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ESG and Stock Market Performance during COVID-19

An Empirical Analysis of Nordic Publicly Listed Firms in the COVID-19 Stock Market

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Abstract

In the wake of the COVID-19 stock market crash, the debate over ESG's ability to preserve shareholder value through turbulent times has received increasing attention. In this thesis we analyze the effect of ESG on stock market performance during the COVID-19 Nordic stock market, and whether ESG acted as a resilience factor. We test 188 listed Nordic firms during the crisis from February 19 to March 23 and the rebound period from March 23 to June 5. In our first model, a cross-sectional model with Buy-and-Hold Abnormal Returns, we find a neutral relationship between ESG and stock market performance during the crisis, but a negative relationship during the rebound, which we believe can be explained by market sentiment. A second model, a panel data model with fixed effects, confirms these results and finds a differential effect of ESG when comparing the rebound to ordinary times. Amongst the three ESG dimensions, our findings indicate that the Environmental dimension played a main role in the negative effect during the rebound. Our results are robust to multiple tests, but the results are limited to ESG-scored, Nordic firms. Further, we identify potential issues of sampling bias for ESG-rated firms, which should be further explored in future research.

Keywords: Environmental, Social and Governance (ESG), Sustainability, COVID-19, Nordic Market.

Contents

1. Introduction

The focus on sustainability in finance has experienced increased attention in recent years, and one of the most common ways of referring to sustainability is through the ESG factors. ESG stands for environmental, social and governance and is used as a key factor in measuring companies' sustainability. There has been unprecedented growth in ESG investments in recent years, a trend that is likely to continue (UN Principles for Responsible Investments, 2020). Numerous studies have examined the relationship between ESG and stock market performance, and the main conclusion that can be drawn from these studies is a neutral effect between ESG integration and stock market performance.

The outbreak of COVID-19 cases led to an unexpectedly rapid decline in the global stock markets, known as the 2020 Market Crash. In the wake of the market crash, there have been widespread claims that the ESG factors act as a downside risk protector for companies' stock market performance. However, when it comes to ESG and the crisis perspective, the literature is limited and divided. Some studies find a positive effect of ESG through crises, while other studies cannot prove such a connection.

In this thesis, we have chosen to focus on the Nordic countries, which are considered to have a leading position in ESG integration. Indications that the effect of ESG in crises may be geographically different, as well as the lack of research on the effect in the Nordic region, are motivations for this scope. As far as we know, no one has investigated whether ESG dimensions have significance for Nordic companies through crises.

Based on a thorough literature review, our impression is that Demers et al. (2020) and Lins et al. (2017) have done the most robust research on ESG during crises. These studies will consequently inspire our methodological approach. We use ESG scores as a proxy for ESG, and Reuters Refinitiv ESG score is our main score, as it has the best coverage among available scores, while Sustainalytics acts as a secondary score for robustness. We define the COVID-19 stock market as the period from February 19 to June 5, 2020, consisting of the market crash lasting from February 19 to March 23, and the rebound period lasting from March 23 to June 5.

Our primary model is an Ordinary Least Squares (OLS) regression, using Buy-and-hold abnormal returns (BHAR) for the crisis- and rebound periods as the dependent variable and

ESG scores as our variable of interest. BHAR is commonly used to calculate abnormal returns and is in line with other studies examining the effect of ESG during market crises. Our sample consists of 188 firms for which Refinitiv ESG scores and all other data are available, and amongst these, 72 firms also have Sustainalytics ESG scores. We control for market- and accounting-based variables, as well as industry- and country-specific effects. Betas, idiosyncratic risk, momentum, and Fama-French factor loadings are estimated using rolling regressions.

We test both aggregated (ESG) and disaggregated ESG scores (E, S and G) for both providers of ESG scores. Next, we check if the effect varies between quartiles of ESG score and between countries, and test different time windows for the rebound period. In addition, we roughly explore stock market performance differences between firms with and without ESG scores. Our secondary model uses panel data dating back to 2015, and the samples include 171 firms with Reuters Refinitiv ESG scores and 74 firms with Sustainalytics ESG scores. The dependent variable is monthly abnormal return, and we control for the same factors as the main model.

The number of independent variables is high relative to the sample size, and there might be a risk of overfitting and multicollinearity. We take several methodological measures to handle this, such as statistical tests and special types of robust standard errors.

We find no significant effect of ESG scores on stock performance during the COVID-19 stock market crash, and the results are robust in all models. Although during the rebound period, we find that the Reuters Refinitiv ESG score has a significant negative effect on stock performance, especially during the first 5 weeks of the rebound. The panel data model confirms this and finds that the ESG effect differs negatively when comparing the rebound to ordinary times. Our results indicate that, amongst E, S and G, the Environmental dimension played a leading role in the negative relationship with stock market performance. In addition, we show that the negative effect was more severe for the firms with ESG scores in the upper two quartiles. The results from the sample of Sustainalytics-rated firms indicate a neutral relationship for the rebound period, which we believe is due to sample differences. Our results are limited to Nordic firms with ESG score coverage and available accounting data. We also find that ESG-rated firms performed better than non-rated firms during the rebound, as well as indications that the rating agencies' selection process is not random, which raises the issue of a sampling bias.

The structure of the thesis is as follows: Section 2 presents the background and motivation for our thesis, before relevant literature and theory are reviewed in sections 3 and 4. Thereafter, section 5 presents our data, and the methodology is described in section 6. The results are presented in section 7, then our findings are discussed in section 8. Finally, section 9 concludes the thesis.

2. **Background**

This section will present the relevance of our topic; ESG and stock market performance during the COVID-19 crisis, and the motivation behind it, before further connecting the topic to the Nordic market.

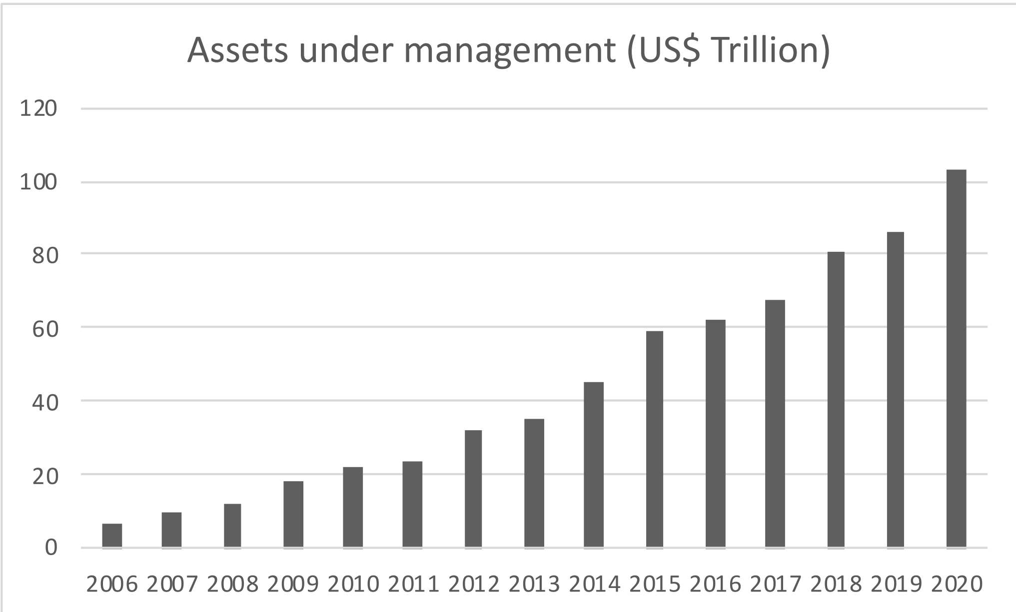
2.1 ESG

In finance, sustainability is most often referred to as "Socially Responsible Investing" (SRI), Sustainable Investing, Corporate Social Responsibility (CSR), and more recently through the factors "Environmental, Social and Governance" (ESG). The definitions have some specific differences, but they all have their core around the ESG factors, intending to improve companies and portfolios along these dimensions for all stakeholders (De Spiegeleer et al., 2020). In 2004, the CEOs of major financial institutions participated in the UN Global Impact initiative, with the IFC and the Swiss government's support, to find a way to integrate the ESG-dimension into capital markets. As a result of the initiative, the term ESG was coined in 2005 in the study "Who cares wins" (Kell, 2018). ESG-factors cover topics such as climate change, pollution, working conditions, human rights and corruption (UN Principles of Responsible Investing, 2020).

The practice of ESG investing in modern times can be dated back to the 1960s as Socially Responsible Investing, which excluded investing in companies or entire industries based on business activities, such as tobacco or involvement in apartheid (MSCI, n.d.). As the financial industry grew, activists found opportunities to influence corporate behavior. In the 1980s, the Exxon Valdez oil spill and the Bhopal disaster created increased involvement around environmental concerns, while people became more aware of the threats from climate change. The financial crisis in 2008-2009 was a strong reminder of the interaction between society, the economy and financial markets (Schroders, 2016). Banks and financial institutions were blamed for being too greedy and lacking governance, and in the wake of the crisis, governments and the public voiced that the financial markets should change their policies. There was a desire to allocate capital towards the efficient solution of social and environmental challenges, as well as the overseeing of activities through increased governance (Sampei, 2018). According to Kell (2018), growth in ESG investments accelerated in 2013-2014 when the first studies were published showing a positive correlation between corporate sustainability performance and financial results.

Today, the ESG factors are the foundation of the UN Principles for Responsible Investment. As of March 31, 2020, more than 2700 investors, with US$103.4 trillion assets under management, have signed up to follow these principles (UN Principles for Responsible Investments, 2020). In Figure 1 we illustrate how assets under management have increased sharply since 2006. As of November 2020, there have been quadruple inflows into ESG funds compared to 2019 (Tew, 2020). According to McKinsey's Global Survey from 2019, the majority of professional investors and executives believe that ESG policies increase shareholder value (McKinsey & Company, 2020).

Figure 1 *– The collective assets under management based on active signatories by Principles for Responsible Investment from 2006 to 2020.*



2.2 COVID-19 Market Crash

On January 30, 2020, the World Health Organization (WHO, 2020) declared the outbreak of COVID-19 a global public health emergency as more than 7.000 cases were reported worldwide. The COVID-19 cases then began spreading at an increasing rate, and by March 11, 2020, the WHO (2020) characterized COVID-19 as a global pandemic. The pandemic led to a lockdown of society in large parts of the world, and by April 2020, about half of the world's population was in lockdown (Sandford, 2020). The outbreak of COVID-19 cases led to a rapid decline in the global stock markets, known as the 2020 Market Crash. This also occurred when share values were at or above previous peaks. The MSCI World Index peaked on February 12 at 2,434.50 points, and bottomed on March 23 at 1,596.00 points, a drop of 34.4%, as shown in figure 2. No previous outbreak of diseases, including the Spanish flu, has impacted the stock markets as severely as the COVID-19 pandemic (Baker et al., 2020). The International Monetary Fund refers to the great lockdown as the worst economic downturn since the great depression (Gopinath, 2020). The market crash was also the fastest fall in global stock markets in financial history (Li, 2020).

However, the fall was short-lived and after just a few months, the market was almost fully recovered. The SEB Group (2020) points to several reasons behind the steep market climb in late March 2020. The COVID-19 infection curves began to flatten with the focus shifting from lockdown to reopening. Further, the unique stimuli packages also allowed the investors to assume that companies' temporary income loss would be replaced by income growth within a reasonable period. As of August 2020, S&P500 reached a new all-time high, known as the "fastest recovery ever" (Jasinski, 2020).

Figure 2 *– The MCSI World Index from January to August 2020.*

2.3 Downside Risk

In the wake of the market crash, there have been several claims that the involvement in ESG dimensions has acted as a protection in the COVID-19 market, and that companies with high ESG involvement have performed better than peers with less ESG involvement. As early as April 2020, the importance of ESG during the COVID-19 crisis was highlighted. Morningstar coined ESG an equity vaccine, stating that ESG holdings seem to have held up better than the rest (Willis, 2020). According to Financial Times, "ESG funds continue to outperform wider markets" (Darbyshire, 2020). In Fortune, Polman (2020) states that companies that care about all their stakeholders, not just shareholders, and strive for something bigger than profit, may be better equipped for the COVID-19 crisis and explains why ESG funds outperform their lesser ESG performing peers. There are many similar articles, and these are just examples of the widespread hype ESG has gained through the COVID-19 crisis.

2.4 The Nordic Countries

Our thesis is geographically limited to the Nordic market, which stands out as a unique market in light of ESG engagement. Morningstar recently crowned the Nordic countries as ESG leaders, with Finland and Sweden respectively ranked number two and three in the world (Basseli, 2020). In the Sustainable Competitiveness Index 2019, all the Nordic countries are covered in the top 6 ranking (Solability, 2020). Nordic institutional investors have long recognized the ESG factors as key drivers of value (Nasdaq, n.d.a). Further, ESG is an integral part of the investment process, and no other region has implemented the normative focus to the same degree as in the Nordic region (Boyd, 2019). Nordic companies have a relatively flat structure, score highly on human orientation, focuses on social values, and are highly future-oriented. These cultural dimensions have a high impact on a firm's sustainability score (Preuss, 2017). In addition, the Nordic region is ranked among the most highly performing global green bond issuers, according to international indices for sustainable performance (Climate Bond Initiative, 2018). Although, despite the Nordic region's leading position, research on ESG in the Nordic region is limited.

During the first quarter of 2020, the Nordic countries followed the movements of global indices and experienced a significant decline in their stock exchange markets. The OMXN40 is a market-weighted index consisting of the 40 largest and most actively traded stocks on the

Nordic exchanges, revised twice a year (Nasdaq, n.d.b). Similar to the MSCI World index, the OMXN40 quickly recovered after only a few months. DNB Assets Management has examined how a group of ESG leading companies in the Nordic countries has performed during the COVID-19 crisis. In their fund “DNB Grønt Norden” which focuses on ESG-dimensions in the Nordic countries, most of their ESG-leading companies have performed better than the benchmark during the period (Lode, 2020).

Based on the Nordic region's leading position within ESG and on the COVID-19 crisis which created shock waves on the stock exchanges, we find it very interesting to examine if the proposed “ESG downside-immunity” applies to the Nordic region. According to a case study by Scholtens and Sievänen (2013), the ESG-performance is highly correlated in the Nordic countries because of great similarities. We find it reasonable to examine the Nordic countries as a whole, because of the countries' similarities and to ensure sufficient data. Our perception is that there is little research on the relationship between ESG and stock market performance in the Nordic region. To the best of our knowledge, no one has examined Nordic ESG firms' stock market performance in light of the COVID-19 crisis. We believe this paper can be informative for investors in the Nordic market.

3. **Literature Review**

This section will cover previous research related to ESG and stock market performance[1]. Most of the studies we highlight address how ESG stocks and ESG funds perform during times of crisis. The crisis periods covered will mainly be the financial crisis of 2008-2009 and studies that have already investigated the COVID-19 crisis. Finally, we will link the previous literature to this thesis and our contribution to the literature.

3.1 ESG and Stock Market Performance

Numerous studies have examined the relationship between ESG and stock market performance. Revelli and Viviani (2015) conducted a meta-analysis in which they examined 85 previous studies and 190 experiments over a period of 20 years. According to their study, no conclusion can be drawn at the global level whether there is a positive or negative correlation between Socially Responsible Investing (SRI) and stock market performance. In addition, Friede et al. (2015) have investigated approximately 2,200 unique studies that examine the connection between ESG and financial performance. They conclude that the vast majority of the studies show a positive or insignificant connection, but that there are large geographical differences. In Europe, the most relevant region for our thesis, 26.1% of the studies showed a positive relation, while 65.9% showed an insignificant relation. In a study based on global data from recent times, Sargis and Wang (2020) find no connection between ESG and returns. In sum, the literature indicates that ESG investments have not given any positive or negative abnormal returns in recent years. Giese et al. (2019) point out that variations in findings between different studies may be due to different methods and differences in databases. The authors also criticize previous research for its inability to identify economic mechanisms to explain the connection between ESG and corporate financial performance.

[1] In the literature review, we refer to the original terms used in the studies, i.e., CSR, CSP and SRI. Nevertheless, throughout the thesis, we will consistently use ESG as a common term.

3.2 ESG and Resilience

Literature within SRI has shown that investors with preferences for sustainability are less sensitive to SRI fund performance compared to conventional fund performance (Bollen, 2007; Renneboog et al., 2011). If investors' attitude toward risk is affected by COVID-19 and many investors are selling their positions, the SRI literature on a general basis indicates that ESG investors are more resilient than other investors. Sassen et al. (2016) demonstrate that a higher Corporate Social Performance (CSP) decreases total and idiosyncratic risk on firms in Europe. Hoepner et al. (2016) provide evidence supporting that engagement on ESG issues can benefit shareholders by reducing firms' downside risk and specifically highlight engagement in the environmental dimension as the most effective. Albuquerque et al. (2019) model CSR as an investment to increase product differentiation, allowing firms to benefit from higher profits. Due to differentiation, the authors argue that CSR decreases systematic risk, raises profits, and has the greatest impact on firms with high product differentiation.

Lys et al. (2015) show that CSR investments provide insufficient returns. The authors conclude that CSR investments signal stronger future performance, but do not find that those investments have positive returns or create value for the typical business. The study does not explicitly address the crisis perspective, but, as discussed by Demers et al. (2020), the CSR-related signals of future performance will change in the event of a crisis. Accordingly, in difficult times, ESG investments can be considered wasted, as they do not help to handle the crisis itself. Based on this view, companies with high ESG investments may be more affected by a crisis.

3.3 ESG and the Financial Crisis of 2008-2009

In contrast to ESG and stock market performance in general, research on the specific role of ESG during times of crisis is limited. Some studies have examined ESG-investments during the financial crisis of 2008-2009 and demonstrate that ESG-investing acts as a downside risk protector. Such as the study by Lins et al. (2017) which has examined U.S. Stocks during the financial crisis. The authors find that companies with a high social capital score, measured by the CSR intensity, had higher returns compared to companies with lower social capital scores. They conclude that companies investing in CSR activities create trust between their stakeholders and shareholders, which pays off when trust in markets and corporations is weakened. A similar study by Bouslah et al. (2018) shows that the relationship between risk and social performance is significantly different in the crisis period compared to the pre-crisis period, and the authors conclude that CSR forces act as risk mitigation measures during market turmoil. Nofsinger and Varma (2014) compare returns between SRI funds and conventional funds in the US during the period from 2000 until 2011. They show that SRI funds outperform their conventional peers during crises, while SRI funds underperform during non-crisis. A study by Leite and Cortez (2015) does not find any positive effect of ESG through the financial crisis. The authors examined French SRI funds investing in Europe during the crisis and non-crisis periods that occurred from January 2001 to December 2012. Their findings are that SRI funds significantly underperform through non-crisis and do not offer any protection through a crisis but instead match similar conventional funds.

Albuquerque et al. (2020) find the COVID-19 crisis very different from the global financial crisis of 2008-2009, both in terms of cause and duration. In the financial crisis, with a duration of two years, companies had plenty of time to adapt to the crisis and new government policies, making it challenging to observe the effect of ESG on stock market performance. Compared to the financial crisis, the COVID-19 crisis has been an unpredictable health crisis that has hit the economy as an exogenous shock, and the duration of the resulting stock market crisis was also far shorter. Dai et al. (2020) show evidence that companies tend to increase their ESG score in times of economic-political uncertainty. Due to this confounding effect between ESG policies and trust during the financial crisis, Albuquerque et al. (2020) argue that there may be a limitation to whether companies with high sustainability scores in 2007-2008 and their good performance can be linked to ESG policies and trust in general.

Despite different causes for the financial crisis of 2008-2009 and the COVID-19 crisis, they both triggered magnitude stock price movements. Takahashi and Yamada (2020) further point to similarities in both crises, such as high debt in the social sector, fire sales by the financial institutions, and trade shrinkage. Arguably, research from the financial crisis may have some transferability to the COVID-19 crisis.

3.4 ESG and the COVID-19 Stock Market Crash

Some studies have already addressed the relationship between ESG and stock market performance through the onset of the COVID-19 pandemic. As early as April 2020, Ding et al. (2020) investigated corporate characteristics and stock returns' reaction to the COVID-19 market crash. The study is based on more than 6,700 stocks from 61 different economies. One of their main findings is that companies with more CSR activities experience a milder drop in stock returns. The authors argue that this finding is consistent with the view that CSR activities strengthen the relationship between the company and its stakeholders. In this way, CSR strengthens loyalty and bonds among key stakeholders enabling the firm to work with those stakeholders in responding to the pandemic effectively. Although the stock market performance of the Nordic countries is not explicitly stated in the study, the authors state that the CSR effect is greatest in societies that value these values the most, i.e., economies that value fair treatment of people and that are concerned with the reduction of climate change. Based on the World Values Survey (2020), the Nordic countries score highly on Environmental Priority and Human rights. This may indicate a positive effect on ESG in the Nordic region, when applying the arguments of Ding et al. (2020). Another study that finds a positive relationship between ESG and returns is Albuquerque et al. (2020), which has conducted an analysis of the COVID-19 market crash based on ESG data from more than 2,000 distinct US stocks. The authors conclude that stocks with higher ES ratings have significantly higher returns and lower return volatility during the first quarter of 2020.

Takahashi and Yamada (2020) have examined the Japanese stock market during COVID-19 and find no evidence that ESG is associated with abnormal returns during the pandemic. They point out that the ESG may have a different meaning in Europe and the United States, where the ESG-concept was developed, compared to Asia. Takahashi and Yamada (2020) also mention that the sample size used in their ESG-analysis is just a small fraction of their total sample and there may be some biases in this regard. However, the study sheds light on the impact of ESG and supports the possibility of geographical differences.

Demers et al. (2020) show evidence that ESG-companies in the US do not offer any positive explanatory power for returns during COVID-19[2]. They demonstrate that ESG is not significant in the crisis period of the first quarter of 2020, while ESG is negatively associated with return in the second quarter of 2020, which they define as the market recovery period.

[2] Demers et al. (2020) study was not published during the beginning of our writing process. The edition we are inspired by is the first draft published in August 2020.

Compared to similar studies, Demers et al. (2020) apply more control variables known to be theoretically or empirically correlated with returns and ESG. They find that financial flexibility was essential to a firm's performance during the crisis period, which is consistent with a long line of economic research. The authors also point out that investments in internally generated intangible assets were highly significant in the explanation of abnormal returns for both periods. In addition, the authors replicate the findings of Albuquerque et al. (2020), which they find suffers from omitted variables bias, and they find the same weakness in Ding et al.'s (2020) study. Demers et al. (2020) claim that in the American market, there is a lot of talk and little execution of corporate social responsibility, which is different from Europe, where ESG is taken more seriously. Demers et al. (2020) only examine U.S stocks, while Ding et al. (2020) examine a global sample that mainly contains non-US stocks. Demers et al. (2020) argue that Ding et al. (2020)'s study is not directly generalizing for US stocks, while their own study is generalizable to a U.S.-only setting. Once again, the literature reiterates that there may be geographical differences associated with the effect of ESG, which makes the Nordic stock market interesting to explore.

3.5 Known Explanatory Variables of Stock Market Performance During Crises

Several studies have examined the attributes, apart from ESG, that characterize resilience during crises. In the studies of Bernanke and Gertler (1989) and Bhattacharya et al. (2010), financial flexibility such as profit, liquidity and low borrowing have been important for firms' resilience during crises. According to Kahle and Stultz (2013), companies with weaker balance sheets before the financial crisis were more affected during the crisis.

Among studies from the COVID-19 crisis, Jagannathan and Zhang (2020) find superior performance for high-quality firms relative to peers during stressful times, where high-quality firms are measured by conventional historical financial statement-based measures as well as default probability measures. Acharya and Steffen (2020) show that companies with access to liquidity perform better during the first quarter. Fahlenbrach et al. (2020) present evidence that non-financial firms with higher cash holdings and lower financial leverage are less affected by stock price resilience. Ramelli and Wagner (2020) find strong causal evidence for the effect of international trade and global value chains on corporate value, where more internationally oriented US stocks underperformed. According to Hassan et al. (2020), stocks that are more exposed to regions where the COVID-19 pandemic is less constrained, performed worse. Firms that are more resilient to social distancing perform better during the pandemic, according to Pagano et al. (2020).

3.6 Connecting Previous Studies to the Thesis

From the literature presented in this section, no common global conclusion can be drawn about the effect of ESG on stock market return during crises, which suggests that local differences will occur. During ordinary times, the literature seems to be fairly consistent, where ESG does not contribute to any better or worse excess returns, while on the topic of ESG during crisis, the literature is to a greater extent limited and divided. Our impression is that Lins et al. (2017) and Demers et al. (2020) have done the most robust research on ESG during crises, and we agree with Demers et al.'s (2020) criticism of omitted variable bias in Albuquerque et al.'s (2020) and Ding et al.'s (2020) studies. Demers et al. (2020) state clearly that their results only apply to the United States, and the effect may be different elsewhere. The literature therefore motivates to test the effect of ESG on stock performance during crises in other regions. As far as we know, no one has examined the ESG performance against the COVID-19 crisis in the Nordic region. We use Lins et al. (2017) and Demers et al. (2020) as inspiration for our methodology because we regard these papers as the most thorough and robust research on the relationship between ESG and stock performance during a crisis. Due to the divided literature, geographical differences and lacking research on the Nordic market, it is difficult to form a hypothesis for our thesis. Although, we find it reasonable to expect a non-positive effect, similarly to Demers et al. (2020), because of their robust evidence from the COVID-19 stock market and the methodological similarities between our thesis and their study.

4. Theory

The following section will discuss several relevant economic theories that will help elucidate the relationship between ESG and stock market performance. Further, we will present multifactor models from the financial theory to explain stock returns.

4.1 Shareholder and Stakeholder Theory

An investment in activities that promote ESG score, and the disclosure of ESG-related information, undeniably demands a part of the firms' resources. Accordingly, we assume that an increase in ESG score comes at an economic cost to the firm. The shareholder theory presented by the economist Milton Friedman (1962), states that firms' sole responsibility is to maximize shareholder value. Friedman argues that shareholders are the only group a firm is socially responsible for. Therefore, the choice of participation in social initiatives should be made by the shareholders themselves, rather than managers on the shareholders' behalf. Friedman further argues that considering several stakeholders with different interests is time-consuming and value-destroying. According to the theory, a firm should only invest in ESG if it is the most profitable option. Opponents have criticized the theory for encouraging short-term management and condone unethical behavior. (Danielson et al., 2008).

Stakeholder theory was first presented in 1984 by R. Edward Freeman in response to Friedman's Shareholder theory. According to Freeman and Philips (2002), a firm must consider all its stakeholders for maximizing shareholder value over time. A firm's success depends on the strength of the relationship between management and the firm's stakeholders. In addition to shareholders, stakeholders include customers, employees, suppliers, authorities, and others affected by the firm's business. ESG activities may strengthen the bonds between the firm and stakeholders, and this way stakeholders are more willing to be loyal and support the firm in times of duress. Critics of the shareholder theory believe that it provides little guidance on balancing the often-competing interests of different stakeholder groups (Marcoux, 2000; Jensen, 2002). The stakeholder theory may also encourage managers to focus on the short-term to the detriment of long-term corporate health, unless the interest of long-term stakeholders explicitly is considered (Danielson et al., 2008).

4.1.1 Risk management theory

The risk management theory (a risk management argument based on the stakeholder theory) postulates that companies will experience "insurance" -like protection against firm-specific risk by being involved in CSR activities (Godfrey et al., 2009). Certain types of CSR activities may produce moral capital or goodwill for various stakeholder groups. When a firm is adversely affected in the event of a crisis, the moral capital tempers punitive penalties by stakeholders (Godfrey, 2005), e.g., customers' loyalty and investors' trust will suffer to a lesser extent. Godfrey et al. (2009) imply that moral capital may have little to do with value-creating but plays a major role in protecting economic value.

4.2 Other Theories

4.2.1 Agency theory

The decision to invest in ESG ultimately happens at the discretion of management. In this context, another view of corporate ESG investments can be deduced from Agency Theory (Jensen & Meckling, 1976). The theory is based on the principal-agent problem, which arises when the agent (managers) makes decisions on behalf of the principal (shareholders) when they have conflicts of interest and asymmetric information. Management's motivation for increasing the company's ESG score may be to improve their personal reputation, for example, by appearing more environmentally friendly, at a cost that shareholders must pay for. According to Surroca and Tribó (2008), increased personal reputation through CSP investments could be a part of management's anchoring strategy to reduce the likelihood of replacement, which in turn has particularly negative effects on financial performance. Based on this view, ESG investments will be wasted and most likely hurt the company. Such investments could indicate poor leadership and make companies less resilient during crises.

4.2.2 Prospect theory

In 1979, Nobel laureate in economics Daniel Kahneman and Amos Tversky developed the Prospect Theory. The theory states an asymmetric relationship between gain and loss, where the pain of loss is greater than the joy of gain of the corresponding amount. The theory challenges the classical economic theories that have a mathematical approach to expected utility. Through the study by Kahneman and Tversky, people tend to prefer choices that are safe and being risk-averse. According to Barbéris and Brière (2020), ESG might be considered a safe haven for the sole reason that investors anticipated that others would consider it the same. This attitude can be linked to the prospect theory, where investors view ESG mainly as a downside risk protector rather than an investment in high returns.

4.3 Factor Models

4.3.1 The Capital Asset Pricing Model (CAPM)

The CAPM describes a linear relationship between systematic risk and expected return for an asset, and it is founded on the fact that an investor must be compensated for the time value of money and the asset's exposure to the market. The model is based on the work by Markowitz (1952) and was introduced independently by Sharpe (1964), Lintner (1965) and Mossin (1966). The CAPM is presented in equation 1.

$$E(r_{i,t}) = r_{f,t} + \beta_1(r_{mk,t} - r_{f,t}) \tag{1}$$

where:

$E(r_{i,t})$ = expected return of the investment.

$r_{f,t}$ = risk-free rate

β_1 = beta of the investment. The slope coefficient, measuring the sensitivity of the asset to the market.

$r_{mk,t} - r_{f,t}$ = market risk premium.

4.3.2 Fama-French three-factor model:

Fama and French (1993) expanded the CAPM model with two more factors, as presented in equation 2, which historically explain more of the variation that the error term in CAPM would have captured. The model was considered as a major advance from CAPM, as it explained around 90 % of the variation in a diversified portfolio, compared to 70% for the CAPM.

$$E(r_{i,t}) = r_{f,t} + \beta_1(r_{mk,t} - r_{f,t}) + \beta_2 SMB_t + \beta_3 HML_t \tag{2}$$

where:
SMB_t = Small Minus Big: The factor is a value premium that reflects that smaller companies tend to outperform larger ones over the long term. The SMB factor is measured by taking the companies' average return with the 50% lowest market value, subtracting the average return of the other half with the highest market value. The factor is a monthly premium in a zero-investment portfolio long in small-cap stocks and short in big-cap stocks.

HML_t = High Minus Low: The factor is another value premium that reflects that companies with higher book-to-market value (value companies) tend to outperform those with lower book-to-market value (growth companies) over the long term. The HML factor is measured by taking the average of the companies with the highest book to market value (above 70th percentile), subtracting the average of those companies with the lowest book to market value (below 30th percentile). The HML factor is a monthly premium in a zero-investment portfolio long in high book-to-market firms and short in low book-to-market firms.

4.3.3 **Carhart four-factor model**

Carhart (1997) detected that returns correlated with prior returns, and they added a momentum factor to the Fama-French three-factor model, to improve the explanation of return variance. The model is presented in equation 3.

$$E(r_{i,t}) = r_{f,t} + \beta_1(r_{mk,t} - r_{f,t}) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 WML_t \qquad (3)$$

where:
WML_t= Winners minus losers. The third value premium factor reflects the momentum effect, where stocks that have performed well over the past 12 months tend to rise further. The opposite applies to shares that have performed poorly in the last 12 months. The factor is calculated by subtracting the average return of the 50% lowest-performing stocks (losers) from the average return of the other half of the highest performing stocks (winners). The factor is a monthly premium, lagged one month, in a zero-cost portfolio long in past winners and short in past losers.

5. **Data**

This section gives an overview of our sample, the ESG scores and the control variables.

5.1 Data collection

The data is collected from Thomson Reuters Datastream, Bloomberg Professional Services, Compustat Capital IQ, Federal Reserve Economic Data (FRED), Norges Bank, Nasdaq, Oslo Børs and Kenneth R. French Data Library. Our return metrics are obtained from Thomson Reuters Datastream, and stock returns are calculated based on Datastreams Return Index (RI), which includes the reinvestment of dividends. We use daily returns for Model 1 and monthly returns for Model 2 and for the estimation of betas, factor loadings, idiosyncratic risk and momentum. Accounting information and other firm characteristics are obtained from the Compustat annual database, and we use observations from the last available year. For more information, see the part on methodology and A.1. Monthly Fama-French factors for Europe are collected from Kenneth R. French Data Library, and the risk factors MKT-RF, HML, SMB and WML are used to estimate factor loadings. The measure on institutional shareholders is obtained from Bloomberg.

Data is collected in the firms' respective currencies (DKK, EUR, NOK and SEK), as this does not affect returns or most variables. Only when creating the variables for market cap, market share and BTM, we transform all data to NOK using exchange rates for the respective dates, obtained from Norges Bank. Refinitiv ESG scores are collected from Datastream and Sustainalytics ESG scores through Bloomberg.

5.2 Sample

We apply a relatively strict sampling process, which we deem necessary to control for all relevant variables. Our sample consists of Nordic firms listed on public stock exchanges in Denmark, Finland, Norway or Sweden. We restrict our sample to include equities active as of October 2020, and the sample is further restricted by the availability of ESG scores and accounting information. Icelandic firms are excluded due to insufficient data availability; accordingly, Iceland is omitted when referring to Nordic countries in this paper.

Financial firms are excluded in our analysis due to the high leverage that is normal for those firms. The high leverage for financial firms probably does not have the same meaning as for non-financial firms, where high leverage in the latter indicates distress (Fama & French, 1992).

Our primary dataset is based on daily observations for all Nordic firms for which a Refinitiv ESG score is available as of 01.01.2020, which amounts to 267 firms. When further restricted by accounting information availability, the final sample consists of 188 firms for which all necessary data is available. Of these firms, 72 also have a Sustainalytics score. The secondary dataset is a panel dataset that covers the period from 2015 to November 1, 2020, and the number of firms with ESG-rating increases with time, from 134 in 2015 to 267 in 2020. This dataset is also further restricted by the availability of accounting information, thus, the final sample consists of 171 firms for which all necessary data is available as of October 1, 2020, and 102 firms as of January 2015. We choose to include all 171 firms in the sample to optimize the utilization of the data. This makes the data unbalanced since some firms lack observations for the entire period. For the Sustainalytics ESG score, there are 45 firms as of January 2015 and 74 as of October 1, 2020. When handling observations that are missing ESG scores but have ESG scores in previous periods, we assume the ESG score is constant and replace the missing values with the past ESG score.

5.2.1 Sample description

Our main sample of firms with Refinitiv ESG-scores consists of 50 % Swedish firms, 18.1 % Norwegian firms, 17 % Finnish firms and 14.9 % Danish firms, as shown in table 1. This is roughly in line with the relative size of the stock exchange in each country. Table 2 presents the SIC industry classification of the firms. Most of them, 56.4 %, are SIC-classified as manufacturing firms and 15.4 % as service firms.

***Table 1** – Firms by country*

	Country	Firms	Percentage of Firms
1	SWE	94	50 %
2	NOR	34	18.1 %
3	FIN	32	17 %
4	DNK	28	14.9 %

***Table 2** – Firms by industry*

	SIC Industry Classification	Firms	Percentage of Firms
1	Manufacturing	106	56.4 %
2	Services	29	15.4 %
3	Transportation & Public Utilities	17	9 %
4	Wholesale Trade	10	5.3 %
5	Construction	8	4.3 %
6	Mining	7	3.7 %
7	Retail Trade	7	3.7 %
8	Nonclassifiable Establishments	3	1.6 %
9	Agriculture, Forestry, & Fishing	1	0.5 %

5.2.2 **Benchmark indices and risk-free rates**

We choose our benchmark indices based on the firms' country of listing. For Sweden, we use OMXS30, a market-weighted price index, consisting of the 30 most actively traded stocks on the Stockholm Stock Exchange. For Denmark, OMXC20, a market-weighted price index consisting of the 20 most actively traded shares on the Copenhagen Stock Exchange. For Finland OMXH25, a capitalization-weighted stock price index, consisting of the 25 most actively traded stocks on the Helsinki Stock Exchange. For Norway, we use OBX, a capitalization-weighted stock price index, consisting of the 25 most actively traded stocks on the Oslo Stock Exchange.

The majority of our sample firms are large, by Nordic standards, which is a characteristic shared by the index constituents, and each respective index covers between 20 and 50 percent of our sample firms by country. Thus, based on the index constituents and firm size, we conclude that the chosen indices are the best available proxy for a market benchmark. Data on benchmark indices are collected from Nasdaq and Oslo Børs. In consistency with the benchmark indices, risk-free rates are also chosen based on the firms' country of listing. We use 10-year government bond yields, recalculated to daily and monthly rates for the respective models. The yields are obtained from Federal Reserve Economic Data.

5.3 Our proxy for ESG: ESG scores

Following the rapidly growing trend of sustainable investments, an increasing number of investors rely on ESG-information in their investments. In a survey by Amel-Zadeh and

Serafeim (2018), 82.1 % of professional investors answered that they use ESG information in their investment decisions. Due to the high demand among investors for ESG data, a specialized industry of rating agencies has emerged offering a third-party assessment of firms' ESG performance (Berg et al., 2019). The agencies collect and assess information of firms' performance in a wide specter of sustainability topics, resulting in an issuance of a firm-specific numeric ESG score or ESG rating. After a decade of growth and consolidations, the industry consists of few but large agencies (Escrig-Olmedo et al., 2018). These agencies have a major influence on sustainable investments as well as on the literature related to sustainable investments, with potentially far-reached effects (Berg et al., 2019).

However, there are some challenges associated with ESG scores. Although large providers have emerged, there are significant variations in ESG scores across the agencies. Doyle (2018) points to several weaknesses in the ESG rating system, due to differences in methodology, subjective interpretation, or the individual agency's agenda. There are no standardized rules for the environment or social disclosures, nor is there a control mechanism for verifying reported data. The rating companies will consequently have to make assumptions, which results in a subjective assessment. Some organizations, such as the Sustainability Accounting Standards Board (SASB) and the Global Reporting Initiative (GRI), work for a standardization, but there is still no consensus on a reporting standard for sustainability. Berg et al. (2019) have examined ESG scores from six key agencies considered as major players of the ESG data market and found a correlation in the range of 0.38 to 0.71, with an average of 0.54. By disaggregating the ESG score, the authors found a correlation of 0.53 on the environmental factor, 0.42 on the social factor and 0.3 on the governance factor.

5.3.1 Thomson Reuters Refinitiv and Sustainalytics

Our main data source for ESG scores is the Thomson Reuters Refinitiv database, hereafter referred to as Refinitiv. According to Douglas et al. (2017) and Davis Polk (2017), Refinitiv (formerly Reuters) evaluates more measures and indicators than its competitors, which makes them cover the dimensions of sustainability in a better way. In contrast to several key agencies, Refinitiv does not rely on companies' input in their assessment of ESG score and only uses publicly available information, to preserve objectivity (Douglas et al., 2017).

Due to the large deviations in ESG scores across providers (Doyle, 2018; Berg et al., 2019), we consider it appropriate to also include ESG scores from Sustainalytics as a secondary ESG score, to examine if the results are consistent. Sustainalytics is the largest independent provider of ESG research and ratings to investors (Sustainalytics, 2020). According to Douglas et al. (2017), there is a trade-off between the coverage of firms and the coverage of issues, as Sustainalytics has the largest number of firms covered. In our case, Refinitiv has by far the best coverage of the publicly listed firms in the Nordic and will naturally be the primary ESG score used in this thesis. As the providers are commercial players, we do not have access to ESG scores from more than these two agencies, through the Norwegian School of Economics' available databases. In our sample, when comparing the ESG scores for the firms that have both scores, we find a correlation of .75 between Refinitiv- and Sustainalytics scores and do not find that they are significantly different.

5.3.2 The strucutre of ESG score

Both ESG scores from Refinitiv and Sustainalytics are numerical, in the range of 0 to 100. Refinitiv structures its ESG score based on data firms report publicly, where they collect more than 450 ESG metrics (Refinitiv, 2020). Of these metrics, 186 are comparable measures, which in turn are divided into ten categories, as shown below in table 3. The score reflects a company's relative ESG performance, commitment, and effectiveness across those ten categories, as shown in table 3.

In comparison, Sustainalytics measures a company's exposure to industry-specific ESG risks and how well a firm manages those risks (Sustainalytics, 2020). Sustainalytics cover only 20 ESG issues, far fewer than Refinitiv's 186 measures. In both cases, the providers are opaque about which calculations are incorporated and how they are weighted (Douglas et al., 2017).

Table 3 *– The structure of the Refinitiv ESG score*

ESG Pillars	Categories	Number of Measures
Environmental	Resource use	20
	Emissions	28
	Innovation	20
Social	Workforce	30
	Human rights	8
	Community	14
	Product responsibility	10

Governance	Management	35
	Shareholders	12
	CSR strategy	9

5.4 Variables

To better isolate the effect of ESG, we control for market-based measures of risk, accounting-based variables, other relevant variables, and industry- and country-fixed effects. See A.1 for the technical composition of the variables.

5.4.1 **Market-based measures of risk**

Following the Carhart Four-factor model, which is the basis of our model, we include the factor loadings βm_i (Mkt_RF_Loading), βs_i (SMB_Loading), βh_i (HML_Loading) and βw_i (WML_Loading). Daniel and Titman (1997) argue that factor loadings are not always effective determinants of returns and show evidence that firm characteristics may also be important. Therefore, we include the size variable market cap (Mcap), book-to-market (BTM) and stock price momentum (Momentum) to our model. Another reason to include (Mcap) is to control for the effect that small cap firms tend to be more exposed to bankruptcy risk and poor performance during market contractionary periods (Switzer & Picard, 2020). We include a separate dummy variable for a negative book-to-market (BTMneg), as the returns of such companies tend to behave more like high book-to-market firms, instead of low book-to-market, due to distress (Lins et al., 2017). We also include idiosyncratic risk (Idiosyncratic) because idiosyncratic stock price volatility can affect the returns, according to Goyal and Santa-Clara (2003).

5.4.2 **Accounting-based variables**

To control for financial flexibility, through liquidity and leverage, we include the variables cash and short-term investments (Cash), long-term debt (LtDebt) and short-term debt (StDebt). Return on assets (ROA) and the indicator of loss (Loss) are included as measures of profitability. As mentioned in the literature review, profitability, liquidity and low borrowing have been significant for firms' resilience during crises (Bernanke & Gertler, 1989; Bhattacharya et al., 2010; Duchin et al., 2010). Also, Eugster et al. (2020) found that high-dividend stocks performed better than low-dividend stocks in Europe during the COVID-19 pandemic. Thus, the firm's dividend payout ratio (DivPayout) is included.

At the beginning of the pandemic, there were concerns related to supply chain difficulties. To capture a potential effect on returns, we include the variable inventory turnover ratio (InvTurn) as a measure of companies' integration of the supply chain. Due to great variation between industries, the inventory turnover ratio variable is industry-adjusted as these are more accurate and stable than unadjusted ratios, in line with Platt and Platt (1990).

Several studies support the notion that intangible assets have a positive and significant effect on firms' financial performance (Lantz & Sahut, 2005; Zhang, 2017). According to Landini et al. (2018), intangibles strengthen firms' resilience to unexpected shocks and directly reduce the probability of bankruptcy, based on evidence from the financial crisis. The intangible assets from the companies' balance sheets are included as the variable acquired intangible assets (AcqIntang). Most internally developed intangible assets are not recognizable on the balance sheet; therefore, some assumptions and calculations must be made. Enache and Srivastava (2018) propose a new method to estimate intangible investment outlay, other than research and development (R&D) expenses. The RD_SGA variable reflects the idea that both research and development (R&D) expenditures and 1/3 of sales, general and administrative (SG&A) expenditures would reflect investment in intangible assets, with a 5-year horizon (Demers et al., 2020; Enache & Srivastava, 2018; Lev & Sougiannis, 1996).

5.4.3 Other relevant control variables

We also include the variable Institutional ownership (Inst_Owners). Cella et al. (2013) show evidence that institutional investors with a longer trading horizon, sell their shares to a lesser extent during market turmoil than other investors with short-term strategies. On the other hand, as discussed by Heyden and Heyden (2020), institutional investors are often better informed than other participants in the market and are able to engage in short selling, which may adversely affect the share price. The authors further refer to the proportion of institutional investors as a commonly used proxy for the amount of short sales.

Market share (MktShare) is included as a measure of market power. Several studies have found a positive relationship between market power variables and stock market returns (i.e., Sullivan, 1977). In addition, we include industry-fixed effects, to control for variables that are constant across industries, thus, controlling for the fact that industries were affected differently by COVID-19. Finally, we include country fixed effects, to control for the fact that the pandemic affected the Nordic countries differently and that the COVID-related fiscal and monetary policies vary between countries.

5.5 Descriptive statistics

When comparing the Reuters- and Sustainalytics samples in tables 4 and 5, we notice that the average market cap for Sustainalytics rated firms is twice that of the sample of Reuters-rated firms. The average market share is also considerably higher for the Sustainalytics rated firms. This implies that Sustainalytics covers the large and powerful amongst the Nordic firms, to a further extent than Reuters.

Table 4 *- The table summarizes the 188 firms with Refinitiv ESG scores, for the crisis period. Continuous variables are winsorized at a 1 pct level.*

	Mean	St.dev	Min	Pctl.5%	Median	Pctl.95%	Max
ESG	54.658	18.352	2.950	24.879	54.815	82.952	90.480
Refinitiv.ENSCORE	48.725	25.174	0.000	6.715	49.910	87.809	94.730
Refinitiv.SOSCORE	59.986	19.742	5.860	23.090	59.595	87.901	95.000
Refinitiv.CGSCORE	52.257	22.488	1.330	15.442	52.575	88.626	96.680
Loss	0.133	0.340	0.000	0.000	0.000	1.000	1.000
BTMneg	0.011	0.103	0.000	0.000	0.000	0.000	1.000
Inst_Owners	59.446	21.593	3.904	22.701	60.179	94.883	113.345
Cash	0.122	0.169	0.001	0.009	0.072	0.449	0.940
LTDebt	0.215	0.154	0.000	0.011	0.190	0.512	0.864
STDebt	0.056	0.058	0.000	0.005	0.036	0.196	0.307
ROA	0.040	0.135	-0.841	-0.102	0.049	0.193	0.293
AcqIntang	0.268	0.214	0.000	0.002	0.212	0.636	0.834
RD_SGA	0.270	0.290	0.001	0.015	0.188	0.806	2.280
Mkt_RF_Loading	0.763	0.485	-0.437	0.012	0.753	1.480	2.587
SMB_Loading	0.363	0.178	0.105	0.184	0.318	0.709	1.384
HML_Loading	2.433	1.490	-1.252	0.071	2.484	4.819	5.280
WML_Loading	0.147	0.242	0.000	0.000	0.016	0.702	0.948
Idiosyncratic	0.085	0.038	0.035	0.046	0.074	0.153	0.246
DivPayout	3.097	15.482	-40.861	-2.997	0.952	11.857	135.173
Mcap MNOK	43337	64810	605	2444	15532	222216	275278
MktShare	0.163	0.231	0.000	0.001	0.063	0.638	1.000
BTM	0.451	0.556	-0.079	0.025	0.308	1.180	4.390
Momentum	0.301	0.425	-0.870	-0.367	0.322	0.871	2.293
InvTurn	0.667	1.287	0.000	0.000	0.353	1.821	10.393
BHAR	-0.103	0.164	-0.694	-0.350	-0.102	0.168	0.396

Table 5 *- The table summarizes the 72 firms with Sustainalytics ESG scores scores, for the crisis period. Continuous variables are winsorized at a 1 pct level.*

	Mean	St.dev	Min	Pctl.5%	Median	Pctl.95%	Max
Sustainalytics G	72.496	27.318	4.255	12.294	83.586	100.000	100.000
Sustainalytics S	70.052	25.935	0.000	14.476	77.430	98.560	100.000
Sustainalytics E	64.129	29.141	0.000	13.001	72.020	97.737	99.306
Sustainalytics ESG	70.292	27.546	2.083	11.896	80.688	98.273	100.000
Loss	0.083	0.278	0.000	0.000	0.000	1.000	1.000
BTMneg	0.028	0.165	0.000	0.000	0.000	0.000	1.000
Inst_Owners	60.127	18.157	18.964	34.821	62.957	89.255	98.071
Cash	0.103	0.111	0.005	0.008	0.077	0.289	0.724
LTDebt	0.200	0.159	0.006	0.016	0.172	0.489	0.864
STDebt	0.050	0.054	0.002	0.005	0.035	0.130	0.284
ROA	0.070	0.101	-0.437	-0.021	0.056	0.274	0.293
AcqIntang	0.233	0.216	0.000	0.003	0.155	0.619	0.834
RD_SGA	0.225	0.194	0.002	0.009	0.183	0.552	0.981
Mkt_RF_Loading	0.742	0.429	-0.171	0.104	0.703	1.391	2.432
SMB_Loading	0.308	0.134	0.105	0.161	0.269	0.622	0.717
HML_Loading	2.696	1.445	-0.380	0.360	2.600	5.048	5.280
WML_Loading	0.125	0.241	0.000	0.000	0.012	0.709	0.948
Idiosyncratic	0.074	0.033	0.035	0.042	0.064	0.143	0.184
DivPayout	4.693	17.360	-7.670	-1.221	1.062	25.420	135.173
Mcap MNOK	87847	85534	756	5347	58634	263830	275278
MktShare	0.221	0.238	0.000	0.002	0.131	0.610	0.990
BTM	0.524	0.665	-0.079	0.016	0.349	1.587	4.390
Momentum	0.286	0.340	-0.544	-0.247	0.345	0.778	1.805
InvTurn	0.604	0.952	0.000	0.000	0.353	1.425	5.730
BHAR	-0.065	0.143	-0.506	-0.300	-0.055	0.153	0.238

6. **Methodology**

Our methodology consists of two models: a main- and secondary model. The main model, which addresses the COVID-19 stock market itself, is a cross-sectional model using Buy-and-Hold Abnormal Returns for the crisis- and rebound periods. We further extend our scope in a second model, with a fixed-effects regression model using panel data dating back to 2015.

6.1 The COVID-19 Stock Market

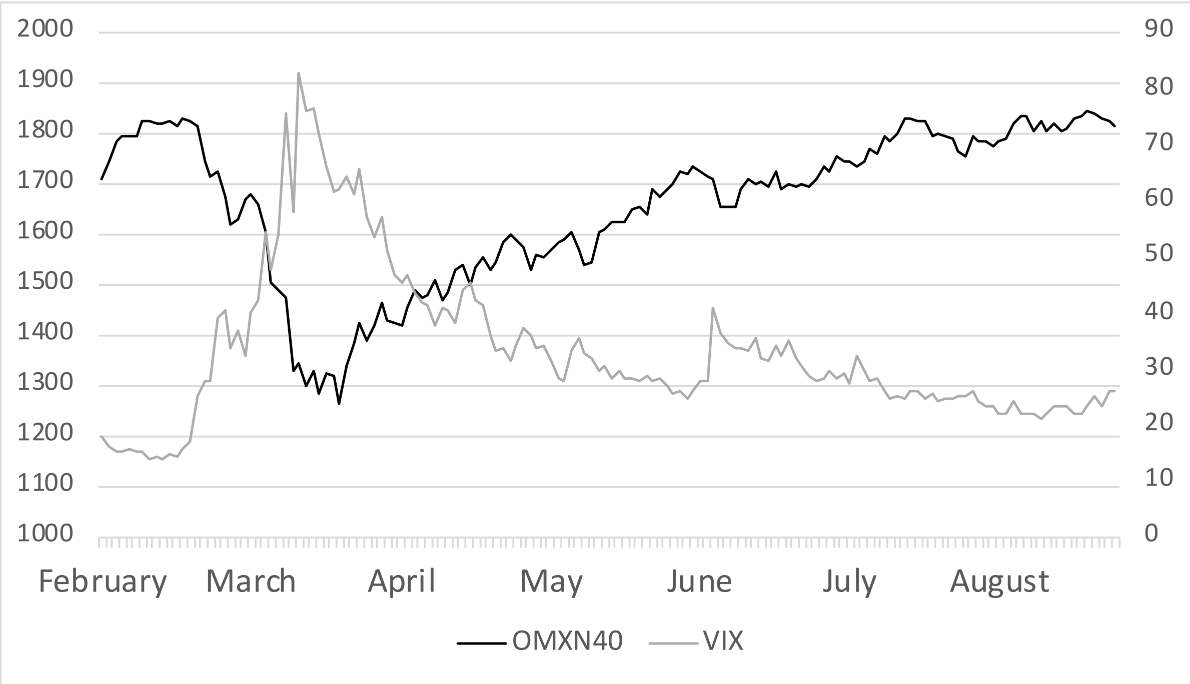
6.1.1 **The crisis period**

According to Nofsinger and Varma (2014), a crisis is defined as a big fall in the stock market. In this context, we find it appropriate to use the OMXN40 index as a benchmark for the Nordic market. Consistent with Nofsinger and Varma (2014), we define our crisis period based on the peak and trough, from February 19 at 1829.88 points to March 23 at 1261.57 points. This is a decrease of 31.06 percent, as illustrated in figure 2. Furthermore, if we define the crisis period in the context of a beer market caused by a stock market crash, we get the same start and end dates. A bear market is understood as the period when the index fell at least 20% from its previous peak (Gonzalez et al., 2005). A new all-time high was reached on August 12, at 1834.18 points, which means the bear market ended when it bottomed on March 23.

6.1.2 **The rebound period**

In addition to the crisis, the COVID-19 stock market is characterized by a steep rebound, during which the global equity markets almost fully recovered in just a few months. Thus, we find it relevant to also test the effect of ESG during the market rebound between March 23 and June 5, when OMXN40 had grown to 1734.15 and recovered to about 95% of the drop before somewhat stabilizing. Based on the movements of OMXN40, our period of interest can then be defined as February 19 to June 5. This also corresponds with the movements of the CBOE Volatility Index (VIX), often regarded as a measure of market sentiment. The VIX started a steep climb from 14.38 points on February 19, topped out at 82,69 points on March 16, then fell until it reached a temporary bottom at 24.52 points on June 5. The movements of OMXN40 and VIX are illustrated in figure 3.

Figure 3 *– OMXN40 and VIX during the period of interest, with the points of OMXN40 and VIX on the left and right side respectively.*



6.2 Model 1: Buy-and-Hold Abnormal Returns

To examine the effect of ESG, we find it most appropriate to measure the abnormal return for the crisis- and rebound periods. The use of abnormal return as a dependent variable is in line with similar studies which examine the effect of ESG on stock market performance during crises (Lins et al., 2017; Albuquerque et al., 2020; Ding et al., 2020; Takahashi & Yamada, 2020; Demers et al., 2020). The abnormal return is calculated as the difference between the realized return and a firm's expected return based on an asset pricing model over a set period, expressed in equation 4.

$$Abnormal\ return_{i,t} = r_{i,t} - Er_{i,t} \tag{4}$$

The abnormal return corrects for a stock's expected reaction to the market crisis and reflects the unanticipated profit or loss generated by the specific stock. The market model (MM) is one of the most commonly used models for estimating the expected returns for abnormal returns. The return from the market model for company *i*, at specific time *t*, is given by equation 5.

$$R_{i,t} \ = \ \alpha_{i,t} + \beta_{i,t} r_{m,t} + \ \varepsilon_{i,t} \tag{5}$$

Although there are more sophisticated models, the market model is preferred by several researchers. Brown and Warner (1985) recommend the market model, as it yields similar results as more complex models. Campbell et al. (1997) also favor the market model, as it does not increase the variance of abnormal returns or impose any restrictions on expected returns compared to more complex models. According to Holler (2012), the model is the most accurate in calculating the normal returns. Amongst relevant literature, Demers et al. (2020) use MM while Albuquerque et al. (2020) use CAPM. We therefore also check if our results are consistent when using CAPM.

In the recent finance literature, the measures cumulative abnormal returns (CAR) and buy-and-hold abnormal returns (BHAR) are commonly used to calculate abnormal returns. The CAR method uses arithmetic calculation, while the BHAR method uses geometric calculation, which includes the effect of compounding. For short horizons, both the CAR and BHAR provide quite similar results, and the choice of method will not lead to significant differences. For longer time-horizons, several economists suggest using the BHAR method, arguing that CARs are not appealing on economic grounds and may cause biased predictors relative to BHAR (Ritter, 1991; Barber & Lyon, 1997; Lyon et al., 1999). Barber and Lyon (1997) show evidence that CAR generates larger abnormal returns compared to BHAR in a period of one year due to ignorance of the compounding effect. The authors further argue that CAR may lead to incorrect inferences. Based on this discussion, we find that BHAR is the stronger of the two measures. Lyon et al. (1999) add that CAR and BHAR answer slightly different questions. The BHAR is warranted if the purpose is to answer whether sample firms earned abnormal stock returns over a particular time horizon, as is the case in our study, while CAR describes whether sample firms persistently earn abnormal returns. BHAR and CAR are presented in equations 6 and 7.

$$BHAR_{i,T} = \left[\prod_{t=1}^{T} \left(1 + r_{i,t}\right) - 1 \right] - \left[\prod_{t=1}^{T} \left(1 + \beta_{i,t}\, r_{m,t}\right) - 1 \right] \tag{6}$$

$$CAR_{i,T} = \sum_{t=1}^{T} \left(r_{i,t} - \beta_{i,t} r_{m,t}\right) \tag{7}$$

The choice of BHAR as the dependent variable is also in line with Demers et al. (2020) and Takahashi and Yamada (2020). The BHAR of firm *i* is calculated by deducting the product of the expected daily returns from the product of the buy-and-hold daily returns for period *T*. For the firm-specific expected return, we use the 60-months estimated beta, exposed to the market risk premium for each country[3]. Our full regression of model 1 is presented in equation 8. We also test the model using CAR to investigate whether the choice of the dependent variable affects the ESG coefficient.

$$\begin{aligned} BHAR_i = \; & \beta_0 + \beta_1 ESG_i + \beta_2 MktRF\_Loading_i + \beta_3 HML\_Loading_i \\ & + \beta_4 WML\_Loading_i + \beta_5 SMB\_Loading_i + \beta_6 BTM_i \\ & + \beta_7 BTMneg_i + \beta_8 Momentum_i + \beta_9 Idiosyncratic_i + \beta_{10} Cash_i \\ & + \beta_{11} LTDebt_i + \beta_{12} STDebt_i + \beta_{13} ROA_i + \beta_{14} Loss_i \\ & + \beta_{15} InvTurn_i + \beta_{16} AcqIntang_i + \beta_{17} RD\_SGA_i \\ & + \beta_{18} \log(Mcap)_i + \beta_{19} DivPayout_i + \beta_{20} MktShare_i \\ & + \beta_{21} InstOwners_{i_i} + \sum_{j=1}^{j} \delta_j \, industry_j + \sum_{j=1}^{4} \delta_j \, country_j + \varepsilon_i \end{aligned} \tag{8}$$

6.3 Model 2: Panel Data

Although model 1 is in line with the majority of research on ESG and performance during COVID-19, it only addresses the periods independently. We therefore include another model to investigate whether the ESG scores' effect is different during the crisis- and rebound periods compared to ordinary times. This model is inspired by Lins et al. (2017), who examine whether the effect of CSR is different in the post- and pre-crisis periods compared with the crisis period of the financial crisis in 2008-2009. In our model 2, we use panel data with monthly observations for companies with ESG scores dated back to January 2015. The choice of monthly returns is made to reduce potential noise arising from a higher return frequency and due to computational limitations. Consequently, the crisis period is defined as February and March, while the rebound covers April and May. Due to the exponential growth in the number

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[3] See subsection 6.4 for estimations of betas and variables.

of firms with ESG scores (the number has doubled since 2015), and a low number of rated firms before 2015, we do not include earlier years.

The main benefit of panel data is that it can handle both firm-specific and time-specific effects. Through controlling for these largely unobserved effects, omitted variable bias can be reduced and inference improved (Stock & Watson, 2011, p.354). Panel data might also reduce the issues of multicollinearity that arise for the cross-sectional samples in Model 1. Although model 2 has some benefits compared to model 1, we nonetheless approach model 1 as a primary model, for several reasons. The methodology of model 1 enables us to easily compare our results with previous research. Further, due to the use of monthly observations in model 2, model 1 more precisely isolates the crisis and rebound periods.

The dependent variable of Model 2 is the monthly abnormal return. Due to the nature of the panel data, we do not use the BHAR or CAR, as this would be incompatible with the panel data methodology in model 2. The expected return of the stocks is calculated using the rolling market model regressions with a 60-month estimation window. Our regression model is presented in equation 9.

$$r_{i,t} - Er_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_2 ESG_{i,t}\, x\, Crisis_t + \beta_3 ESG_{i,t}\, x\, Rebound_t + \sum_{k=4}^{k} \beta_k X_{k,it} + \sum_{n=2}^{n} \gamma_n E_n + \sum_{t=2}^{t} \delta_t T_t + \varepsilon_{i,t} \tag{9}$$

Crisis$_t$ is a dummy variable set to 1 in the crisis period, and *Rebound$_t$* is a dummy variable set 1 in the rebound period after the crisis. $\sum_{k=4}^{k} \beta_k X_{k,it}$ represents the complete set of control variables and factor loadings from equation 8. $\sum_{n=2}^{n} \gamma_n E_n$ represents the entity fixed effects. γ_n is the coefficient for the binary dummy entity E_n. $\sum_{t=2}^{t} \delta_t T_t$ represents the time fixed effects, and δ_t represents the coefficient for the time binary dummy regressor T_t. We do not include variables for industry and country because these are time-invariant characteristics that do not change over time and are already controlled for using fixed effects.

6.4 Estimation of variables

We estimate betas, factor loadings, idiosyncratic risk and calculate momentum. Firm betas are estimated using a rolling market model with a 60-month estimation window, which is the period that generates the most accurate beta forecast according to Cenesizoglu et al. (2016). At least 12 months of return data is required for each firm. Idiosyncratic risk is the residual variance from these market-model regressions. The regression specification for this estimation, for company *i,* at time *t*, is as follows:

$$r_{i,t} = \beta_0 + \beta_1 r_{m,t} + \varepsilon_{i,t} \tag{10}$$

We estimate factor loadings on Mkt-RF, SMB, HML and WML the same way, by regressing firm-specific returns on Kenneth French's Fama-French European three-factors and momentum factor, using rolling regressions with a 60-month estimation window. The regression specification for company *i*, at time *t*, is presented as:

$$r_{i,t} = \beta_0 + \beta_1 MktRF + \beta_2 SMB + \beta_3 HML + \beta_4 WML + \varepsilon_{i,t} \tag{11}$$

Momentum is calculated as the rolling, raw buy-and-hold returns of the past 12 months. In the regressions, betas, factor loadings, idiosyncratic risk and momentum are updated monthly based on the rolling estimates.

6.5 Functional form and specification

For each sample and period of interest, we run different specifications, gradually adding variables to the models, before finishing with the restricted model. In this section, we use the models that are run on the defined crisis period to illustrate our process of testing and constructing the models. We have applied the same process to the models run on the other time periods, but find it excessive to report all these steps.

6.5.1 **Model 1 – Cross-sectional**

Functional form

To find the correct functional form, we use the Ramsey RESET test for nested models and the Davidson-MacKinnon J test for non-nested models (Wooldridge, 2016, p. 304). Based on the Davidson-MacKinnon J test, we choose to log-transform Mcap for interpretation purposes since it is the only control variable in absolute form. The tests indicate no other changes in functional form. None of the tests rejects the null of correct functional form, and we conclude that our model does not have an incorrect functional form.

Multicollinearity

Because of the sample size and similarities of variables, we suspect that the inclusion of both market variables and Fama French factor loadings might cause multicollinearity issues. To check this, we apply a Generalized Variance Inflation Test (GVIF) (Fox & Monette, 1992). For our models, the GVIF test is preferred above the standard VIF test because of the inclusion of categorical variables; industry- and country-fixed effects.

The test indicates multicollinearity in the sample with Reuters-rated firms, especially between SMB_Loading and Idiosyncratic risk. Although there are no detected multicollinearity issues in the variable of interest, ESG, but in control variables only, we improve the model to make the control variables interpretable. After testing different model specifications and rerunning GVIF tests on the different specifications, we find that the exclusion of SMB_Loading and MktShare effectively reduces multicollinearity. The GVIF test for the Reuters sample is presented in table A.15.

For the sample consisting of firms with Sustainalytics ESG scores, multicollinearity issues are more serious, probably due to the smaller sample size (72). The GVIF test detects potential multicollinearity in the variable of interest, Sustainalytics ESG score. After removing some variables and testing different model specifications, we decide on a specification that reduces the issue of multicollinearity and still controls for the most important factors. This specification excludes SMB_Loading, HML_Loading, WML_Loading, BTM, BTMneg, Idiosyncratic and InvTurn. The GVIF test for the Sustainalytics sample is presented in table A.15.

There appears to be a lack of consensus in the literature as to what is the correct cutoff value in a GVIF or VIF test. Opinions range between a cutoff of 5 (Ringle et al., 2015) and 10 (Hair et al., 1995). With this in mind, we regard a value below ten as acceptable for control variables and conclude that the GVIF-values for our specifications are acceptable. See A.2 for a complete correlation matrix.

Overfitting

Our large number of independent variables, relative to the number of firms, might cause an overfitted model (Babyak, 2004; Green, 1991). Demers et al. (2020) apply even more variables in their model but on a much larger sample size. Thus, we might not be able to include all relevant variables in our models.

We check for overfitting by examining R-squared, adjusted R-squared and Predicted R-squared. Predicted R-squared estimates what the R-squared would be if the model was fitted to new data (Allen, 1974). Thus, it is a way of measuring the loss of explanatory power when the model is applied to new data. Predicted R-squared is calculated as follows:

$$Predicted\ R^2 = 1 - \frac{Predicted\ residual\ sum\ of\ squares}{Total\ sum\ of\ squares} \tag{12}$$

R-squares for the crisis period are presented in table A.16.The ratio between R-squared and adjusted R-squared, and the difference between R-squared and predicted R-squared indicates that there might be problems with overfitting in the model. After trying different model specifications, with fewer variables, we find that our original specification still performs best when comparing the different R-squares. In addition, we emphasize that our primary focus should be on detecting significance, rather than chasing explanatory power. We therefore regard the predicted R-squared as acceptable and choose to avoid the removal of explanatory variables and accept the moderate indications of overfitting.

Restricted models

To reduce the weakness that might result from the ratio between the high number of variables and the sample size, we also design restricted models. These models contain only variables that contribute statistically to the model. This is done using F-tests and including only the variables that reduce the model's residual sum of squares. We regard these restricted models as the most precise and robust amongst the models. The variables included vary with sample and time period. For some time periods and especially for the samples of firms with Sustainalytics rating, the issues of overfitting are more problematic than for the main sample. Therefore, in these cases, the restricted model must be regarded as a significantly better model than the models containing more control variables. In section 7, these issues are pointed out and discussed where they occur. For robustness tests, only the restricted model is reported. An increase in predicted R-squared indicates that the issues of overfitting are successfully reduced by restricting the models (Table A.16).

Heteroskedasticity

We apply the Breusch-Pagan test to identify problems with heteroskedasticity. Only in the model specifications where the test detects heteroskedasticity, we use robust standard errors. For the standard errors, we apply bias-reduced linearization (BRL), which reduces the bias in the Eicker-Huber-White variance estimator and a Bell-McCaffrey degrees-of-freedom adjustment (Bell & McCaffrey, 2002) based on the bias-reduced estimators. The use of BRL and degrees-of-freedom adjustment is discussed by Imbens and Kolesár (2016). They recommend this method over the traditional Eicker-Huber-White method, which relies on large samples, and they argue that the Bell-McCaffrey method performs better for small and moderately sized samples and when the distribution of the independent variables is skewed. When taking the number of control variables into account, our sample size is moderate, and many of the variables have considerable right-skewed distributions. Hence, we believe the Bell-McCaffrey adjustment should perform well on our sample.

6.5.2 **Model 2 – Panel Data**

We roughly use the same functional form and specification as in Model 1, with minor modifications. To find the optimal regression method for our panel data, we apply several tests. Using an F-test for individual effects, we find that there are significant individual fixed effects. In addition, a Lagrange Multiplier Test indicates that there are significant time-fixed effects. These results indicate that a pooled OLS should not be used. To further decide between a random- or fixed-effect estimation approach, we use a Hausman test, which indicates that we should use fixed effects. No problems with multicollinearity are detected using VIF-tests. Nor do we identify issues with overfitting when the model is applied to panel data, through the examination of predicted R-squared. We see that using panel data somewhat reduces the challenges associated with the combination of our moderate sample and the many independent variables. Still, as in model 1, we design restricted models, consisting only of variables that contribute significantly to the model.

Heteroskedasticity and autocorrelation

Potential problems with heteroskedasticity and autocorrelation are handled using clustering. Standard clustering methods can perform poorly when the number of independent clusters is limited (Pustejovsky & Tipton, 2016). Therefore, as with the cross-sectional model, we use BRL and adjusted degrees of freedom. The original Bell-McAffrey formulation of BRL does not work in a model with both entity- and time-fixed effects, such as ours. We therefore use a generalization of BRL, which works in models with arbitrary sets of fixed effects, as proposed by Pustejovsky and Tipton (2016). We apply the Breusch-Pagan test to identify problems with heteroskedasticity and use robust standard errors only where heteroskedasticity is detected.

6.6 Robustness tests

We include several robustness tests to check the coherence and sensitivity of our main findings. In addition, the models will be tested using CAR and CAPM.

6.6.1 **Disaggregated ESG**

As mentioned in the literature review, Hoepner et al. (2016) highlight engagement in the environmental dimension, as the most effective in lowering downside risk. Albuquerque et al. (2020) only examine the Environmental and Social dimensions of ESG, to avoid capturing the governance effect, as well-governed firms invest more in ES-policies. To investigate whether any of the dimensions are more prominent, and to control for a potential governance effect, we use disaggregated ESG scores in our model.

6.6.2 **ESG quartiles**

By using quartiles, instead of a linear score, we can assess if the effect of a company's ESG score changes between different levels of ESG score. We will regress BHAR on ESG score quartiles with dummies for quartiles 2 to 4 together with control variables from the restricted model.

6.6.3 **Country interactions**

To investigate whether ESG may have a different effect across the Nordic countries, we have re-estimated Model 1 with dummy variables for Norway, Denmark, and Finland. We create interactions between the country dummies and ESG score.

6.6.4 **ESG scores from Sustainalytics**

Due to the large deviations in ESG scores across providers (Berg et al., 2019; Doyle, 2018), we also use ESG scores from Sustainalytics in our main estimations from models 1 and 2.

6.6.5 **Restricted sample**

When comparing the models using different ESG scores, different results might be caused by the differences in samples. Our samples consist of 188 firms with Reuters scores, and 72 of these firms also have the Sustainalytics score. To reduce any noise arising from sample differences, we also run the Reuters regressions on this restricted sample of 72 firms.

6.6.6 **Others**

We control if model 1 is robust to the application of a shorter rebound period, using the immediate rebound that ended April 29. On a side note, we also test if the fact that a firm has an ESG score or not influences the abnormal return. This is done using a dummy variable representing if the firm is ESG-rated. We further investigate which factors influence the probability of being ESG scored, through a linear probability model with the ESG-dummy as the dependent variable. We use the sample of 720 firms for which all variables, except ESG score, are available. This will not be discussed in detail, as the focus in our thesis is on the samples of firms with ESG scores, but is included to identify a possible sampling bias.

7. Results from the Empirical Analysis

The main purpose of this study is to examine the effect of ESG during the COVID-19 stock market. Therefore, our focus is primarily on the ESG variable rather than a detailed presentation of the variables associated with the abnormal returns. In unreported results, all findings are robust to the application of CAPM instead of MM. We report three decimals for the coefficients, when possible, therefore some rounding occurs.

7.1 Results from the defined crisis period

Table 6 presents the results of various estimates of model 1 using BHAR during the crisis period. In the first column (1), the ESG score is significant at 0.05 level in explaining the BHAR. An increase of 1 point in the ESG score positively affects the abnormal returns with 0.2 percentage points. However, the explanatory power is small, where ESG in isolation only explains about 3% of the overall variation. In column (2), we add country and industry fixed effects, and the ESG score is no longer significant. ESG remains insignificant from column (2) to column (7) where we gradually add more variables. As shown in column (7), the most prominent variables that contribute positively are the Mkt-RF factor loading, return on assets and size (Mcap). The HML factor loading, long-term debt and the proportion of institutional investors contributed negatively. The coefficients' values and significance levels remain largely unchanged across the estimations. In the appendix, table A.1 column (1), the CAR is regressed on the restricted model 1 for the crisis period, which shows that ESG is insignificant.

Table 6: Crisis period with ESG scores from Refinitiv

Table 6 presents the results from regressing BHAR on the Refinitiv ESG score and the control variables for the crisis sample. In column (1), we only regress BHAR on the ESG score. In column (2), we add country- and industry-fixed effects. In column (3), we add the Fama-French + momentum factor loadings. In column (4), we add more market-based measures of risk. We remove the SMB-Factor loading due to issues with multicollinearity. In column (5), we add the accounting-based variables. In column (6), we regress BHAR on the complete model 1. In column (7), we regress BHAR on the restricted model.

	Dependent variable:						
	BHAR						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ESG	0.002**	0.0003	0.0004	0.0003	-0.001	-0.001	-0.0003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)

Mkt_RF_Loading			0.242***	0.251***	0.284***	0.284***	0.202***
			(0.053)	(0.048)	(0.048)	(0.047)	(0.031)
HML_Loading			-0.047**	-0.049***	-0.057***	-0.055***	-0.036***
			(0.019)	(0.017)	(0.017)	(0.017)	(0.012)
WML_Loading			0.044	0.074	0.071	0.063	
			(0.080)	(0.081)	(0.074)	(0.072)	
SMB_Loading			-0.171				
			(0.114)				
BTM				-0.034	0.001	-0.007	
				(0.028)	(0.026)	(0.026)	
BTMneg				-0.001	0.129	0.082	
				(0.122)	(0.123)	(0.121)	
Momentum				0.002	-0.033	-0.035	
				(0.027)	(0.027)	(0.026)	
Idiosyncratic				-1.117**	-0.595	-0.712	
				(0.515)	(0.568)	(0.553)	
Cash					-0.172*	-0.170*	
					(0.101)	(0.098)	
LTDebt					-0.328***	-0.334***	-0.220***
					(0.094)	(0.091)	(0.070)
STDebt					0.058	0.001	
					(0.199)	(0.194)	
ROA					0.031	0.044	0.245***
					(0.118)	(0.115)	(0.076)
Loss					-0.054	-0.054	
					(0.038)	(0.037)	
InvTurn					0.002	0.002	
					(0.008)	(0.008)	
AcqIntang					-0.121**	-0.096	-0.059
					(0.060)	(0.058)	(0.051)
RD_SGA					0.030	0.014	
					(0.042)	(0.041)	
log(Mcap)					0.038***	0.035***	0.031***
					(0.011)	(0.011)	(0.010)
DivPayout					-0.001*	-0.001*	
					(0.001)	(0.001)	
Inst_Owners						-0.002***	-0.001***
						(0.001)	(0.0005)
Constant	-0.198***	-0.118	-0.060	-0.024	-0.394**	-0.343*	-0.426***
	(0.042)	(0.155)	(0.147)	(0.148)	(0.183)	(0.178)	(0.158)
Industry Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	188	188	188	188	188	188	188
Adjusted R^2	0.033	0.210	0.350	0.355	0.501	0.530	0.527

Note: *p<0.1; **p<0.05; ***p<0.01

7.1.1 Disaggregated ESG scores

In table A.2, the ESG score is disaggregated into the environmental, social and governance scores, and restricted models are run for each of the scores. None of the disaggregated scores are significant, while all control variables except AcqIntang are significant at a .01 level.

7.1.2 Differences between countries

When running the restricted model with interactions between ESG and countries, we find no significant differences in the effects of ESG across countries. See table A.4, column (1). Compared to Swedish firms, the Finnish firms had on average 19.6 percentage points lower abnormal returns during the crisis period, significant on a .05 level. All control variables except AcqIntang are significant at a .01 level.

7.1.3 ESG scores by quartile

As shown in table A.5, column (1), none of the ESG score quartiles have a significant effect on BHAR for the crisis period. All control variables except AcqIntang are significant at a .01 level.

7.1.4 Sustainalytics

Table A.8 presents the results from regressing BHAR on Sustainalytics' ESG score and the control variables for the crisis sample. The ESG score remains significant until column (2) when fixed effects are included. In column (3), by adding the Fama-French + momentum factor loadings, the significance of ESG disappears. The ESG score remains insignificant in column (4) when all control variables are added, and in column (5) when we include the control variables from the restricted model.

Table A.10. presents the results from a strict sample consisting of firms that have been given ESG scores from both Refinitiv and Sustainalytics. Columns (1) and (2) show that both ESG scores are insignificant during the crisis period.

7.2 Results from the Rebound Period

In table 7, except from columns (5) and (6), the ESG score is significantly negatively associated with abnormal returns during the rebound period. From column (4) the

SMB_Loading is removed due to issues with multicollinearity. In columns (5) and (6), we detect issues of overfitting, hence we do not regard these models as precise estimates of the relationship between ESG and BHAR. Therefore, the restricted model in column (7) is the strongest of the models for this sample. In column (7), the restricted model, increasing the ESG score by 1-point negatively affects the BHAR by 0.03 percentage points. Among the prominent control variables, Mkt-RF contributes negatively, while cash and acquired intangible assets contribute positively. The results of the rebound period are also consistent when using CAR as the dependent variable, as shown in the appendix, table A.1, column (2).

Table 7: Rebound period with ESG scores from Refinitiv

Table 7 presents the results from regressing BHAR on the Refinitiv ESG score and the control variables for the rebound sample. In column (1), we only regress BHAR on the ESG score. In column (2), we add country- and industry fixed effects. In column (3), we add the Fama-French + momentum factor loadings. In column (4), we add more market-based measures of risk. We remove the SMB-Factor loading due to issues with multicollinearity. In column (5), we add the accounting-based variables. In column (6), we regress BHAR on the complete model 1. In column (7), we regress BHAR on the restricted model.

	Dependent variable:						
	BHAR						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ESG	-0.007***	-0.004***	-0.004**	-0.003*	-0.002	-0.002	-0.003**
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
Mkt_RF_Loading			-0.289**	-0.369***	-0.453***	-0.453***	-0.250***
			(0.112)	(0.102)	(0.115)	(0.115)	(0.052)
HML_Loading			0.029	0.047	0.073*	0.073*	
			(0.040)	(0.037)	(0.041)	(0.041)	
WML_Loading			0.021	-0.074	-0.106	-0.101	
			(0.169)	(0.173)	(0.176)	(0.176)	
SMB_Loading			0.080				
			(0.242)				
BTM				-0.018	-0.052	-0.048	
				(0.059)	(0.063)	(0.063)	
BTMneg				-0.026	-0.111	-0.085	0.184
				(0.259)	(0.294)	(0.297)	(0.254)
Momentum				0.062	0.070	0.071	0.073
				(0.057)	(0.064)	(0.064)	(0.055)
Idiosyncratic				1.686	2.087	2.152	
				(1.099)	(1.355)	(1.361)	
Cash					0.314	0.313	0.298*
					(0.240)	(0.240)	(0.164)
LTDebt					0.305	0.308	
					(0.224)	(0.224)	
STDebt					-0.665	-0.633	
					(0.474)	(0.478)	

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ROA					0.308	0.301	
					(0.282)	(0.283)	
Loss					0.056	0.056	
					(0.091)	(0.091)	
InvTurn					0.006	0.006	
					(0.020)	(0.020)	
AcqIntang					0.342**	0.328**	0.325**
					(0.142)	(0.144)	(0.134)
RD_SGA					0.043	0.052	
					(0.101)	(0.102)	
log(Mcap)					-0.011	-0.010	
					(0.026)	(0.027)	
DivPayout					0.003**	0.003**	0.002
					(0.002)	(0.002)	(0.001)
Inst_Owners						0.001	0.001
						(0.001)	(0.001)
Constant	0.604***	0.211	0.162	0.031	-0.098	-0.126	0.043
	(0.075)	(0.315)	(0.313)	(0.316)	(0.435)	(0.438)	(0.296)
Industry Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	188	188	188	188	188	188	188
Adjusted R^2	0.120	0.267	0.343	0.345	0.367	0.364	0.375
Note:					*p<0.1; **p<0.05; ***p<0.01		

7.2.1 **Disaggregated ESG scores**

In table A.3, the ESG score is disaggregated and run on restricted models for each of the scores in the same way as in subsection 7.1.1. All the disaggregated ESG scores are negatively associated with abnormal returns during the rebound period. The environmental score is significant at a .05 level, while the social score and governance score are significant at a .1 level. All the coefficients are -.002, which means an increase of 1-point of the respective score, negatively affects the abnormal return by .02 percentage points.

7.2.2 **Country aggregated ESG scores**

In table A.4 column (2), we run the restricted model between ESG and the countries for the rebound period. We do not find any significant differences in the effects of ESG across countries. Nor do we find any significant differences across the countries on abnormal returns during the rebound.

7.2.3 ESG scores by quartile

As shown in table A.5 column (2), none of the ESG-quartiles have a significant effect on BHAR during the rebound period.

7.2.4 Sustainalytics

Table A.9 presents the results from regressing BHAR on Sustainalytics' ESG score and the control variables for the rebound sample. In column (1), ESG is negatively associated with abnormal returns during the rebound period, at a .05 significance level. When fixed effects are added, the ESG score becomes insignificant. The ESG score remains insignificant from column (2) to (5) when more control variables gradually are added and when BHAR is regressed on the restricted model.

Table A.10 presents the results of the strict sample of firms that have been given ESG score from both Refintiv and Sustainalytics. Columns (3) and (4) show that both Refinitiv- and Sustianalytics ESG scores are insignificant in the explanation of BHAR in the rebound period.

7.2.5 Shorter rebound period

The results from the shorter rebound period are shown in table A.6. When running the models on a rebound period that ends on April 29, the coefficient of the ESG effect is significant in all specifications. Suggesting that the relationship is somewhat stronger during April and the end of March. The ESG coefficient in columns (6) and (7) indicates that a 1-point increase in ESG decreases BHAR by .3 percentage points. In the restricted model (7) all control variables except Momentum are significant at a .1 level or less. For columns (5) and (6) the issues of overfitting are now less severe than for the longer rebound period.

Table A.7 presents several robustness tests for the shorter rebound period. In columns (1) and (3) Environmental score and Governmental score are significant at a .05 and .01 level respectively, but in column (2) Social score is not significant. In column (4) we do not find any significant differences in the effects of ESG across countries, nor any significant differences between the countries in terms of abnormal returns. In the ESG quartile specification in column (5), we find that firms in quartiles 3 and 4 perform significantly weaker than firms in quartile 1. On average, compared to the first quartile, firms in the third quartile underperformed by 8.5 percentage points, significant at a .1 level, and firms in the fourth quartile underperformed by 11.1 percentage points, significant at a .05 level. In column (6) the Sustainalytics ESG score is not significant, while all control variables are.

7.2.6 The effect of having an ESG score

We find that firms that are rated with the Refinitiv ESG score on average perform significantly better than non-rated firms during the rebound period. In table A.13, column (3), the effect is 10.9 percentage points of abnormal returns, significant at a .01 level, and in the restricted model in column (4), the effect is 8.5 percentage points, significant at a .1 level. During the crisis, in colums (1) and (2), we find no effect of being ESG-rated.

In table A.14 we find several significant relationships when estimating the probability of being ESG scored. A one percentage increase in Mcap is associated with a 1.3 percentage point increase in the probability of being ESG scored, significant at .01 level. Idiosyncratic, AcqIntang, RD_SGA, MktShare and InstOwners also have significant positive effects on the probability, whereas Momentum is the only variable with a significant negative effect. In unreported results from the panel data model, we find no effect of being ESG-rated during any of the periods.

7.3 Results from the Panel Data Model

7.3.1 ESG scores from Refinitiv

In table 8, the results from model 2 with ESG scores from Refinitiv are presented. The results from all six columns suggest that the ESG score is insignificant in explaining abnormal returns during ordinary times. The interaction term ESG:Crisis is also insignificant in all six columns, which indicates that the effect of the ESG does not change during the crisis period. However, the interaction term ESG:Rebound is significant with a coefficient of -.001 in all six columns, significant at .05 level in column (6). This indicates that when increasing the ESG score by 1 point, there is a significant difference of -0.1 percentage points in the effect on abnormal returns, when comparing ordinary times to the rebound period. The F-test for the joint hypothesis of ESG and ESG:Rebound is significant at a .1 level in all 6 specifications, which indicates that the ESG effect was significant also when regarding the rebound period independently.

Table 8: Model 2 with ESG scores from Refinitiv

Table 8 presents the results from regressing abnormal returns on the Refinitiv ESG score and the control variables for the panel data sample. In column (1), we regress abnormal returns on the ESG score combined with ESG interaction terms for the crisis- and the rebound period. In column (2), we add the Fama-French + momentum factor loadings. In column (3), we add more market-based measures of risk. In column (4), we add the accounting-based variables. In column (5), we regress the abnormal returns on the complete model 2. In column (6), we regress abnormal returns on the restricted model.

	Dependent variable:					
	Abnormal Returns					
	(1)	(2)	(3)	(4)	(5)	(6)
ESG	-0.001	-0.001	-0.0001	0.0001	0.0001	0.00001
	(0.0004)	(0.0005)	(0.0003)	(0.0003)	(0.0003)	(0.0002)
Mkt_RF_Loading		-0.003	0.006	0.013**	0.014**	0.012*
		(0.007)	(0.008)	(0.006)	(0.006)	(0.007)
HML_Loading		0.006	0.005	0.007*	0.007*	0.005*
		(0.005)	(0.004)	(0.003)	(0.003)	(0.003)
WML_Loading		-0.005	-0.005	-0.004	-0.004	
		(0.005)	(0.004)	(0.004)	(0.004)	
SMB_Loading		0.002	0.009**	0.008	0.008	
		(0.004)	(0.004)	(0.005)	(0.005)	
BTM			0.019**	0.004	0.004	
			(0.007)	(0.010)	(0.010)	
BTMneg			-0.038	-0.043	-0.044	
			(0.052)	(0.058)	(0.059)	
Momentum			0.046	0.045	0.045	0.044
			(0.027)	(0.027)	(0.027)	(0.027)
Idiosyncratic			-0.267*	-0.477***	-0.483***	-0.407***
			(0.134)	(0.135)	(0.138)	(0.112)
Cash				-0.005	-0.004	
				(0.035)	(0.035)	
LT_Debt				0.006	0.007	-0.009
				(0.035)	(0.035)	(0.029)
ST_Debt				0.016	0.018	
				(0.050)	(0.051)	
ROA				-0.005	-0.003	-0.013
				(0.050)	(0.050)	(0.049)
Loss				0.001	0.002	
				(0.007)	(0.007)	
InvTurn				-0.005	-0.005	
				(0.003)	(0.003)	
AcqIntang				0.040	0.041	0.034
				(0.026)	(0.026)	(0.025)
RD_SGA				0.006	0.006	
				(0.004)	(0.004)	
log(Mcap)				-0.018**	-0.018**	-0.020***

	(1)	(2)	(3)	(4)	(5)	(6)
				(0.008)	(0.008)	(0.005)
DivPayout				-0.0001	-0.0001	
				(0.0002)	(0.0002)	
MktShare					-0.139	
					(0.296)	
Inst_Owners					-0.0001	-0.0001
					(0.0001)	(0.0001)
ESG:Crisis	0.001	0.001	0.001	0.001	0.001	0.001
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
ESG:Rebound	-0.001*	-0.001*	-0.001**	-0.001*	-0.001*	-0.001**
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Joint Hypothesis Rebound	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,357	9,357	9,357	9,357	9,357	9,357
Adjusted R^2	-0.025	-0.024	0.021	0.028	0.028	0.026
Note:				*p<0.1; **p<0.05; ***p<0.01		

Disaggregated ESG scores

In table A.11 we show that none of the disaggregated scores have a significant effect during ordinary times or during the crisis. Only the environmental scores are negatively associated with abnormal returns during the rebound period. In column (1) a 1-point increase in the environmental score is associated with a .1 percentage point reduction in monthly abnormal returns. The F-test for the joint hypothesis of Refinitiv_ENSCORE and Refinitiv_ENSCORE:Rebound is significant at a .01 level.

7.3.2 ESG scores from Sustainalytics

In table A.12, we run model 2 with ESG scores from Sustainalytics. In all six columns, the ESG score and the interaction terms for the crisis- and the rebound period with ESG are insignificant.

8. **Discussion**

In this section, we will connect our results to the theory and literature review and discuss the implications. We begin by discussing the crisis period, then relevant control variables will be addressed briefly, in the context of the market sentiment, before the rebound is discussed. Thereafter, we will acknowledge the limitations of our results. Indications of sampling bias will be discussed in the limitations section.

8.1 The crisis period

None of the results from the models run on the crisis period indicate a significant relationship between ESG and stock market performance. Our findings are robust to all the robustness tests, and we detect no differential effect of ESG between countries or ESG quartiles. For the firms with Sustainalytics ESG scores, the relationship between ESG and performance is somewhat more resilient to the addition of control variables, but nonetheless insignificant in the full- and restricted models. Thus, the findings point in the direction of a neutral relationship between ESG and stock market performance for the first part of the COVID-19 Nordic stock market. This is in contrast with the positive relationship found in Albuquerque et al.'s (2020) and Ding et al.'s (2020) studies, which we believe is due to possible omitted variable bias in their studies. By disaggregating the ESG score and only focusing on the environmental and social dimensions, such as Albuquerque et al. (2020), we still find no significance.

The neutral relationship between ESG and stock market performance is in line with the studies of Takahashi and Yamada (2020) and Demers et al. (2020), despite geographical differences. When we run various specifications of model 1 on the crisis period, ESG's significance diminishes very quickly. This indicates that in the Nordic region, the ESG score itself is poorly correlated with the abnormal return during the crisis period. Compared with Demers et al.'s (2020) findings, the relationship between ESG and stock performance is even less robust to the addition of control variables.

Model 2 indicates that there is no significant relationship between ESG and stock market performance during ordinary times, which is consistent with previous research from Revelli and Viviani (2015), Friede et al. (2015), and Sargis and Wang (2020). Furthermore, there is no indication that the effect of the ESG score is different during the crisis period compared to normal times, consistent with the results from our model 1. This non-differential effect of ESG during the crisis period contrasts with Lins et al.'s (2017) findings. The authors found a significant change in the effect of CSR on abnormal returns during the financial crisis, compared with the periods before and after the crisis. Our deviating results may be due to the origin of the crises. The financial crisis arose endogenously from banks and financial institutions, which makes Lins et al. (2017) suggest that the social capital generated by CSR activities will pay off when trust in the economy suddenly declines. A similar trust issue might not be considered relevant in the COVID-19 crisis, which was triggered by an exogenous non-economic factor. Therefore, it may well be assumed that involvement in the ESG factors provides less protection in the covid-19 stock market compared to the financial crisis in 2008-2009.

In the context of Shareholder theory, the neutral effect does not necessarily mean that ESG investments harm shareholders. On the other hand, if additional shareholder value could be created by reallocating the resources spent on ESG-related activities, this indicates that ESG possibly destroys shareholder value indirectly, through the opportunity cost. Hence, if the shareholders are to be regarded as the sole principal, a principal-agent problem arises between shareholders and management. However, if such a misallocation exists and is known to shareholders, it should be reflected in reduced stock market performance as a consequence of ESG, which did not happen during the crisis. Moreover, when approaching the findings using the Stakeholder theory, the neutral effect indicates that the firms successfully maintain the interests of multiple stakeholders. Further, if one regards the stakeholders as the principal, this does not indicate the presence of a principal-agent problem, because the managers appear to act in the interests of the stakeholders. If investors are aware of a misallocation of resources and do not punish the stock price, a neutral relationship between ESG and performance suggests that the investors act in accordance with the Stakeholder theory, valuing more than just returns.

Despite a dramatic change in market sentiment, the relationship between ESG and stock market performance remained the same during the crisis as in ordinary times. Consequently, we find no indication of an insurance effect associated with ESG, and this indicates that the risk management theory did not hold in our case.

8.2 The change in market sentiment

We consider the change in sentiment an integral part of understanding the different ESG effects in the two periods. While the sentiment during the crisis did not coincide with a change in the ESG effect compared to ordinary times, the opposite was the case during the rebound. Further, we believe indications of the change in investor sentiment can be found in several of the control variables. Namely, in the differences between the significant variables in the crisis- and rebound periods. Consequently, we will address this before discussing the rebound. Apart from this, we do not find a thorough discussion of the control variables relevant to the thesis.

As shown in Table 6, long-term debt is negatively associated with abnormal returns during the crisis period, while return on assets contributes positively. This is consistent with the long line of literature that states low borrowing and profitability are crucial for a stock's performance through a period of crisis. During the rebound, these are no longer important determinants of returns, which indicates a change in market sentiment. Furthermore, market cap contributes positively during the crisis. However, the variable is not significant during the rebound, and this indicates that investors seek safety in firm size during the crisis, but not during the rebound. Finally, the proportion of institutional investors proves to be of importance and has a significant, slightly negative effect on abnormal returns during the crisis period. This negative effect may indicate that institutional investors are better informed and engaged in short selling. In contrast, the effect changes to a positive one during the shorter rebound period. Again, this indicates a shift to a more bullish sentiment.

In sum, the aforementioned changes in the effects of control variables postulate the transition to a more bullish market sentiment in the rebound period, in line with the movements of the VIX and the report from SEB (2020).

8.3 The rebound period

Our findings show that a 1-point increase in ESG leads to a decrease in BHAR of .3 percentage points on average. This indicates that ESG is negatively associated with returns during the rebound period.

When reducing the scope of the rebound period to last until April 29, the models show that the effect might have been even more robust. This indicates that the relationship between ESG and stock market performance was more prominent during the first 5 weeks of the rebound. This is confirmed by the results from the ESG score quartiles, where the firms in the top two quartiles significantly underperformed compared with those in the lowest quartile of ESG scores. For the models with disaggregated ESG score, the social score is not significant, suggesting that the Environmental and Governmental dimensions are the ones explaining the negative relationship between aggregated ESG score and stock market performance during the first 5 weeks of the rebound.

In model 2 we find that the effect of ESG differs negatively during the rebound period compared to ordinary times, confirming the findings from Model 1. In addition, we find evidence that the effect is negative when regarding the rebound period independently. The model indicates a negative effect of .1 percentage points of returns per point of ESG score during the rebound, compared to normal times, as well as during the rebound independently. Compared to model 1, this is a smaller effect. Some of this difference might be caused by the fact that the rebound period of model 2 does not capture the first part of the rebound, which happened in March. As shown, the ESG effect might have been most robust during the first part of the rebound. Nonetheless, some of the difference might be due to factors that are unobserved in model 1.

The Sustainalytics sample indicates a neutral effect of ESG during the rebound period. Again, model 2 confirms the results from model 1, while also finding no differential effect of ESG in either the crisis period or the rebound period using Sustainalytics scores. When we run a model with Refinitiv ESG scores on the same sample (72 companies), we get a corresponding neutral effect. Therefore, we find it reasonable to assume that the neutral effect is due to sample differences, rather than the different ESG scores, and that if Sustainalytics had rated the same firms as Reuters, the models run on the sample of Sustainalytics-rated firms would have given results similar to those of the Refinitiv sample.

The findings point in the direction of a negative relationship between ESG and stock market performance during the rebound period of the COVID-19 stock market. Especially for the firms in the two upper quartiles of ESG scores, and during the first 5 weeks of the rebound. Among the literature reviewed, only Demers et al. (2020) consider the rebound period of the COVID-19 market crash. For this period, the authors find a negative relationship between ESG and stock market performance, in line with our results. This might be expected, due to the similarities in methodology, and also indicates that there are no geographical differences in the relationship between ESG and stock market performance between the Nordics and the United States.

The results from model 2 with disaggregated ESG scores suggest that the negative relationship can be explained by the environmental dimension, but not the other two dimensions. In the context of Hoepner et al.'s (2016) findings, this suggests that the possible downside risk protection offered by engaging in the environmental dimension may have come at a cost to stock market performance during the rebound.

The negative effect during the rebound can be discussed in the context of Agency Theory and the principal-agent problem that arises when the managers invest in ESG on behalf of the shareholders. Accordingly, it indicates that management might have other reasons to invest in ESG, or that they simply consider ESG investments profitable and are oblivious to the possible downside shown in our results. In addition, the negative effect of ESG is supported by the Shareholder theory, in the way that the ESG investments probably target other stakeholders, but come at the cost of the shareholders. Thus, according to the Agency Theory and the Shareholder Theory, the resources spent on ESG investments and activities might not be allocated optimally. Nonetheless, we find it unlikely that such fundamental mechanisms changed during the transition from crisis to rebound, and therefore turn to other explanations.

In the market sentiment that was prominent during the rebound period, many investors were seeking returns by leaving safe stocks in favor of riskier ones. If the Prospect theory holds, it will reason the abandonment of the firms with high ESG scores in such a market, since these firms have lower total and idiosyncratic risk[4], when compared to those with a lower ESG score (Sassen et al., 2016). Therefore, we believe the change in sentiment might have contributed to the relative reduction of stock market performance during the rebound period. The negative effect also corresponds with the findings of Lys et al. (2015), suggesting that investors lost faith in the ESG-related signals of future performance. Although, based on their study, one

[4] In our sample, idiosyncratic risk is negatively correlated with ESG. See A.2.

might have expected to find the same effect during the crisis. Consequently, it is possible that a delayed effect is captured during the rebound.

The indicated overperformance by ESG-rated firms compared to unrated firms suggests that it is not random if a firm is rated or not. The rated firms might possess qualities that strengthen them during the rebound. Such qualities can be size, market share and institutional ownership, as indicated by our linear probability model for the probability of being ESG-rated.

Ultimately, when regarding the Nordic COVID-19 stock market as a whole, we believe that the relationship between ESG and performance is much in line with stakeholder theory, while the negative relationship during the rebound was caused by a bullish market sentiment. From our results, it seems evident that ESG offered no downside protection. Although we find a neutral to negative relationship between ESG and stock market performance, we do not know the long-term effect of ESG investments for our sample firms. Hence, the negative effect associated with the rebound might be more than compensated by future earnings.

Ceteris paribus, the corresponding neutral and negative effects found in models 1 and 2 indicate that, despite the flexibility of panel data, model 1 is a robust model for explaining the ESG effect for the isolated periods. This might suggest that the factors unobserved in model 1 are not important determinants of abnormal returns when regarding the crisis and rebound independently. Nonetheless, model 2 sheds light on the differentiated effect of ESG on stock market performance in the COVID-19 stock market and during ordinary times.

8.4 Limitations and implications for further research

There are important limitations in our thesis that should be mentioned. A crucial element is the sample size, being limited by the coverage of ESG scores, relative to the total number of Nordic firms. This is especially prominent in the Sustainalytics sample, where the limited number of firms forces us to reduce the number of control variables due to multicollinearity and possible overfitting when applying models to this sample. Thus, a more extensive coverage of Nordic firms would improve the quality of our models.

Due to the large variation among providers of ESG scores, it would have been beneficial to use ESG scores from other agencies to investigate the consistency of the results. Although, in our thesis, the similarities in the two scores suggest that they do not represent the diversity of scores. We therefore recommend that further research use ESG scores from different providers and perform comparative analyzes. Nonetheless, as discussed in section 5.3, there are several weaknesses associated with the use of the ESG score as a proxy for sustainability. Consequently, it might be optimal to independently analyze the sustainability of the Nordic firms, rather than just relying on ESG scores as a proxy. The isolation and analysis of the firms' ESG-related investments and the discussion of their profitability might also be informative.

Further, it is important to highlight that during the rebound period, the 188 ESG-rated firms performed better than the 532 unrated ones, although the effect of being rated is neutral during the crisis. This is not confirmed by the panel data model, suggesting that the effect might be due to factors that are unobserved in the cross-sectional model. In addition, there are several significant relationships explaining the probability of a firm being ESG-rated. This implies that the rating agencies' selection process is not random, thus leading to a sampling bias in our samples of rated firms. It also emphasizes the fact that our results only apply to firms with ESG scores, and that had all 720 firms been rated, our results may have been different. Thus, further research should investigate the factors that explain if a firm is ESG-rated or not.

In addition, model 2 is based on active companies and might suffer from survivorship bias. This means that the stocks used in the analysis are viewed as a representative comprehensive sample, without regarding those that are delisted for various reasons, i.e., bankruptcy. The consequence of survivorship bias is often an overestimation of historical performance and may impact our findings.

There are also multiple relevant factors that we have not controlled for. Such as the involvement in and sensitivity to international trade and global value chains, as is previously done for US firms (Ramelli & Wagner, 2020), and management turnover, addressing the principal-agent problem. Our use of industry- and country fixed effects capture many variables that could perhaps be better analyzed independently, such as COVID-19 infection numbers and fiscal and monetary policies. This implies that future research should control for the variables that we did not, and further analyze the Nordic COVID-19 stock market and control for other important drivers. We also believe that the extension of our methods to Nordic firms during the financial crisis would contribute to the understanding of the ESG-effect.

Finally, the Nordic region's leading position in ESG integration may suggest that most firms in our sample are relatively sustainable, in a global context. This means that the real effect of ESG would not necessarily have been negative for Nordic firms during the rebound, when added to a global sample, and constitutes another important implication for future research.

9. **Conclusion**

The thesis analyzes the effect of ESG on stock market performance for Nordic firms during the COVID-19 stock market, and whether ESG acted as a resilience factor. We examine the relationship using BHAR models for the crisis- and rebound periods, as well as fixed effects models on a panel data ranging from 2015, while controlling for an array of variables based on literature and theory. We find no evidence of a positive relationship between ESG and stock market performance for Nordic firms during the COVID-19 stock market. Neither when analyzing the period independently or when comparing it to ordinary times, and the results are robust to all of our robustness tests. On the contrary, there is evidence of a negative relationship between ESG and stock market performance during the rebound period. Both when analyzing the period independently, and when comparing the rebound period to normal times. We believe this was caused by a change in market sentiment, which led to the abandonment of firms with high ESG scores. Furthermore, this indicates that investors might have regarded ESG as less profitable during the steep bull market.

Our findings also suggest that all three disaggregate ESG dimensions might have impacted stock performance negatively during the rebound, but that the impact of the Environmental dimension was the most robust. In addition, we find indications that the negative effect was more severe for the firms with ESG scores in the upper two quartiles, and that the effect was most robust in the early stage of the rebound. We believe that the lack of support of the negative relationship from the Sustainalytics models is due to sample differences, rather than the nature of the ESG scores. Our findings are somewhat in line with research on the US market (Demers et al., 2020), but shed new light on the effect of ESG in the Nordic stock market. The results only apply to 188 Nordic firms with ESG scores, due to the rating agencies' inadequate coverage, and we regard this as the main weakness of our thesis. Further, we make several suggestions for future research, and we especially recommend an exploration of the effect of being ESG-rated and the factors that explain if a firm is rated, as well as the use of different proxies for ESG.

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Appendix

A.1: Composition of variables

AcqIntang: Intangible assets / total assets. Compustat items INTAN/AT.

BHAR: Buy-and hold abnormal returns estimated using the Market Model. Betas estimated using a 60-month estimation window.

BTM: Book to market. Book value of equity / market value of equity. Compustat items CEQ and CSHOI and Datastream item PT. BTM = CEQ(PT*CSHOI).

BTMneg: Dummy variable with the value "1" if BTM is negative.

Cash: Cash and short-term investments / total assets. Compustat items CHE/AT.

DivPayout: Dividend payout ratio. Dividends/net income. Compustat items DV/NICON.

ESG: Thomas Reuters Refinitiv ESG Score.

ESG_Sustainalytics: Sustainalytics ESG Score.

HML_Loading: The factor loading on Kenneth French's high minus low factor for European firms. Estimated using a 60-month estimation window.

Idiosyncratic: Idiosyncratic risk. The residual standard deviation estimated using a 60-month estimation window.

Inst_Owners: Percentage of shares outstanding held by institutional shareholders. Bloomberg item EQY_INST_PCT_SH_OUT.

InvTurn: Inventory turnover ratio. Cost of goods sold/total inventories. Compustat items COGS/INVT. Set to zero if missing.

Loss: Dummy variable with the value "1" if ROA is negative.

LT_Debt: Long-term debt. Long-term debt/total assets. Compustat items DLTT/AT.

Mcap: Log-transformed market cap. Compustat item CSHOI and Datastream item PT. Mcap = CSHOI*PT.

Mkt_RF_Loading: The factor loading on Kenneth French's market factor for European firms. Estimated using a 60-month estimation window.

MktShare: Market share. Sales/total industry sales. Compustat item SALE/sim(Sale_i), where i = 2-digit SIC.

WML_Loading: The factor loading on Kenneth French's momentum factor for European firms. Estimated using a 60-month estimation window.

Momentum: Rolling, raw buy-and-hold returns of the past 12 months.

RD_SGA: Stock-transformed R&D and one-third of SG&A. Calculated using a 5-year amortization period. Compustat items XRD + 1/3*XSGA amortized over 5 years, divided by total assets. When data is missing, we assume the last available R&D and SG&A expense to be constant for the prior years.

ROA: Return on assets. Net income/total assets. Compustat items NICON/AT.

SMB_Loading: The factor loading on Kenneth French's small minus big factor for European firms. Estimated using a 60-month estimation window.

ST_Debt: Short-term debt. Compustat items DLC/AT.

A.2: Correlation Matrix

The main sample for Model 1, 188 firms with Reuters Refinitiv ESG score during the crisis.

	ESG	Loss	BTMneg	Inst_ Owners	Cash	LTDebt	STDebt	ROA	AcqIntang	RD_SGA	Mkt_RF_ Loading	SMB_ Loading	HML_ Loading	WML_ Loading	Idiosyncratic	DivPayout	Mcap	MktShare	BTM	Momentum	InvTurn
ESG																					
Loss	-0.18*																				
BTMneg	0.10	-0.04																			
Inst_Owners	0.18*	-0.15*	-0.05																		
Cash	-0.19**	0.29***	-0.02	-0.08																	
LTDebt	0.01	-0.01	0.36***	0.03	-0.40***																
STDebt	-0.16*	0.10	0.00	-0.10	-0.24**	0.14*															
ROA	0.15*	-0.63***	0.13	0.11	-0.44***	0.01	-0.09														
AcqIntang	-0.17*	-0.08	-0.09	0.22**	-0.29***	0.16*	0.11	0.07													
RD_SGA	-0.14	0.25***	-0.05	-0.21**	0.42***	-0.30***	-0.12	-0.33***	-0.14												
Mkt_RF_Loading	0.11	0.00	0.00	0.12	0.08	-0.03	0.01	0.12	-0.05	0.03											
SMB_Loading	-0.40***	0.42***	-0.04	-0.17*	0.60***	-0.18*	0.01	-0.44***	-0.03	0.33***	0.09										
HML_Loading	0.31***	-0.18*	0.01	0.20**	-0.18*	0.01	-0.05	0.23**	0.00	-0.09	0.74***	-0.46***									
WML_Loading	-0.26***	0.20**	-0.06	-0.15*	0.13	-0.04	-0.01	-0.24***	0.08	0.09	-0.68***	0.42***	-0.78***								
Idiosyncratic	-0.43***	0.48***	-0.04	-0.20**	0.54***	-0.17*	0.03	-0.47***	0.01	0.37***	0.03	0.95***	-0.48***	0.46***							
DivPayout	0.08	-0.23**	-0.02	0.04	0.01	-0.08	0.04	0.00	-0.06	0.04	0.04	-0.04	0.01	-0.07	-0.06						
Mcap	0.49***	-0.18*	0.06	0.01	-0.04	-0.10	-0.15*	0.20**	-0.14	-0.12	-0.03	-0.35***	0.25***	-0.18*	-0.39***	0.09					
MktShare	0.32***	-0.16*	0.07	0.00	-0.22**	0.21**	0.06	0.13	-0.07	-0.18*	-0.10	-0.33***	0.11	-0.11	-0.34***	0.01	0.42***				
BTM	0.22**	-0.05	-0.09	0.06	-0.16*	0.04	0.01	-0.02	-0.07	-0.19**	0.01	-0.08	0.01	-0.01	-0.07	0.14	-0.14	0.11			
Momentum	-0.06	-0.07	0.04	0.11	0.08	-0.12	-0.09	0.25***	0.04	-0.20**	0.10	-0.09	0.17*	-0.10	-0.11	-0.20**	0.07	-0.05	-0.21**		
InvTurn	-0.04	-0.12	0.00	0.07	-0.02	-0.01	-0.08	0.11	0.02	-0.13	-0.06	0.00	-0.06	0.00	-0.05	0.08	-0.07	0.06	0.06	0.24***	
BHAR	0.20**	-0.13	0.01	-0.13	0.12	-0.34***	-0.11	0.25***	-0.21**	0.06	0.34***	0.05	0.21**	-0.20**	-0.02	0.00	0.29***	-0.06	-0.04	0.08	-0.01

The secondary sample model 1, 72 firms with Sustainalytics ESG scores during the crisis.

	ESG_S	Loss	BTMneg	Inst_ Owners	Cash	LTDebt	STDebt	ROA	AcqIntang	RD_SGA	Mkt_RF_ Loading	SMB_ Loading	HML_ Loading	WML_ Loading	Idiosyncratic	DivPayout	Mcap	Mkt Share	BTM	Momentum	Inv Turn
ESG_S																					
Loss	-0.11																				
BTMneg	0.00	-0.05																			
Inst_Owners	0.09	0.02	-0.11																		
Cash	-0.18	0.04	-0.02	-0.08																	
LTDebt	-0.07	0.00	0.59***	-0.01	-0.32**																
STDebt	-0.21	0.12	0.02	-0.09	-0.27*	0.31**															
ROA	0.05	-0.54***	0.22	0.10	0.23	-0.18	-0.21														
AcqIntang	-0.31**	0.02	-0.11	0.09	-0.15	0.19	0.24*	-0.16													
RD_SGA	-0.07	-0.05	-0.07	-0.09	0.27*	-0.16	-0.12	0.10	0.08												
Mkt_RF_Loading	0.26*	0.12	0.00	0.10	0.01	-0.12	0.04	0.03	-0.13	-0.04											
SMB_Loading	-0.49***	0.55***	-0.02	-0.28*	0.23	0.02	0.29*	-0.35**	0.11	0.05	0.13										
HML_Loading	0.44***	-0.19	-0.02	0.16	-0.11	-0.11	-0.16	0.15	-0.08	-0.07	0.72***	-0.47***									
WML_Loading	-0.49***	0.21	-0.08	-0.22	-0.02	0.10	0.16	-0.22	0.20	-0.04	-0.65***	0.44***	-0.76***								
Idiosyncratic	-0.56***	0.54***	-0.01	-0.28*	0.21	0.03	0.30*	-0.37**	0.17	0.05	0.04	0.98***	-0.51***	0.49***							
DivPayout	0.01	-0.14	-0.04	-0.14	0.06	-0.06	0.03	-0.13	0.01	0.21	-0.09	0.10	-0.17	0.04	0.09						
Mcap	0.46***	-0.25*	-0.02	0.02	0.13	-0.09	-0.22	0.16	-0.17	-0.07	-0.03	-0.44***	0.28*	-0.22	-0.49***	0.11					
MktShare	0.34**	-0.14	0.07	0.07	-0.16	0.11	-0.01	0.07	-0.08	-0.03	-0.11	-0.39***	0.12	-0.14	-0.39***	0.05	0.56***				
BTM	0.17	0.09	-0.15	0.00	-0.25*	-0.10	-0.02	-0.16	-0.09	-0.18	0.16	0.03	0.06	-0.08	0.04	0.13	-0.28*	0.02			
Momentum	-0.12	-0.16	0.08	0.10	0.23	-0.19	-0.09	0.43***	-0.09	-0.28*	0.08	-0.12	0.18	-0.05	-0.11	-0.29*	0.15	-0.03	-0.17		
InvTurn	-0.08	-0.04	0.02	0.19	-0.08	0.08	0.00	-0.08	0.03	0.00	-0.01	-0.01	-0.06	-0.11	-0.02	0.20	-0.10	0.20	0.27*	-0.17	
BHAR	0.29*	0.08	-0.03	-0.07	0.11	-0.25*	-0.05	0.06	-0.28*	-0.10	0.19	-0.02	0.17	-0.17	-0.11	-0.02	0.38**	0.00	-0.01	0.11	-0.17

Table A.1: Crisis and rebound period with CAR

Table A.1 shows the results from regressing CAR on the Refinitiv ESG score and the control variables from the restricted models. Column (1) represents the crisis period and column (2) represents the rebound period.

	Dependent variable:	
	CAR	
	(1)	(2)
ESG	-0.001	-0.002**
	(0.001)	(0.001)
Mkt_RF_Loading	0.270***	-0.171***
	(0.045)	(0.036)
HML_Loading	-0.054***	
	(0.017)	
LTDebt	-0.358***	
	(0.100)	
ROA	0.242**	
	(0.109)	
Momentum		0.045
		(0.038)
Cash		0.234**
		(0.112)
BTMneg		0.163
		(0.174)
AcqIntang	-0.077	0.230**
	(0.072)	(0.092)
log(Mcap)	0.048***	
	(0.014)	
DivPayout		0.001
		(0.001)
Inst_Owners	-0.002***	0.0004
	(0.001)	(0.001)
Constant	-0.567**	0.053
	(0.226)	(0.203)
Industry Fixed Effects	Yes	Yes
Country Fixed Effects	Yes	Yes
Observations	188	188
Adjusted R^2	0.554	0.385
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table A.2: The crisis period with disaggregated ESG scores

Table A.2 presents the results from regressing BHAR on the disaggregated Refinitiv ESG scores and the control variables from the restricted model. In column (1), we only include the environmental score, in column (2) we only include the social score, and in column (3) we only include the governance score.

	Dependent variable:		
	BHAR		
	(1)	(2)	(3)
Refinitiv.ENSCORE	-0.00004		
	(0.001)		
Refinitiv.SOSCORE		-0.0005	
		(0.001)	
Refinitiv.CGSCORE			-0.0001
			(0.0004)
Mkt_RF_Loading	0.202***	0.202***	0.202***
	(0.031)	(0.031)	(0.031)
HML_Loading	-0.036***	-0.035***	-0.036***
	(0.012)	(0.012)	(0.012)
LTDebt	-0.223***	-0.220***	-0.222***
	(0.070)	(0.070)	(0.070)
ROA	0.247***	0.246***	0.243***
	(0.076)	(0.076)	(0.077)
AcqIntang	-0.057	-0.063	-0.057
	(0.051)	(0.051)	(0.051)
log(Mcap)	0.029***	0.032***	0.030***
	(0.010)	(0.010)	(0.009)
Inst_Owners	-0.002***	-0.001***	-0.002***
	(0.0005)	(0.0005)	(0.0005)
Constant	-0.418***	-0.432***	-0.418***
	(0.159)	(0.157)	(0.156)
Industry Fixed Effects	Yes	Yes	Yes
Observations	188	188	188
Adjusted R^2	0.527	0.529	0.527
Note:	*p<0.1; **p<0.05; ***p<0.01		

Table A.3: The rebound period with disaggregated ESG scores

Table A.3 presents the results from regressing BHAR on the disaggregated Refinitiv ESG scores and the control variables from the restricted model. In column (1), we only include the environmental score, in column (2) we only include the social score and in column (3) we only include the governance score.

	Dependent variable:		
	BHAR		
	(1)	(2)	(3)
Refinitiv.ENSCORE	-0.002**		
	(0.001)		
Refinitiv.SOSCORE		-0.002*	
		(0.001)	
Refinitiv.CGSCORE			-0.002*
			(0.001)
Mkt_RF_Loading	-0.249***	-0.251***	-0.258***
	(0.053)	(0.053)	(0.053)
Momentum	0.081	0.079	0.072
	(0.055)	(0.056)	(0.056)
Cash	0.253	0.322*	0.361**
	(0.170)	(0.165)	(0.163)
BTMneg	0.124	0.149	0.166
	(0.252)	(0.256)	(0.258)
AcqIntang	0.323**	0.326**	0.377***
	(0.135)	(0.136)	(0.133)
DivPayout	0.002	0.002	0.002
	(0.001)	(0.001)	(0.001)
Inst_Owners	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
Constant	0.001	0.006	-0.028
	(0.295)	(0.299)	(0.296)
Industry Fixed Effects	Yes	Yes	Yes
Observations	188	188	188
Adjusted R^2	0.372	0.365	0.364
Note:	*p<0.1; **p<0.05; ***p<0.01		

Table A.4: Crisis and rebound period: Differences between countries

Table A.4 presents the results from regressing BHAR on Refinitiv ESG scores, the control variables from the restricted models and interaction terms between countries and ESG. Column (1) represents the results from the crisis period and column (2) represents the results from the rebound period.

	Dependent variable:	
	BHAR	
	(1)	(2)
ESG	-0.0002	-0.002
	(0.001)	(0.002)
Mkt_RF_Loading	0.205***	-0.239***
	(0.032)	(0.053)
HML_Loading	-0.039***	
	(0.012)	
LTDebt	-0.218***	
	(0.070)	
ROA	0.237***	
	(0.076)	
Momentum		0.078
		(0.057)
Cash		0.298*
		(0.164)
BTMneg		0.201
		(0.255)
AcqIntang	-0.060	0.333**
	(0.051)	(0.134)
log(Mcap)	0.034***	
	(0.010)	
DivPayout		0.002
		(0.001)
Inst_Owners	-0.002***	0.001
	(0.0005)	(0.001)
Denmark	-0.060	0.174
	(0.104)	(0.259)
Finland	0.196**	-0.316
	(0.092)	(0.223)
Norway	-0.039	0.130
	(0.085)	(0.206)
ESG:Denmark	-0.0004	-0.004
	(0.002)	(0.005)
ESG:Finland	-0.002	0.002
	(0.001)	(0.004)
ESG:Norway	0.001	-0.004
	(0.001)	(0.004)
Constant	-0.363**	-0.017
	(0.165)	(0.313)
Industry Fixed Effects	Yes	Yes
Observations	188	188

Adjusted R^2	0.531	0.376
Note:	$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$	

Table A.5: The crisis and rebound period with ESG scores by quartile

Table A.5 presents the results from regressing BHAR on the Refinitiv ESG score by quartiles and the control variables from the restricted models. Column (1) represents the results from the crisis period and column (2) represents the results from the rebound period.

	Dependent variable:	
	BHAR	
	(1)	(2)
ESG_Quartile_2	-0.033	0.073
	(0.027)	(0.066)
ESG_Quartile_3	-0.026	-0.053
	(0.031)	(0.074)
ESG_Quartile_4	-0.027	-0.093
	(0.035)	(0.074)
Mkt_RF_Loading	0.201***	-0.246***
	(0.031)	(0.054)
HML_Loading	-0.035***	
	(0.012)	
LTDebt	-0.216***	
	(0.070)	
ROA	0.255***	
	(0.076)	
Momentum		0.075
		(0.056)
Cash		0.365**
		(0.166)
BTMneg		0.179
		(0.256)
AcqIntang	-0.054	0.341**
	(0.051)	(0.134)
log(Mcap)	0.031***	
	(0.010)	
DivPayout		0.002
		(0.001)
Inst_Owners	-0.001***	0.0003
	(0.0005)	(0.001)
Constant	-0.438***	-0.090
	(0.165)	(0.291)
Industry Fixed Effects	Yes	Yes
Country Fixed Effects	Yes	Yes
Observations	188	188
Adjusted R^2	0.525	0.371
Note:	*p<0.1; **p<0.05; ***p<0.01	

Table A.6: Shorter rebound period with Refinitiv ESG score

Table A.6 presents the results from regressing BHAR on the Refinitiv ESG score and the control variables for the shorter rebound period sample. In column (1), we only regress BHAR on the ESG score. In column (2), we add country- and industry fixed effects. In column (3), we add the Fama-French + momentum factor loadings. In column (4), we add more market-based measures of risk. We remove the SMB-Factor loading due to issues with multicollinearity. In column (5), we add the accounting-based variables. In column (6), we regress BHAR on the complete model 1. In column (7), we regress BHAR on the restricted model.

	Dependent variable:						
	BHAR						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ESG	-0.004***	-0.002**	-0.002**	-0.002*	-0.002*	-0.003**	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mkt_RF_Loading			-0.242***	-0.254***	-0.204**	-0.204**	-0.181***
			(0.079)	(0.072)	(0.080)	(0.078)	(0.036)
HML_Loading			0.028	0.030	0.019	0.017	
			(0.028)	(0.026)	(0.028)	(0.028)	
WML_Loading			-0.056	-0.077	-0.068	-0.057	
			(0.119)	(0.122)	(0.122)	(0.120)	
SMB_Loading			0.142				
			(0.170)				
BTM				-0.017	-0.046	-0.035	
				(0.042)	(0.044)	(0.043)	
BTMneg				0.185	0.412**	0.475**	0.369**
				(0.182)	(0.204)	(0.202)	(0.173)
Momentum				0.038	0.048	0.050	0.046
				(0.040)	(0.044)	(0.044)	(0.038)
Idiosyncratic				1.011	0.170	0.327	
				(0.773)	(0.940)	(0.926)	
Cash					0.050	0.048	0.304***
					(0.166)	(0.163)	(0.112)
LTDebt					-0.212	-0.205	
					(0.155)	(0.152)	
STDebt					-0.607*	-0.530	
					(0.329)	(0.325)	
ROA					-0.314	-0.331*	
					(0.196)	(0.193)	
Loss					0.014	0.014	
					(0.063)	(0.062)	
InvTurn					-0.0004	-0.002	
					(0.014)	(0.013)	
AcqIntang					0.203**	0.170*	0.169*
					(0.098)	(0.098)	(0.091)
RD_SGA					-0.030	-0.008	

					(0.070)	(0.069)	
log(Mcap)					-0.002	0.002	
					(0.018)	(0.018)	
DivPayout					0.002**	0.002**	0.002*
					(0.001)	(0.001)	(0.001)
Inst_Owners						0.002**	0.002**
						(0.001)	(0.001)
Constant	0.341***	0.072	0.022	-0.022	0.129	0.060	-0.027
	(0.051)	(0.222)	(0.220)	(0.222)	(0.302)	(0.298)	(0.202)
Industry Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	188	188	188	188	188	188	188
Adjusted R^2	0.095	0.186	0.271	0.275	0.318	0.341	0.349

Note: *p<0.1; **p<0.05; ***p<0.01

Table A.7: Shorter rebound period: Robustness tests

Table A.7 presents several robustness tests for the shorter rebound period sample. In all columns, we include the control variables from the restricted models. Column (1) – (3) show the results from regressing BHAR on the disaggregated Refinitiv ESG scores. In column (4), BHAR is regressed on the interactions between the Refinitiv ESG score and the countries. Column (5) shows the results from regressing BHAR on the Refinitiv ESG score by quartiles. In column (6), BHAR is regressed on Sustainalytics' ESG score.

	Dependent variable:					
	BHAR					
	(1)	(2)	(3)	(4)	(5)	(6)
Refinitiv.ENSCORE	-0.002**					
	(0.001)					
Refinitiv.SOSCORE		-0.001				
		(0.001)				
Refinitiv.CGSCORE			-0.002***			
			(0.001)			
ESG				-0.002*		
				(0.001)		
ESG_Quartile_2					-0.005	
					(0.045)	
ESG_Quartile_3					-0.085*	
					(0.050)	
ESG_Quartile_4					-0.111**	
					(0.050)	
Mkt_RF_Loading	-0.180***	-0.183***	-0.187***	-0.176***	-0.175***	
	(0.036)	(0.036)	(0.035)	(0.036)	(0.037)	
Momentum	0.052	0.051	0.040	0.052	0.050	
	(0.038)	(0.038)	(0.038)	(0.039)	(0.038)	
Cash	0.274**	0.333***	0.349***	0.296***	0.329***	
	(0.117)	(0.113)	(0.109)	(0.112)	(0.113)	
ESG_Sustainalytics						0.001
						(0.001)
HML_Loading						-0.043**
						(0.020)
BTMneg	0.321*	0.325*	0.394**	0.385**	0.371**	1.259***
	(0.172)	(0.176)	(0.173)	(0.174)	(0.175)	(0.215)
ROA						1.057***
						(0.284)
AcqIntang	0.170*	0.182*	0.209**	0.167*	0.181*	0.440***
	(0.092)	(0.094)	(0.089)	(0.091)	(0.092)	(0.115)
DivPayout	0.002*	0.002*	0.002*	0.002*	0.002*	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	
Inst_Owners	0.002**	0.002**	0.002**	0.002**	0.002**	
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	
log(Mcap)						-0.074***

						(0.024)
Denmark				0.160		
				(0.177)		
Finland				-0.232		
				(0.152)		
Norway				-0.129		
				(0.140)		
ESG:Denmark				-0.004		
				(0.003)		
ESG:Finland				0.002		
				(0.002)		
ESG:Norway				0.00001		
				(0.002)		
Constant	-0.063	-0.081	-0.050	0.031	-0.125	-0.086
	(0.202)	(0.206)	(0.198)	(0.214)	(0.199)	(0.245)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	No	Yes	Yes
Observations	188	188	188	188	188	72
Adjusted R^2	0.341	0.325	0.359	0.349	0.342	0.569
Note:				*p<0.1; **p<0.05; ***p<0.01		

Table A.8: The crisis period with ESG scores from Sustainalytics

Table A.8 presents the results from regressing BHAR on Sustainalytics' ESG score and the control variables for the crisis sample. In column (1), we regress BHAR only on the ESG score. In column (2), we add country- and industry fixed effects. In column (3), we add the Fama-French + momentum factor loadings. In column (4), we regress BHAR on the complete model 1. Several variables are removed due to multicollinearity. In column (5), we regress BHAR on the restricted model.

	Dependent variable:				
	BHAR				
	(1)	(2)	(3)	(4)	(5)
ESG_Sustainalytics	0.002**	0.001*	0.002	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mkt_RF_Loading			-0.045	0.053	
			(0.110)	(0.041)	
HML_Loading			0.029		
			(0.033)		
WML_Loading			-0.081		
			(0.154)		
SMB_Loading			0.247		
			(0.355)		
Momentum				0.150**	0.133***
				(0.057)	(0.046)
Cash				-0.038	
				(0.150)	
LTDebt				0.004	
				(0.151)	
STDebt				0.947**	1.090***
				(0.348)	(0.299)
ROA				-0.523*	-0.547**
				(0.276)	(0.225)
Loss				-0.019	
				(0.072)	
AcqIntang				-0.179*	-0.246***
				(0.090)	(0.079)
RD_SGA				0.162	
				(0.102)	
log(Mcap)				0.052***	0.045***
				(0.018)	(0.016)
DivPayout				-0.0001	
				(0.001)	
Inst_Owners				-0.001	
				(0.001)	
Constant	-0.171***	-0.291**	-0.467*	-0.922***	-0.802***
	(0.045)	(0.125)	(0.251)	(0.228)	(0.153)

Industry Fixed Effects	No	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	Yes
Observations	72	72	72	72	72
Adjusted R^2	0.073	0.371	0.344	0.627	0.641
Note:			*p<0.1; **p<0.05; ***p<0.01		

Table A.9: The rebound period with ESG scores from Sustainalytics

Table A.9 presents the results from regressing BHAR on Sustainalytics' ESG score and the control variables for the rebound period sample. In column (1), we regress BHAR only on the ESG score. In column (2), we add country- and industry fixed effects. In column (3), we add the Fama-French + momentum factor loadings. In column (4), we regress the BHAR on the complete model 1. Some variables are removed due to multicollinearity. In column (5), we regress BHAR on the restricted model.

	Dependent variable:				
	BHAR				
	(1)	(2)	(3)	(4)	(5)
ESG_Sustainalytics	-0.005***	-0.002	-0.001	0.001	0.002
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)
Mkt_RF_Loading			-0.308	-0.352**	
			(0.312)	(0.140)	
HML_Loading			-0.001		-0.083**
			(0.094)		(0.038)
WML_Loading			0.265		
			(0.437)		
SMB_Loading			0.032		
			(1.007)		
Momentum				-0.206	
				(0.193)	
Cash				0.410	
				(0.509)	
LTDebt				-0.030	
				(0.513)	
STDebt				-2.357*	
				(1.177)	
BTMneg					1.441***
					(0.407)
ROA				2.377**	1.808***
				(0.936)	(0.537)
Loss				0.063	
				(0.243)	
AcqIntang				0.821**	0.717***
				(0.306)	(0.217)
RD_SGA				-0.402	
				(0.346)	
log(Mcap)				-0.135**	-0.121**

				(0.062)	(0.046)
DivPayout				0.0002	
				(0.003)	
Inst_Owners				-0.002	
				(0.003)	
Constant	0.505***	-0.182	0.328	1.615**	0.036
	(0.124)	(0.386)	(0.711)	(0.772)	(0.464)
Industry Fixed Effects	No	Yes	Yes	Yes	Yes
Country Fixed Effects	No	Yes	Yes	Yes	No
Observations	72	72	72	72	72
Adjusted R^2	0.093	0.239	0.335	0.461	0.532
Note:			*p<0.1; **p<0.05; ***p<0.01		

Table A.10: The crisis- and rebound period with the strict sample

Table A.10 presents the results from regressing BHAR on a strict sample of firms that have been given ESG scores from both Refinitiv and Sustainalytics. In all columns, the control variables from the restricted models are included. Columns (1) and (2) show the results from the crisis period with ESG scores from Refinitiv and Sustainalytics. Columns (3) and (4) show the results from the rebound period with ESG scores from Refinitiv and Sustainalytics.

	Dependent variable:			
	BHAR			
	(1)	(2)	(3)	(4)
ESG	0.002		-0.002	
	(0.001)		(0.004)	
ESG_Sustainalytics		0.001		0.002
		(0.001)		(0.002)
Momentum	0.133***	0.133***		
	(0.044)	(0.046)		
STDebt	1.093***	1.090***		
	(0.292)	(0.299)		
HML_Loading			-0.050	-0.083**
			(0.044)	(0.038)
BTMneg			1.597***	1.441***
			(0.488)	(0.407)
ROA	-0.558**	-0.547**	2.101***	1.808***
	(0.222)	(0.225)	(0.735)	(0.537)
AcqIntang	-0.249***	-0.246***	0.802***	0.717***
	(0.078)	(0.079)	(0.268)	(0.217)
log(Mcap)	0.046***	0.045***	-0.092*	-0.121**
	(0.014)	(0.016)	(0.051)	(0.046)
Constant	-0.817***	-0.802***	-0.206	0.036
	(0.152)	(0.153)	(0.526)	(0.464)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	No
Observations	72	72	72	72
Adjusted R^2	0.649	0.641	0.504	0.532
Note:	*p<0.1; **p<0.05; ***p<0.01			

Table A.11: Model 2 with disaggregated ESG scores from Refinitiv

Table A.11 presents the results from the regressions of abnormal returns on the disaggregated Refinitiv ESG scores and the control variables from the restricted model 2. In column (1), we only include the environmental score, in column (2) we only include the social score, and in column (3) we only include the governance score.

	Dependent variable:		
	Abnormal Returns		
	(1)	(2)	(3)
Refinitiv_ENSCORE	0.0001		
	(0.0002)		
Refinitiv_SOSCORE		-0.00004	
		(0.0002)	
Refinitiv_CGSCORE			0.00004
			(0.0001)
Mkt_RF_Loading	0.012*	0.012*	0.012*
	(0.007)	(0.007)	(0.007)
HML_Loading	0.005*	0.005*	0.005*
	(0.003)	(0.003)	(0.003)
Momentum	0.044	0.044	0.044
	(0.027)	(0.027)	(0.027)
Idiosyncratic	-0.406***	-0.408***	-0.409***
	(0.113)	(0.111)	(0.111)
LT_Debt	-0.009	-0.008	-0.009
	(0.029)	(0.029)	(0.029)
ROA	-0.012	-0.012	-0.012
	(0.050)	(0.049)	(0.049)
AcqIntang	0.034	0.034	0.035
	(0.024)	(0.026)	(0.025)
log(Mcap)	-0.020***	-0.020***	-0.020***
	(0.005)	(0.005)	(0.005)
Inst_Owners	-0.0001	-0.0001	-0.0001
	(0.0001)	(0.0001)	(0.0001)
Refinitiv_ENSCORE:Crisis	0.0005		
	(0.0003)		
Refinitiv_ENSCORE:Rebound	-0.001**		
	(0.0003)		
Refinitiv_SOSCORE:Crisis		0.001	
		(0.0004)	
Refinitiv_SOSCORE:Rebound		-0.001	
		(0.0005)	
Refinitiv_CGSCORE:Crisis			0.00003
			(0.0003)
Refinitiv_CGSCORE:Rebound			-0.0004
			(0.0003)
Joint Hypothesis Rebound	-0.001**	-0.001	-0.0004
Firm Fixed Effects	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes

Observations	9,357	9,357	9,357
Adjusted R^2	0.027	0.026	0.025
Note:	*p<0.1; **p<0.05; ***p<0.01		

Table A.12: Model 2 with ESG scores from Sustainalytics

Table A.12 presents the results from regressing abnormal returns on Sustainalytics' ESG score and the control variables for the panel data sample. In column (1), we regress abnormal returns on the ESG score combined with ESG interaction terms for the crisis- and the rebound period. In column (2), we add the Fama-French + momentum factor loadings. In column (3), we add more market-based measures of risk. In column (4), we add the accounting-based variables. In column (5), we regress the abnormal returns on the complete model 2. In column (6), we regress abnormal returns on the restricted model.

	Dependent variable:					
	Abnormal Returns					
	(1)	(2)	(3)	(4)	(5)	(6)
ESG_Sustainalytics	-0.0001	-0.0001	0.0001	0.00004	0.00003	0.0001
	(0.0001)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Mkt_RF_Loading		0.0003	0.007	0.016*	0.017*	0.020**
		(0.006)	(0.007)	(0.009)	(0.009)	(0.008)
HML_Loading		-0.004	0.001	0.006	0.007	0.006*
		(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
WML_Loading		0.003	0.008	0.006	0.006	
		(0.009)	(0.008)	(0.006)	(0.006)	
SMB_Loading		0.003	0.013***	0.012***	0.012**	
		(0.004)	(0.005)	(0.004)	(0.004)	
BTM			0.023***	-0.002	-0.003	
			(0.006)	(0.011)	(0.011)	
BTMneg			-0.018	-0.034	-0.035	
			(0.015)	(0.019)	(0.020)	
Momentum			0.097***	0.098***	0.097***	0.094***
			(0.016)	(0.016)	(0.016)	(0.016)
Idiosyncratic			-0.303*	-0.577**	-0.568**	-0.485**
			(0.171)	(0.239)	(0.239)	(0.198)
Cash				0.013	0.013	
				(0.028)	(0.028)	
LT_Debt				0.047	0.047	0.040
				(0.033)	(0.034)	(0.029)
ST_Debt				-0.002	-0.0002	
				(0.061)	(0.063)	
ROA				0.104	0.101	0.059
				(0.097)	(0.100)	(0.080)
Loss				0.017	0.017	
				(0.011)	(0.011)	
InvTurn				0.002	0.002	
				(0.003)	(0.003)	

AcqIntang				-0.019	-0.018	-0.030
				(0.029)	(0.030)	(0.026)
RD_SGA				0.00001	0.0002	
				(0.003)	(0.004)	
log(Mcap)				-0.030**	-0.031**	-0.030**
				(0.013)	(0.013)	(0.013)
DivPayout				0.0003	0.0003	
				(0.0002)	(0.0002)	
MktShare					0.035	
					(0.388)	
Inst_Owners					-0.0001	-0.0001
					(0.0001)	(0.0001)
ESG_Sustainalytics:Crisis	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003	-0.0003
	(0.0005)	(0.0005)	(0.0005)	(0.001)	(0.001)	(0.001)
ESG_Sustainalytics:Rebound	-0.00002	-0.0001	-0.00004	-0.00003	-0.00003	-0.0001
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,826	3,847	3,847	3,847	3,847	3,847
Adjusted R^2	-0.039	-0.040	0.055	0.067	0.067	0.065

Note: *p<0.1; **p<0.05; ***p<0.01

Table A.13: The effect of being ESG-rated during the rebound period

Table A.13 presents the results from the regressions of BHAR on the independent variables. The ESG Dummy is set to 1 if the firm has a Refinitiv ESG score. Column (1) is estimated using all variables on the crisis period and (2) using a restricted model on the crisis. Columns (3) and (4) run the full- and restricted model on the rebound period.

	Dependent variable:			
	BHAR			
	(1)	(2)	(3)	(4)
ESG_Dummy	-0.003	0.004	0.109**	0.086**
	(0.022)	(0.018)	(0.052)	(0.035)
Mkt_RF_Loading	0.137***	0.125***	-0.120**	-0.138***
	(0.030)	(0.011)	(0.055)	(0.034)
HML_Loading	-0.003		-0.003	
	(0.015)		(0.027)	
WML_Loading	0.034		0.044	
	(0.050)		(0.086)	
SMB_Loading	0.077		-0.132	
	(0.100)		(0.157)	
BTM	0.015		-0.067**	-0.056**
	(0.015)		(0.030)	(0.027)
BTMneg	0.128*		0.090	
	(0.071)		(0.147)	
Momentum	-0.005		0.036	
	(0.015)		(0.031)	
Idiosyncratic	-0.232		0.350	
	(0.550)		(0.887)	
Cash	0.009		0.195	0.267**
	(0.057)		(0.134)	(0.116)
LTDebt	-0.023		-0.211	
	(0.060)		(0.133)	
STDebt	-0.087		-0.231	
	(0.098)		(0.204)	
ROA	0.106***	0.094***	-0.061	
	(0.040)	(0.027)	(0.106)	
Loss	-0.015		-0.022	
	(0.022)		(0.050)	
InvTurn	0.004		-0.017	
	(0.004)		(0.011)	
AcqIntang	-0.021		0.264***	0.251***
	(0.041)		(0.087)	(0.086)
RD_SGA	0.046*	0.045**	0.031	0.058
	(0.024)	(0.018)	(0.083)	(0.064)
log(Mcap)	0.006		-0.011	
	(0.007)		(0.014)	
DivPayout	0.0003		-0.00003	
	(0.001)		(0.001)	

MktShare	-0.019		0.091	
	(0.068)		(0.122)	
Inst_Owners	0.0001		-0.0002	
	(0.0004)		(0.001)	
Constant	-0.310	-0.284**	0.001	-0.136
	(0.892)	(0.135)	(0.439)	(0.487)
Industry Fixed Effects	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
Observations	721	721	720	720
Adjusted R^2	0.240	0.240	0.122	0.129
Note:		*p<0.1; **p<0.05; ***p<0.01		

Table A.14: The probaility of beeing ESG-rated

Table A.14 presents a linear probability model for the probability of being ESG-rated. ESG Dummy is regressed on all independent variables.

	Dependent variable:
	ESG_Dummy
Mkt_RF_Loading	0.009
	(0.028)
HML_Loading	0.023
	(0.021)
WML_Loading	0.105
	(0.068)
SMB_Loading	-0.075
	(0.063)
BTM	0.037
	(0.027)
BTMneg	0.051
	(0.083)
Momentum	-0.064***
	(0.018)
Idiosyncratic	0.852**
	(0.406)
Cash	-0.053
	(0.066)
LTDebt	0.041
	(0.088)
STDebt	-0.093
	(0.122)
ROA	0.052
	(0.040)
Loss	0.037
	(0.034)
InvTurn	0.002
	(0.009)
AcqIntang	0.114*
	(0.064)
RD_SGA	0.071***
	(0.024)
log(Mcap)	0.134***
	(0.010)
DivPayout	0.001
	(0.001)
MktShare	0.239*
	(0.124)
Inst_Owners	0.001**
	(0.001)

Constant	-0.898
	(0.775)
Industry Fixed Effects	Yes
Country Fixed Effects	Yes
Observations	720
Adjusted R^2	0.525
Note:	$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Table A.15: GVIF tests

For the continuous variables, the GVIF test produces the same values as the standard VIF test. For the factor variables GVIF^(1/(2*Df)) must be squared to get a value that can be interpreted in the same way as an ordinary VIF value.

GVIF test for the Refinitiv sample during crisis period:

	GVIF	GVIF^(1/(2*Df))
ESG	2.7204515	1.6493791
Mkt_RF_Loading	7.6603293	2.7677300
HML_Loading	8.9752576	2.9958734
WML_Loading	4.4472918	2.1088603
BTM	2.9714484	1.7237890
BTMneg	2.2874221	1.5124226
Momentum	1.8270348	1.3516785
Idiosyncratic	6.4184932	2.5334745
Cash	4.0325816	2.0081289
LTDebt	2.9153557	1.7074413
STDebt	1.8698038	1.3674077
ROA	3.5994217	1.8972142
Loss	2.3643343	1.5376392
InvTurn	1.5579005	1.2481588
AcqIntang	2.3091674	1.5195945
RD_SGA	2.1366892	1.4617418
log(Mcap)	3.3190283	1.8218200
DivPayout	1.4787408	1.2160349
Inst_Owners	1.8063992	1.3440235
factor(SIC)	978.4937345	1.0948370
factor(Country_Dummy)	6.4137361	1.3630711

GVIF test for the Sustainalytics sample during crisis period:

	GVIF	GVIF^(1/(2*Df))
ESG_Sustainalytics	6.2964668	2.5092762
Mkt_RF_Loading	2.9328197	1.7125477
Momentum	3.5190843	1.8759223
Cash	2.5931140	1.6103149
LTDebt	5.4098364	2.3259055
STDebt	3.3382340	1.8270835
ROA	7.2613467	2.6946886
Loss	3.7206000	1.9288857
AcqIntang	3.5630060	1.8875926
RD_SGA	3.6622248	1.9136940
log(Mcap)	5.6189303	2.3704283
DivPayout	2.2130013	1.4876160
Inst_Owners	2.5815988	1.6067354
factor(SIC)	41734.6710679	1.2270315
factor(Country_Dummy)	29.2137762	1.7549495

Table A.16: Predicted R-squared

R-squares for the full model on the Refinitiv sample during the crisis period:

R-squared	Adjusted R-squared	Predicted R-squared
0.6806208	0.5323985	0.31573592

R-squares for the restricted model on the Refinitiv sample during the crisis period:

R-squared	Adjusted R-squared	Predicted R-squared
0.6511385	0.5299363	0.3498214

R-squares for the full model on Sustainalytics sample during the crisis period:

R-squared	Adjusted R-squared	Predicted R-squared
0.8477054	0.6336594	0.253099

R-squares for the restricted model on Sustainalytics sample during the crisis period:

R-squared	Adjusted R-squared	Predicted R-squared
0.8182137	0.6479255	0.37167