



GÖTEBORGS UNIVERSITET HANDELSHÖGSKOLAN

The relationship between ESG and stock performance in sensitive and non-sensitive industries during the COVID-19 crisis

A quantitative study performed on the Swedish stock market

EFI303 - BACHELOR THESIS IN FINANCIAL ECONOMICS

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Abstract

This thesis examines the relationship between ESG and stock performance in sensitive and non-sensitive industries during the COVID-19 crisis. It is based on a sample consisting of 344 unique Swedish companies during the years 2020 and 2021 with data collected from the Refinitiv Eikon database. The purpose of this analysis was to test if a statistically significant link between ESG scores and stock performance could be determined through regression analysis. Data were exclusively collected from the Refinitiv Eikon database and manipulated in the statistical data science software Stata. The fixed effect regression analysis provided no statistically significant support for a relationship between ESG score and Buy-and-hold Abnormal Returns, BHAR. However, by including an interaction variable, ESGxSensitive, the regression analysis demonstrated that the relationship between ESG and BHAR differs between sensitive and non-sensitive industries. Thus, the analysis provided evidence for a positive relationship between ESG and BHAR in sensitive industries. Furthermore, a discussion concerning ESG and its link to the stakeholder theory is discussed. Even if no significant relationship exists between the ESG and BHAR variable in this sample, ESG could in theory still form a valuable investment from a stakeholder theory perspective.

Keywords: Environmental, Social and Governance (ESG), Sensitive and non-sensitive industries, COVID-19, Sweden, Abnormal returns.

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Tables

Table 1.1 - ESG score, weights and subcategories.

Table 4.4 - Means between sensitive and non-sensitive industries

Table 6.1 - Variable Appendix

Table 6.2 - Descriptive Statistics

Table 6.3 - Correlation Matrix

Table 7.1 - Regression output without interaction variable

Table 7.2 - Regression output with interaction variable

Table 7.3 - Percentage effect of ESG score on BHAR (ESG multiplied with standard deviation)

Table of contents

1. Introduction	6
1.1 The COVID-19 Crisis and The Swedish Market	6
1.2 ESG	7
1.3 The relationship between ESG and stock performance	8
1.4 Sensitive and Non-sensitive Industries	9
1.5 Limitations	10
2. Problematization	11
3. Purpose	11
4. Theoretical Framework	12
4.1 Shareholder Theory	12
4.2 Stakeholder Theory	13
5. Literature Review	16
5.1 Hypotheses	17
6. Methodology	18
6.1 Sample Selection	19
6.2 Data Cleansing	20
6.3 The Regression Model	20
6.4 Calculation of Buy-and-hold Abnormal Returns	21
6.5 Calculation of ESG	22
6.6 Variable Appendix	24
6.7 Descriptive Statistics	25
6.8 Correlation Analysis	26
7. Results	28
8. Discussion	31
9. Conclusion	33
10. Bibliography	34

1. Introduction

The interest in sustainable investments have continuously increased during the last decades (Yahoo Finance, 2021).¹ There could be many possible reasons behind this. Some say that we are becoming more aware of the environment around us and therefore want our investments to reflect this. As consumers, we are therefore demanding companies to act in this direction which puts pressure on them (RegASK, 2022)². As further explained, the interest for ESG has increased during the COVID-19 pandemic which explains the chosen time span for this thesis. Moreover, it has been shown that depending on which industry you are operating in, a sensitive or a non-sensitive industry, your engagement in ESG related activities often differ. Hence, a distinction between these two segments will be implemented into the analysis.

1.1 The COVID-19 Crisis and The Swedish Market

There are several reasons behind the increased interest in investing in ESG-investments, however, focusing on the recent COVID-19 pandemic, the many events that occurred during this time made individuals more aware of their health and the environment around them, leading to greater focus on these types of investments (Rao and Roy, 2021)³. The focus of this report will be the years 2020 to 2021. Our reasoning behind this is that since the consciousness around ESG related factors increased during this time, an opportunity to further investigate these ratings occurred. The crisis was handled in different ways across the world but one of the main strategies that were witnessed was the use of lockdowns to different degrees. The strategy aims, especially when having a strict form, to close down several crucial sectors and puts the economy in a critical condition. Even though this strategy was seen being used in most countries, there were some exceptions. An example of this was Sweden, which instead of putting the country in lockdown, chose to keep schools, bars, restaurants etc. open (Pashakhanlou, 2021). Their motives behind this type of action was, besides reducing the spread, to decrease the amount of anxiety as well as the impact on socially important services such as healthcare and food supply (Regeringskansliet, 2020)⁴.

¹ <https://finance.yahoo.com/news/growth-sustainable-investing>

² <https://regask.com/why-is-esg-more-important-now-than-ever-for-your-business/>

³ <https://www.acuitykp.com/blog/rising-investor-demand-for-esg-in-their-portfolios/>

⁴ <https://www.regeringen.se/regeringens-politik/regeringens-arbete-med-coronapandemin/>

Despite the attempt to keep the society rolling, Sweden still experienced the downturn in the economic activity of the world with consequences such as fall in asset prices (Gustafsson et al, 2021). In terms of the financial markets, investors fled from risky assets which led to a fall on the OMX. In the beginning of March 2020 when the pandemic was in its initial stages, the OMX fell by almost 20 percent which was “on a par with the stock market falls in other countries” (Sveriges Riksbank, 2021 p. 65). The article from Sveriges Riksbank also states that this pattern continued on and the OMX reached its lowest point on March 23rd, 2020.

Sweden constitutes an interesting country to investigate since it provides insights from a place where the strategy for handling the pandemic was comparatively different but still faced many challenges and economic consequences. Therefore, by choosing Sweden, an opportunity to study a country that embraced a disparate road in terms of handling the pandemic has emerged. This opportunity will provide interesting insights that differ from previous studies.

1.2 ESG

ESG stands for the three criterias; Environmental, Social and Governance where Environmental is defined as the corporation’s contribution to climate change. Social includes factors such as labor standards and relationships to its customers and employees. Governance includes leadership and responsibilities within the corporation (The Investopedia Team, 2022). The ESG rating that a specific company will achieve will be based on how well it works towards improving these three criterias. A relevant question concerns how this rating is determined. There is no exclusive way of doing this, instead multiple agencies exist that perform these types of ratings which all have their unique way of calculating the overall score (The Private Office, 2021)⁵. During the last years, the interest in investing in ESG-investments has increased. From 2006 to 2016, global assets under management that were using ESG-strategies experienced a growth from 4 trillion USD to 60 trillion USD (Pagano, Sinclair and Yang, 2018).

According to a paper made by KPMG (Swinburne et al, 2019) the interest and focus from investors lies no longer exclusively on the financial data, instead, non-financial aspects have

⁵ <https://www.theprivateoffice.com/insights/how-are-esg-ratings-calculated>

gained value and importance. In other words, the demand has switched to some degree and now more importance lies on factors such as carbon controls and ethical treatment of employees. Hence, in order to continue to remain on the market in the future, corporations need to take ESG and related factors into consideration. Additionally, this will most probably become more difficult to avoid since institutional investors are “applying pressure on asset managers to declare or articulate better how they are integrating ESG factors into their investment process” (p. 16). Further, the article states that the switch towards an increased focus on ESG factors will create new business opportunities relating to solutions that are, for instance, net emission negative.

1.3 The relationship between ESG and stock performance

The idea of a positive correlation between ESG and financial performance has intrigued many firms and shareholders the last few years, hence, several studies on various markets with the purpose of investigating the relationship between ESG and financial performance have been performed. With evidence from the Chinese market, C. Broadstock et al. (2021) identifies a positive relationship between the variables of interest and argues that ESG performance is positively associated with short-term returns. Further, Cheng et al. (2014) points out that firms that value and converge resources on CSR, corporate social responsibility, generally creates a superior stakeholder engagement and appear more transparent, hence, mitigates the risk concerned with informational asymmetries amidst the investor and the company. Generally, this enhanced engagement from stakeholders will augment the potential of value growth within the firm.

This is further supported by the summary of several studies within this particular area made by Whelan et al. (2020). Here, they present that for the over 1 000 studies that were published between the years 2015 to 2020 it was discovered that a positive relationship between ESG and financial performance could be found for 58% of the “corporate” studies. Moreover, when it comes to “investment” studies, similar conclusions were made where 59% showed either a similar or a superior performance when compared to conventional investment approaches (Whelan et al., 2020).

On the other hand, La Torre et al (2020) concludes that the linear correlation is very weak or absent between ESG and stock returns. For only 7 out of the 46 corporations included in the sample, a significant correlation was found between ESG factors and stock returns. One of the explanations made to these findings that is mentioned is that these companies appear in markets where investments in ESG have “e a significant relevance on company profitability, such as the energy and utilities sectors” (p. 10).

1.4 Sensitive and Non-sensitive Industries

The analysis will touch upon the distinction between sensitive and non-sensitive industries in terms of the relationship between ESG and stock performance. The main reasoning behind this concerns the signs that depending on what type of industry a corporation is active in, their engagement in for instance CSR and similar factors will differ. Cottrill (1990) states that corporations that have close contact to the public will, because of this, have a larger engagement in CSR factors. In other words, to what extent and how well a corporation acts when it comes to these factors, that in many ways are linked to ESG, depends on what type of market they are in.

Garcia et al. (2017) describes sensitive industries as “those subject to systematic social taboos, moral debates, and political pressures and those that are more likely to cause social and environmental damage” (p.1). The paper claims that companies within sensitive industries predominantly produce superior ESG performance compared to companies within non-sensitive industries. Cheng et al. (2014) further elaborates that financial performance often coexists with environmental, social and governance practices. It is therefore in our interest to compare these two industries in our thesis and thereby control for industry affiliation. Examples of industries that are non-sensitive are technology, health care and consumer goods. Examples of sensitive industries are oil and gas, utilities and basic materials (Loprevite, Raucci and Rupo, 2020). Ahsan et al. (2021) suggest that CSR, closely aligned with ESG, increases the firm value of companies qualified as part of sensitive industries. The paper additionally claims that CSR has an overall negative impact on firm-value with exception from sensitive industries, thus, further motivating the distinction between sensitive and non-sensitive industries in this analysis.

1.5 Limitations

There are multiple limitations associated with this paper that are important to emphasize. Two main aspects concern the time frame and lack of data on some observations. The time frame made it difficult to collect data from several databases, something that would have brought more reliable results. Further, each database has their various approaches on how to, for instance, calculate ESG scores. Our study will be based on data collected from the Refinitiv Eikon database and a thorough explanation of how they determine their scores can be found in section 4.5.

Moreover, the sample selection was foremost based on available ESG scores on companies listed in Sweden. Since Thomson Reuters Refinitiv Eikon database was used exclusively, some companies did not have available data for all variables in both 2020 and 2021. Hence, contributing to an unbalanced panel data set. While balanced data would be preferable, unbalanced data is common in economic empirical research. However, this contributed to some difficulties when adopting a panel data regression analysis to the data set.

2. Problematization

The circumstances of the COVID-19 crisis brings an opportunity to investigate the nature of the relationship between ESG scores and stock performance during the pandemic on the Swedish market. Hence, the ambition of this thesis is to investigate whether or not a corporation with a high ESG score outperforms corporations with a lower score in terms of stock performance during COVID-19. Further, this analysis aims to detect if this relationship differs between sensitive and non-sensitive industries, hence, adding an additional layer of differentiation. The thesis aim to answer following questions:

I:	<i>Is there a correlation between ESG scores and stock performance during the COVID-19 pandemic?</i>
II:	<i>Does the nature of the relationship differ within sensitive vs. non-sensitive industries?</i>

3. Purpose

The purpose of this study is to examine if a correlation exists between ESG scores and stock performances on the stock market during the COVID-19 crisis for companies in Sweden. This will be tested through the use of a regression analysis using data on ESG scores as well as variables that are portraying the performance of these companies' stocks. The reasoning behind our selection is that we believe that the awareness around these types of investments have increased during the last years and that the pandemic has been a contributory reason behind this. Year 2021 witnessed the highest amount of capital invested into ESG investments, an amount twice as high as the year before (Visram, 2021), thus contributing to our earlier expressed beliefs. In accordance with these beliefs, we find it interesting to investigate if the companies with higher ESG scores have performed better in comparison to companies who exhibit a lower score in terms of stock performance. The sole purpose of this study is not only to shed light on the relationship between ESG and stock performance, but in addition examine a potential distinctness between sensitive and non-sensitive in terms of the link between ESG and stock performance.

4. Theoretical Framework

4.1 Shareholder Theory

The shareholder theory states, according to Danielson et al. (2008) that a corporation's primary goal is to maximize the wealth of its shareholders. The theory emphasizes the importance of investing in projects that are going to make the shareholders achieve the greatest possible value (Tse, 2011). Tse further resonates that the theory is widely known and is supported by many. Tse further elaborates that one reason behind this is the concept of agency costs. If managers have pressure from shareholders because of the fact that they have invested their capital, then agency costs will become lower since they then have incentives to maximize their earnings. However, the theory has faced criticism. Tse brings up the fact that it could be viewed as quite narrow, since it only takes the shareholders into account and not other, highly relevant, actors such as employees and suppliers. This since these actors all contribute highly to the success of a corporation. With this in mind, below you will find a theory that focuses on this in particular, the stakeholder theory.

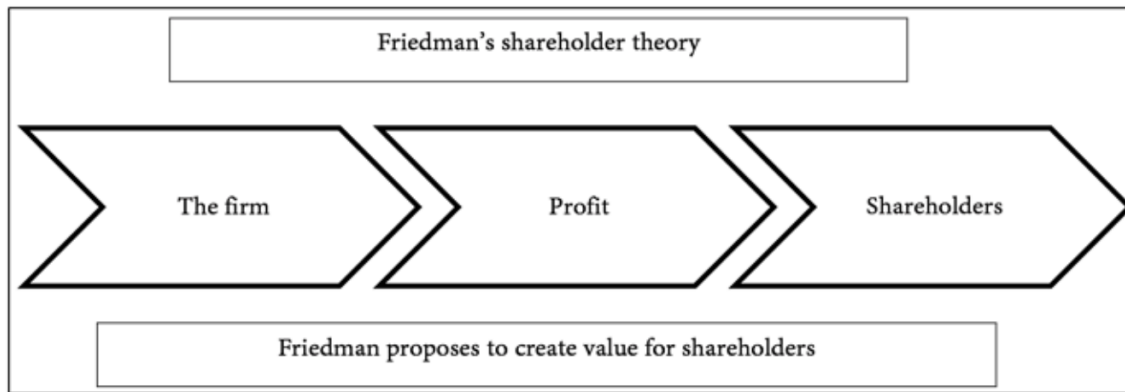


Image source: Scientific Research (2017) ⁶

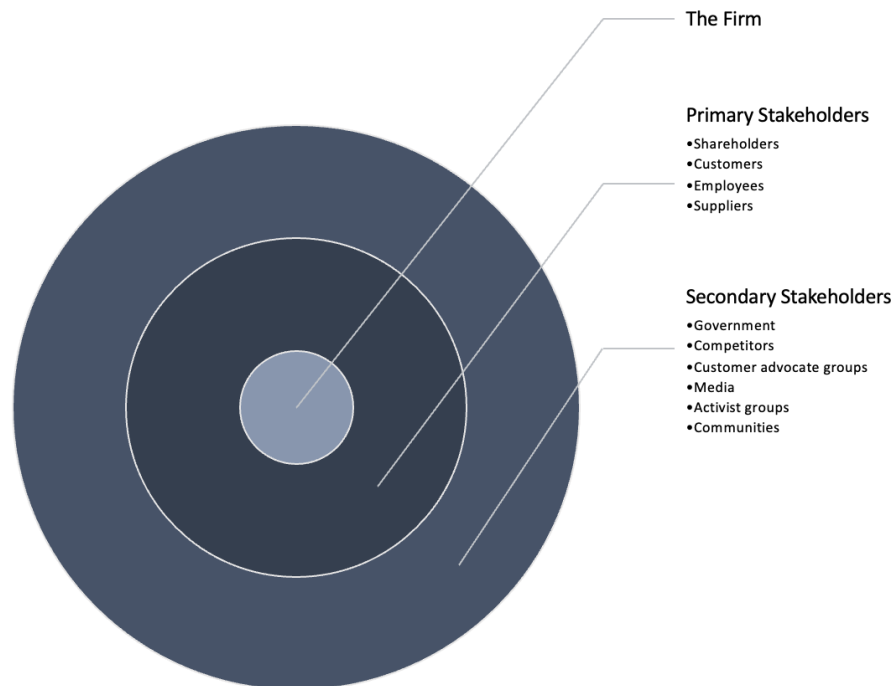
The image above illustrates that “it establishes profit maximization as a firm’s sole objective and the shareholder as the only stakeholder to which it is socially responsible” (section 2.3, Scientific Research, 2017)⁷. Moreover, the main reason as to why the corporation strives for profit maximization according to this theory is to reward its shareholders for taking the risks that they did when investing in the firm. Milton Friedman, the author of the theory, criticized actions related to Corporate Social Responsibility (CSR). He argued that it was unloyal to the shareholders since it reduced earnings which contradicts the previous argument of profit maximization.

4.2 Stakeholder Theory

The essence of the theory is concerned with taking the interest of all stakeholders into account when implementing a business decision, not only shareholders, as the shareholder theory emphasizes. Freeman, R. E., et al (2010), further suggest that if “a group or individual can affect a business, then the executives must take that group into consideration in thinking about how to create value” (p. 26). The purpose of incorporating this theory is to more deeply gain an understanding of capitalism and that it is, in fact, a set of relationships between all stakeholders. When fulfilling the stakeholders’ needs, the corporation at the same time develops a relationship with them which in turn increases shareholder value (Tampakoudis et al., 2020).

⁶ <https://www.scirp.org/journal/paperinformation.aspx?paperid=78197>

⁷ <https://www.scirp.org/journal/paperinformation.aspx?paperid=78197>



Source: Our own.

The model above illustrates first and foremost the core which is the firm itself. The stakeholders around the firm are thereafter divided into two groups; primary stakeholders and secondary stakeholders. Primary stakeholders could be defined as “stakeholders that hold a direct interest in a business or organization” (Terms Compared, 2019)⁸. Examples of these that are mentioned are customers, employees and suppliers.

Furtherly, a definition for secondary stakeholders that could be given is “stakeholders that do not hold direct interests in a business but can have a reasonable influence over a business’s dealing” (Terms Compared, 2019). Examples of secondary stakeholders that they mention are media groups, business competitors and local government organizations.

4.3 Resource Based View

Lockett and Thompson (2001) describes the resource based view as an approach that “views the firm as a historically determined collection of assets or resources which are tied semipermanently to the firm’s management” (p. 725). It was firstly introduced around the

⁸ <https://www.termscompared.com/difference-between-primary-and-secondary-stakeholders/>

1980-1990's and emphasized the importance of looking at the inside of a company rather than focusing on the market and outside environment (Strategic Management Insight, 2021)⁹. Some even found it unrealistic to determine a company's success solely based on its outside environment (Russo and Fouts, 1997). Relevant to this view is an explanation of what a resource actually is. Wernerfelt (1984) defines this as "anything which could be thought of as a strength or weakness of a given firm". Some examples of resources that he states are in-house knowledge of technology, machinery and brand names.

The Resource Based view also divides resources into three categories, according to Russo and Fouts:

1. Tangible
2. Intangible
3. Personnel-based

Definitions that are mentioned are "financial reserves and physical resources such as plant, equipment, and stocks of raw material" for tangible resources (Russo and Fouts, p. 537), "reputation, technology, and human resources; the latter include culture, the training and "expertise of employees, and their commitment and loyalty" for intangible resources (p. 537)

This approach could be connected to the previously mentioned theories; the shareholder theory and the stakeholder theory. Similarities could be found when it comes to the stakeholder theory. What it has in common with the resource based view is that they both put emphasis on the importance of the factors inside of the company. As previously mentioned, when maintaining a good relationship to and taking care of these factors, strong relationships are created which in turn leads to an increase in shareholder value (Tampakoudis et al. 2020). Companies that act in this way also automatically focus on CSR since they put importance into what kind of effects their activity has on the factors around them. Tampakoudis et al. further explains that there have been several studies made that show that firm value is positively affected by CSR engagement and ESG performance.

⁹ <https://strategicmanagementinsight.com/tools/resource-based-view/>

Shareholder theory differs slightly from what has been stated above due to the fact that a greater focus lies on the outside factors, that is, the shareholders and their wealth. When looking again at CSR factors, some argue that companies with a shareholder focus could be investing in CSR for the sole purpose of maintaining a good reputation. These investments may therefore end up being unsuccessful and time consuming (Tampakoudis et al. 2020).

5. Literature Review

There have been several studies made within the area that have been taken into account while performing this analysis. One of them, a study from Demers et al. (2021) where they in a simulation consisting of 1 642 firms listed in the United States of America investigate the impact of ESG on returns during COVID-19. The study explains that ESG fund managers, ESG data purveyors and financial journalists have advertised the value of ESG as “ a share price vaccine” during COVID-19. However, the results of the study indicate that no positive explanatory power for returns can be found once industry affiliation, financial position, market-based measures of risk and accounting-based measures of performance and intangibles investments have been controlled for.

Another study that comes to similar conclusions is one made by La Torre et al. (2020). Here, they investigate how ESG components affect stock returns. The authors use a two step methodology where they analyze the performance of companies that are included in the Eurostoxx50 index (a stock index of the Eurozone) according to their ESG score, during the years 2010 to 2018. The results from the study shows that there is a very weak or absent linear correlation between ESG and stock returns and that a positive impact was found only for a few companies. However, these studies were made on rather old data and it is therefore important to know that changes could have occurred since.

On the other hand, there are several examples of studies that have shown positive relationships between ESG and returns. One example of this is one made by C. Broadstock et al. (2021) where they aim to examine the effect of ESG performance during a financial crisis. Using data from China’s CSI300, a conclusion that high ESG portfolios outperform low ESG portfolios on a general basis and lighten financial risk during a crisis is made. The article states that ESG performance is positively associated with short-term returns, thereby

illustrating the resilience of stocks with high ESG performance during a crisis. The article's result is consistent with the view that ESG performance can operate as a signal of future stock performance and/or risk alleviation during a crisis. Continuing on these types of conclusions, there's another example of a study made by Whelan et al. (2020). In this study, the authors give a summary of different studies made on the relationship between financial performance and ESG from the years 2015 - 2020. The summary is based on over 1 000 research papers and which focused on corporate financial performance and investment performance. One of the findings in the study was that for 58% of the corporations, the authors found a positive relationship between financial performance and ESG, 13% showed a neutral impact, 21% showed mixed results and 8% showed a negative relationship.

Another interesting insight could be found in a paper written by Hong Van Hoang, Segbotangni and Lahiani (2020). The paper examines if the ESG reporting transparency helps firms to better mitigate the impact of the COVID-19 pandemic on stock performance. The study concludes that firms in the UK with high ESG disclosure scores exhibit a less negative impact from the COVID-19 pandemic relative to firms with low ESG disclosure scores. Firms with high ESG disclosure scores have a lower volatility in terms of performance spread and they are less impacted by external factors, such as number of COVID-19 cases and lockdown announcements. However, the study shows that ESG reporting transparency does not help improve the stock performance.

5.1 Hypotheses

Previous studies on the subject have provided contradicting results. Demers et al. (2021) stated that ESG scores offer no explanatory power for returns during the COVID-19 crisis on the American market. However, C. Broadstock et al. (2021) concludes with evidence from China that high ESG portfolios generally outperform low ESG portfolios and that ESG performance alleviates financial risk during a crisis. Wheland et al. (2020) illustrates in their article that the majority of the companies in their study show a positive correlation between ESG scores and financial performance. Furthermore, Garcia et al. (2017) claims that investments in sensitive industries generally exhibit a better ESG performance, hence, we expect to distinguish a difference between our two groups, sensitive and non-sensitive industries.

With results from previous studies in mind, the hypothesis of this analysis is that the quantitative thesis will provide evidence for a correlation between ESG scores and stock performance. Additionally, one will be able to distinguish a difference between sensitive and non-sensitive industries in terms ESG and stock performance.

6. Methodology

This quantitative analysis is characterized by a deductive approach where the goal is to explore the relationship between ESG score and stock performance in sensitive and non-sensitive industries. In order to examine a potential correlation between ESG scores and stock performance on the Swedish stock market, historical data will be implemented into the regression, more specifically data during the COVID-19 crisis. The data collection will include variables such as ESG scores, stock prices, market capitalization, debt/equity ratio, industry affiliation, book-to-market ratio and ROA on Swedish listed companies as well as monthly OMX30 index for the period of interest. Stock prices and market index are collected monthly during the period whereas ESG scores, market capitalization, ROA, book-to-market ratio, and debt/equity ratio is collected at the end of each year, 2020 and 2021.

The data will be analyzed and processed in Stata, a statistical software for data science. The software will enable us to define the sample as panel data and run several regressions appropriate for the particular data set. Due to the qualitative aspect of this paper, it will be characterized by objectivism and its foundation will be statistical data on which an analysis will be performed and a conclusion will be made.

6.1 Sample Selection

The selection of companies is based on available ESG scores on Swedish listed companies in the Refinitiv Eikon database, hence defining our sample consisting of 344 unique firms. The company-panel data is obtained through the Thomson Reuters database where the Refinitiv Eikon screener is used as an add-on in Excel.

In terms of industry affiliation, the Global Industry Classification Standard, GICS, was used for classification of industries. The Global Industry Classification Standard divides the firms into sectors, industry groups, industries and sub-industries where each firm gets classified based on its fundamental business activity (MSCI, 2022).¹⁰



(MSCI, 2022)

The hierarchical classification system was retrieved from Thomson Reuters database where each company has been given a sub-industry level. Firms that fulfilled the definition of being part of a sensitive industry, based on Loprevite, Raucci and Rupos (2020), were given a value of “1” on the dummy variable Sensitive.

¹⁰ <https://www.msci.com/our-solutions/indexes/gics>

6.2 Data Cleansing

The data is collected monthly over a two-year time period, 2020 to 2021. While the sample consists of 344 unique firms, the total number of observations included in the panel data amounted initially to 688. However, due to some missing data on for example ROA, Book-To-Market Ratio etc. for some firms, these observations were removed. Thus, the panel data that constitute the foundation for this analysis is unbalanced. While a balanced data set is preferable, Baltagi and Song (2006) states that unbalanced panel data sets are the norm in economic empirical settings and they are defined as data sets where data is missing over some time periods. Consequently, some firms in this particular analysis have available data for one of the years, although not for both.

After the data cleansing, a total of 515 observations were found. When using Stata and defining the sample as panel data, the software recognizes the data set as unbalanced and is able to perform the regression despite the unevenness in number of firms over time.

6.3 The Regression Model

A regression analysis will be performed on the panel data in order to examine the impact of ESG on stock performance. In order to control for other various aspects that may have an explanatory power in terms of stock returns, certain control variables will be included in the regression analysis. This action enables us to account for omitted variable bias, hence, providing a value closer to the true estimate of our variable of interest.

Three regression models will be performed in Stata on model 1 and model 2, see models further below. The fixed effect model, the random effect model and the pooled OLS model. When conducting a regression on the panel data in Stata, one must first define the sample as panel data and account for the id and time variable. Here, each company was given a number as an id and a year as the time variable. In most cases, each firm had two observations, the year 2020 and year 2021. However, due to missing data, i.e., unbalancenness, some firms only have one observation. After performing these three regressions, certain tests will be performed to determine the most appropriate model. In this analysis the Hausman test and Breuch and Pagan LM test will be implemented. In terms of the Hausman test, it is frequently used in panel data analysis to determine if a correlation between the unobserved individual

effect and the conditional regressors are present in the model, hence, this is a question of exogeneity. If the exogeneity assumption is rejected, the fixed effect model would be preferable over the random effect model (Amini et al. 2006). The Breuch and Pagan LM test is used when determining between a random effect model and a pooled OLS model and is testing for heteroskedasticity (Breusch, Pagan. 1980).

By using Whites test, signs of heteroskedasticity were shown. Moreover, robust standard errors will be implemented in all of the regressions to account for the heteroskedasticity.

The regression will be performed with accordance to following models:

Model 1:

$$BHAR_{it} = \gamma_0 + \gamma_1 ESG_{it} + \gamma_2 ROA_{it} + \gamma_3 HighTech_{it} + \gamma_4 Debt/Equity_{it} + \gamma_5 Book/Market_{it} + \gamma_6 Size_{it} + \gamma_7 Sensitive_{it}$$

Model 2:

$$BHAR_{it} = \gamma_0 + \gamma_1 ESG_{it} + \gamma_2 ROA_{it} + \gamma_3 HighTech_{it} + \gamma_4 Debt/Equity_{it} + \gamma_5 Book/Market_{it} + \gamma_6 Size_{it} + \gamma_7 Sensitive_{it} + \gamma_8 ESGxSensitive_{it}$$

6.4 Calculation of Buy-and-hold Abnormal Returns

The formula for buy-and-hold abnormal returns is determined by subtracting the expected return from the return of the sample firm. (Barber, et al. 1997.) In this thesis, we will consider the Sweden Stock Market Index, OMX30, when calculating the expected return for each investment. The OMX30 index is collected monthly during the period of interest, 2020 and 2021. By including a benchmark, the formula allows us to compare different investments with each other.

$$BHAR_{it} = \prod_{t=1}^t [1 + R_{it}] - \prod_{t=1}^t [1 + E(R_{it})]$$

The Buy-and-hold Abnormal Returns is used in Demers et al. (2021) research on the relationship between ESG score and stocks resilience during the COVID-19 crisis. Demers et

al. uses the measurement as the outcome variable for their regression. In this analysis, the Buy-and-hold Abnormal Return measurement holds the same purpose.

6.5 Calculation of ESG

Table 1.1. Illustrates the fundamentals of the ESG score and its subcategories.

Pillars	Themes	Data Points in Scoring	Weight %
Environmental	Resource Use	20	11
	Emissions	28	15
	Innovation	20	11
Social	Workforce	30	16
	Human rights	8	4
	Community	14	8
	Product Responsibility	10	5
Governance	Management	35	19
	Shareholders	12	6
	CSR strategy	9	5
Σ		186	100

Source: Refinitiv Eikon (2022)

The overall score is based on the three pillars Environmental (37%), Social (33%) and Governance (30%). These three together include 10 themes that are stated in the table above which are divided between the three. The scores are “a relative sum of the category weights, which vary per industry for the environmental and social categories” (Refinitiv Eikon, p. 6). Moving on to the methodology behind calculating the ESG scores, Refinitiv Eikon divides this into a five step process:

Step 1: ESG category sources
Step 2: Materiality Matrix
Step 3: Overall ESG score calculation and pillar score
Step 4: Controversies scores calculation
Step 5: ESGC score

Step 1: ESG category sources

In the initial step, there are two types of treatments for the data that is collected: *Boolean* and *Numeric*. For the first one, questions with “yes” or “no” answers are being asked and are thereafter summarized by being assigned a “0” or a “1”. For the numeric data, “a relative percentile ranking is only applied if a numeric data point is reported by a company, while all the companies in an industry group report that respective data point.” (Refinitiv Eikon, p. 9).

Step 2: Materiality Matrix

Refinitiv developed an ESG magnitude matrix in order to have “an objective, impartial and trusted assessment of the importance of each ESG theme to different industries” (p. 10).

Step 3: Overall ESG score calculation and pillar score

Refinitiv explains this step as: “To calculate the overall pillar and ESG scores, category weights per industry are applied using data-driven and objective logic” (p. 13).

Step 4: Controversies scores calculation

Refinitiv states that there are 23 ESG controversy topics. These are used as a base to calculate the ESG controversies scores. What this implies is that if “during the year, if a scandal occurs, the company involved is penalized and this affects their overall ESGC score and grading” (p. 7).

Step 5: ESGC score

Another type of ESG score is the ESGC score. This score “overlays the ESG score with ESG controversies to provide a comprehensive evaluation of the company’s sustainability impact and conduct over time” (p. 6). It is calculated by taking the average of the ESG score and the score for ESG controversies that was mentioned in step 4.

6.6 Variable Appendix

Table 6.1. Illustrates the variables included in the regression model and their definitions.

ESG	The ESG score takes a number between 0 and 100 and is based on performance within the environmental, social and governance factors. A high score indicates high performance and satisfaction within all three areas.
BHAR	BHAR stands for buy-and-hold abnormal return and is calculated with accordance to: $\prod_{t=1}^t [1 + R_{it}] - \prod_{t=1}^t [1 + E(R_{it})]$. (Barber and Lyon. 1997). Here, we will use the OMX30 market index to calculate expected return.
Size (LogMktCap)	The natural logarithm of market capitalization.
ROA	ROA stands for <i>Return on Assets</i> and is calculated as follows: ¹¹ $\frac{\text{Net Income}}{\text{Total Assets}}$
Book-to-market ratio	Calculated as follows: $\frac{\text{Common Shareholder's Equity}}{\text{Market Cap}}$ Expressed in percentage.
Debt-to-Equity Ratio	The debt-to-equity ratio is calculated as follows: $\frac{\text{Total Liabilities}}{\text{Total Shareholders' Equity}}$ Expressed in percentage. ¹²
High_tech	Dummy variable that takes the value “1” if the company is in a high tech industry and the value “0” otherwise.
Sensitive	Dummy variable that takes the value “1” if a company is part of a sensitive industry, and “0” if not.
ESGxSensitive	Integrated variable. ESG multiplied with the Sensitive industry dummy.

¹¹ <https://www.investopedia.com/terms/r/returnonassets.asp>

¹² <https://www.investopedia.com/terms/d/debtequityratio.asp>

6.7 Descriptive Statistics

By processing the data thoroughly, the descriptive statistics provide an overview over the collected data on which the analysis will be performed and helps detect potential outliers in the data set. Further, it provides an indication of the spread of the data and thus the potential skewness or centralization of the sample. **Table 4.1** summarizes the panel data used in this analysis where all 515 observations have been included.

Descriptive statistics for the variables included in the regression

Table 6.2. Illustrates the descriptive statistics for the dependent, independent and control variables.

Variables	N	Mean	Median	Std	Maximum	Minimum
ESG	515	43.2030	43.2996	22.4231	93.3309	1.6565
BHAR	515	-0.0202	-0.0249	0.0633	0.9815	-0.1466
Size (LogMktCap)	515	20.4659	20.4499	1.9058	24.9969	14.5074
ROA	515	-0.0083	0.0388	0.2280	0.9730	-2.0295
Book-to-Market Ratio	515	0.4839	0.2937	1.1359	15.9973	-0.4329
Debt-to-Equity Ratio	515	0.9407	0.5268	2.0218	19.1506	-5.8577
High_tech	515	0.0816	0	0.2739	1	0
Sensitive	515	0.1476	0	0.3550	1	0
ESGxSensitive	515	5.7206	0	16.1804	86.7499	0

6.8 Correlation Analysis

The correlation matrix indicates a strong positive correlation between size and ESG. Normally, this problem would be repaired by omitting the size variable from our regression. However, for comparison reasons, the control variable size will still be included in our regression since this is aligned with previous research. Nonetheless, the correlation between these two variables demonstrates that larger firms often exhibit a larger ESG score. Furthermore, by performing a variance inflation factor test on the panel data, one can conclude that no multicollinearity, i.e. correlation between several of the independent variables, exists in the data sample.

When defining the data set as panel data one must include an id variable and a time variable. In this analysis each observation has been given a company number and a year that operates as time and id variables. Both have been excluded from the correlation matrix.

Table 6.3. Correlation Matrix. Illustrates the correlation between all variables.
* = Significant at a 10% level, ** = significant at a 5% level, *** = significant at a 1% level

	BHAR	ESG	ROA	Sensitive	High_tech	DE	BM	Size	ESGxSensitive
BHAR	1,0000								
ESG	-0,0605	1,0000							
ROA	-0,4233***	0,2892***	1,0000						
Sensitive	0,1246***	-0,0824*	-0,1014***	1,0000					
High_tech	0,1440***	-0,1442***	-0,2203***	0,4561***	1,0000				
DE	-0,0042	0,1114***	-0,0148	-0,1589***	-0,1137***	1,0000			
BM	0,0969**	0,0302	0,0236	-0,0139	-0,0572	0,0734***	1,0000		
Size	-0,2637***	0,6612***	0,4552***	-0,1303***	-0,1599***	0,0735*	-0,0823*	1,0000	
ESGxSensitive	0,1057***	0,1295***	-0,0275	0,8505***	0,3522***	-0,1226***	0,0067	0,0242	1,0000

6.9 Various Means

In order to illustrate why it might be of interest to take industry affiliation into account, more specifically to analyze sensitive and non-sensitive industries, the sample has been divided and means have been calculated. By looking at the means of each variable in sensitive and non-sensitive industries separately, one can conclude that they differ slightly. The BHAR barely differs between sensitive and non-sensitive industries. However, it is noticeable that the ESG score is slightly higher in the sensitive industries. The below table demonstrates the various means between the two groups of interest and their differences. Hence, illustrating that there are differences between the groups.

Table 6.4. Illustrates the means of the variables after dividing the sample into sensitive and non sensitive industries.

Variable	Non Sensitive		Sensitive		Difference	
ESG	4.9421		44.0977		-0.1756	
BHAR	-0.0236		-0.0237		0.0001	
Size	20.5689		20.4083		0.1606	
ROA	0.0013		-0.0006		0.0019	
Book-to-Market Ratio	0.4895		0.4322		0.0573	
Debt-to-Equity Ratio	1.0718		0.0733		0.9985	
High_tech	0.0295		0.3333		-0.3035	

7. Results

Three panel data regressions were performed on each model, see tables below. The independent variable ESG provided significance in the random effect model and the pooled OLS regression model, however no significance was demonstrated for the variable in the fixed effect model in neither model 1 or model 2 with the interaction variable. In terms of control variables, the various regression models delivered similar results. When perfect collinearity exists, Stata will automatically drop the variables. This is expected, since both dummies concern industry affiliation, an aspect that does not vary over time. The fixed effect model subtracts the group mean from the regressors. Hence, in the fixed effect model, both dummies were omitted by automation when running the regression.

To determine the most appropriate model, a Breusch Pagan Lagrange Multiplier test was conducted in Stata. The test could, with statistical evidence, support that the pooled OLS model is more favorable. However, when running the Hausman test, H_0 was rejected with a probability of 0,0000 and a conclusion that the fixed effect model should be used over the random effect model was made. In accordance with previous studies, the Breusch Pagan Lagrange Multiplier test is usually implemented when the Hausman test provides support for the random effect model, hence, the fixed effect model will be the most appropriate still.

The fixed effect model demonstrates a positive insignificant relationship between the independent variable ESG and the dependent variable BHAR. Further, a negative and strongly significant relationship between control variables ROA, Debt/Equity ratio and Book/Market ratio and the dependent variable BHAR can be distinguished from the regression. This result is aligned with Demers et al. (2021) where an insignificant relationship between the independent variable ESG and the dependent variable BHAR was demonstrated as control variables were added to the model.

By multiplying the ESG score coefficient extracted from the regression output with the standard deviation, one can define the percentage effect of the coefficient on BHAR. See **table 7.3**. If ESG score increases with one point, the BHAR will increase with 0.0179 % in model 1 without the interaction term and with 0.0089 % in model 2 with the interaction term.

Additionally, with a 10% level of significance the integrated variable ESGxSensitive in model 2 demonstrates a slightly positive relationship between the variable and BHAR. Thus, illustrating that there is a statistically significant difference between the correlation between ESG and BHAR in sensitive industries comparable to the relationship between the same variables in non-sensitive industries.

Table 7.1. Model 1: Fixed Effect vs Random Effect vs Pooled OLS Regression on Panel Data without interaction variable
 * = Significant at a 10% level, ** = significant at a 5% level, *** = significant at a 1% level

Explanatory Variable	Fixed Effect	Random Effect	Pooled OLS Regression
_cons	2.2913***	0.0944***	0.0829***
ESG	0.0008	0.0005***	0.0005***
ROA	-0.0872***	-0.1025***	-0.1049***
High_tech	omitted	0.0077	0.0075
Debt/Equity (DE)	-0.0107***	-0.0004	-0.0003
Book/Market (BM)	0.0278*	0.0052***	0.0049**
Size	-0.1147***	-0.0070***	-0.0064***
Sensitive	omitted	0.0107	0.0109
R^2	0.5352	0.2201	0.2204

Table 7.2. Model 2: Fixed Effect vs Random Effect vs Pooled OLS Regression on Panel Data with interaction variable
 * = Significant at a 10% level, ** = significant at a 5% level, *** = significant at a 1% level

Explanatory Variable	Fixed Effect	Random Effect	Pooled OLS Regression
_cons	2.2274***	0.0971***	0.0843**
ESG	0.0004	0.0005***	0.0005***
ROA	-0.0956***	-0.1023***	-0.1048***
High_tech	omitted	0.0079	0.0077
Debt/Equity (DE)	-0.0108***	-0.0004	-0.0003
Book/Market (BM)	0.0279*	0.0052**	0.0049**
Size	-0.1121***	-0.0071***	-0.0064***
Sensitive	omitted	0.0023	0.0038
ESGxSensitive	0.0041*	0.0002	0.0843
R^2	0.5428	0.2206	0.2209

Table 7.3. Percentage effect of ESG score on BHAR (ESG multiplied with standard deviation)

Model	ESG	Standard Deviation	Percentage effect
Model 1	0.0008	22.4231	0.0179
Model 2	0.0004	22.4231	0.0089

8. Discussion

The purpose of this quantitative analysis was to examine the relationship between ESG score and stock performance, furthermore, to detect any potential difference in terms of this relationship in sensitive and non-sensitive industries. This qualitative analysis was performed on data collected from Thomson Reuters and their Refinitiv Eikon database where Stata were used in order to perform various regression analyses on the collected data.

Several previous studies on the subject have been performed with results that differ from each other. Demer et al. (2021) suggests with evidence from the American market that no explanatory power can be found in ESG score once control variables are added and controlled for. A conclusion that later was proved aligned with the results composed in this analysis. The hypothesis formed earlier in this analysis was partly inspired by Broadstock et al. (2021) that demonstrated in their study that high ESG score portfolios outperform low ESG score portfolios and alleviate financial risk during the Covid-19 crisis. Although our results were inconclusive in regards to the link between ESG scores and stock performance, a significant and slightly positive relationship was distinguished from the interaction variable ESGxSensitive.

The focus of this paper has been the year 2020 and 2021. After implementing a Hausman test on the data set, a conclusion was made that the fixed effect regression model was best suitable. Hence, the results from that specific model have been emphasized. Worth mentioning is that the random effect model is the most commonly used in similar settings. However, since this paper exclusively focuses on the year 2020 and 2021 the variation between the two time periods is presumably small. This could form an explanation to why the Hausman test supported the fixed effect model instead. The random effect model did present statistical support for a significant positive relationship between ESG score and stock performance. With this in mind, one can discuss if the choice of method was favorable in this situation and if the results from the random effect model should still be considered. In that case, the analysis provides support for a significant relationship between ESG score and stock performance.

Due to the limitations of this analysis concerning time frame and extent, ESG scores have been collected from the Refinitiv Eikon database exclusively. Nevertheless, there are several databases and companies that offer ESG ratings in addition to Refinitiv Eikon, each with a unique grading scale. In order to provide justice for this analysis, several ESG ratings from various sources should have been taken into account. It is an important aspect that would have been included if possible and is worth mentioning when interpreting the results.

Another aspect that might have brought more enlightenment and comparability to this analysis is the inclusion of a “normal” period of time free from the economic effect of the pandemic. This would bring an interesting insight into the analysis since we then would find out whether or not there are big differences between these time periods. However, because of the time frame, this was not possible.

There are several theoretical frameworks that could be applied to what is examined in this analysis. Three of these that were chosen in this case are Shareholder Theory, Stakeholder Theory and Resource Based View. Here, similarities could be observed between the latter two since they mainly focus and show a broader perspective of the inside factors of the corporation rather than the outside market. Shareholder Theory instead puts emphasis on the wealth of the company’s shareholders and would have been aligned with a positive relationship between ESG and stock performance in terms of motivating firms to invest in ESG activities. Even though no statistically significant correlation was found in our analysis between ESG scores and stock performance, there could still be value created to others than the shareholders such as the company’s stakeholders, as previously mentioned in the Resource Based View. One could therefore still argue that investing in ESG activities is still of high importance since it has shown to have positive effects on many parts of the company from a stakeholder theory perspective.

9. Conclusion

To conclude, this section aims to answer the research questions stated at the beginning of the report:

Is there a correlation between ESG scores and stock performance during the COVID-19 pandemic?

The analysis provided no statistically significant relationship between ESG scores and stock performance in either the model with the interaction term or the one without it. Thus, the analysis cannot with statistical evidence support the argument that a relationship between ESG score and stock performance exists.

Does the nature of the relationship differ within sensitive vs. non-sensitive industries?

Yes. The fixed regression model demonstrated a statistically significant difference between sensitive and non-sensitive industries in terms of the link between ESG scores and stock performance. The results were aligned with our hypotheses.

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