which may not fully capture all dimensions of corporate sustainability performance. Future research could address these limitations by employing higher-frequency data, exploring alternative ESG measures, or applying firm-level panel regressions to gain deeper insights into the relationship between ESG practices and financial outcomes.

In conclusion, this thesis finds that ESG performance in Nordic equity markets is not associated with superior risk-adjusted stock returns and, in some cases, correlates with lower expected returns. These findings highlight role of regional context, market maturity, and institutional frameworks in shaping the financial relevance of ESG and suggest that sustainability should be viewed primarily as a long-term strategic and societal objective rather than a guaranteed source of excess financial returns.

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Appendices

Appendix A: Robustness Checks

This appendix reports additional robustness analyses that support the main empirical findings presented in Chapter 6. Equal-weighted portfolio regressions are reported to assess whether the results are driven by firm size or by the value-weighting method used in the primary analysis. These tests complement the value-weighted results discussed in the main text and are included here for completeness.

A1. Equal-Weighted Portfolio Regression Results

To examine whether the negative ESG premium identified in the main analysis is driven by large firms dominating value-weighted portfolios, the CAPM regression was re-estimated using equal-weighted returns for the High-Low ESG portfolio. This specification assigns equal importance to all firms, regardless of market capitalization, and therefore provides a robustness check against size-related effects.

Table A1: CAPM Regression Results for Equal-Weighted High-Low ESG Portfolio

Regression Statistics	
Multiple R	0.096539
R Square	0.00932
Adjusted R Square	-0.11452
Standard Error	1.950033
Observations	10

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.286182	0.286182	0.075259	0.790779
Residual	8	30.42103	3.802629		
Total	9	30.70721			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-1.84963	0.650497	-2.8434	0.021698	-3.34967	-0.34958	-3.34967	-0.34958
MktRf	0.011421	0.041633	0.274333	0.790779	-0.08458	0.107427	-0.08458	0.107427

The estimated alpha for the equal-weighted High-Low ESG portfolio is negative (-1.85) and statistically significant at the 5% level, indicating that high ESG firms underperform low ESG firms even when portfolio returns are not value-weighted. The market beta is small and statistically insignificant, suggesting that ESG-related return differences are not driven by exposure to overall market movements.

These findings are consistent with the value-weighted CAPM results reported in Chapter 6 and confirm that the observed negative ESG premium is not driven by firm size or portfolio weighting choices. Overall, the equal-weighted specification confirms the robustness of the main empirical conclusions.