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ESG rating, a booster of stock performance during the Covid-19 pandemic in Sweden?

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Abstract:

The purpose of this study is to analyze if ESG rating of sustainability have an influence on the stock return of Swedish firms during the Covid-19 pandemic. The aim is to contribute to the research field by conducting a study on the Swedish market, where sustainability aspects are known to be of great influence. In combination with the chosen period of Covid-19, there is a unique opportunity to examine relationships between financial performance and sustainability during a contemporary crisis. Two hypotheses are formulated based on the social restrictions that the Swedish government issued in relation to the pandemic. Both hypotheses state that firms with a high ESG rating should perform better than firms with a low ESG rating during the restriction periods. The first hypothesis applies to the first restriction period of 500 people and the second hypothesis applies to the following restriction period of 50 people. To test the hypotheses a panel data analysis is conducted on 152 firms from 10 different industry sectors. The results of the study show that the high ESG rated firms perform significantly better than the low ESG rated ones only during the more restricted period of 50 people. Thus, the second hypothesis is supported while the first hypothesis is rejected.

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ESG, Sustainability, Stock Return, Panel Data, OMXSPI

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1. Introduction

This section is meant to introduce the reader to the overall picture and meaning of this study, and hopefully raise interest for the research field. The background, purpose and hypotheses are presented, followed by a disposition of the rest of the study.

1.1 Background

The world we live in today is struggling with global environmental and social challenges, not least now in the grip of the Covid-19 pandemic. In recent years, it has become evident that it is of utmost importance for both investors and companies to adapt to a sustainable way of operating. The aspect of concerning sustainability in investing strategies is nowadays more the rule than the exception. Today, the concept of sustainable investment is not just about excluding controversial sectors such as pornography and the arms industry, but it has grown to a global movement, including all parties of the market chain. The ESG (Environment, Social and Governance) criteria, alongside other measurements, has emerged, setting the standards to help investors navigate in the field and determine what sustainable investment really is. More and more, investors and firms are starting to see the financial possibilities of sustainable investment, and the concept is considered an asset rather than a cost. Sweden is a country where this progress is clearly visible. Johanna Kull, economist at Avanza Bank and specialized in sustainable investing, is noticing a distinct growing interest in sustainable investing from Swedish investors. She expresses that investing sustainably increases the probability of picking future winners rather than those of yesterday. She says that this will lead to a higher expected return for the individual investor, and at the same time a reduced risk. Kull means that the financial sector as a whole play a key role in the transformation of the society into becoming sustainable, since it possesses the power of distributing the capital, and hence can impact which companies that will survive. Younger investors, women in particular, prioritize sustainability (Kull, 2020). Based on this discussion, we believe that an analysis of sustainable investments can indicate the investment climate of the future. If this is true, it is of great interest to examine the resilience of sustainable assets during critical market situations.

The pandemic of Covid-19 has knocked the world off its feet, not least socially, but it is also forecasted to become the most severe global recession since the World War II (Kose and Sugawara, 2020). The Swedish stock market, indexed by OMXSPI, decreased by 34.6% in a little over a month (Nasdaq Index, 2020). As discussed above, this event is happening within the framework of the modern

sustainability investment climate. ESG criteria are far more important now than it has been during prior crises, especially in Europe. In parallel, the UN Sustainability Development Goals (SDGs) are gaining importance in most business and investment plans as it is a driver for business. Previous research has shown that ESG funds over the world have outperformed their index during the pandemic. For example, S&P Global reported that out of 17 investigated ESG funds, 12 of them outperformed the market the first 4 months of 2020 (Whieldon et al., 2020). We want to contribute to this research by examining the relationship of ESG rating and performance of assets on the Swedish market, a market that is at the front of sustainability work, and therefore may bring valuable conclusions.

1.2 Purpose

The purpose of this study is to examine if ESG rating has had an impact on the performance of Swedish stocks during a critical market situation, in the form of the Covid-19 pandemic.

1.3 Choice of market

A survey from Svensk Handel shows that 88% of participating Swedish firms declare that there is a positive relationship between sustainability and profitability, and that 8 of 10 firms actively are working with sustainability questions. The same survey shows that between 70% and 89% of Swedish consumers consider it important that their consumption is sustainable (Svensk Handel, 2019). Johanna Kull from Avanza states that it is important for their investors not to contribute to operations that are not in line with their values (Kull, 2020). It is a natural to draw an economical conclusion that the high demand for sustainable goods and services, as well as investment assets in Sweden, should push up the price of sustainable stocks.

Sweden is involved in the United Nations 2030 Agenda for Sustainable Development. To meet the 17 Sustainability Development Goals, Sweden has developed a strategy to reform the society into a more sustainable one. This procedure partly includes a climate policy framework to reach the goal of no greenhouse emissions before the year 2045, as well as a development of a strategy for sustainable consumption and smart industry etc. (Lövin and Shekarabi, 2018). The Swedish Government emphasizes that this process should be transparent and accessible for the citizens and among them investors. Since December 1, 2016, Swedish companies of a certain size are obligated by law to report their sustainability beneficial progress. The purpose of the law is to make it easier for consumers to follow and compare companies, again by creating transparency (Ygeman and Malm, 2016). The law

includes reporting within all the three components of the ESG. This type of law makes the Swedish market credible as a sustainable player, since it counteracts false sustainability progress such as green washing. Based on the arguments stated above, we believe that the Swedish market is a plausible choice for research related to sustainability.

1.4 Brief introduction to the methodology

A panel data analysis will be conducted on observations of 152 listed companies on the Swedish market, from 10 different industry sectors. The data will be taken from Refinitiv Eikon and will be controlled for by several control variables. The global pandemic of Covid-19 is chosen as an underlaying and influencing factor for the research process. The reason for this is that we wish to examine whether highly rated ESG firms are performing better than lower rated ones during a critical market situation. To do this, we will divide the period based on the social restrictions issued by the Swedish Government regarding the maximum number of people allowed to gather during the pandemic, in order to reduce the contamination. The first of maximum 500 people were decided on Mars 11, 2020. The second of a maximum of 50 people were decided on about three weeks later (Folkhälsomyndigheten, 2020). These two restriction periods will be the time periods of interest for this study. Note that in the writing of this study, Sweden is subject to even stricter social restrictions on a maximum of 8 people. Due to lack of time this restriction has not been accounted for.

1.5 Hypotheses

Two research hypotheses are formulated to meet the purpose of the study. The hypotheses apply to Swedish firms with a valid ESG score, during the two periods when Sweden was under social restrictions, first of 500 and then of 50 people. Both hypotheses are in comparison to firms of lower ESG rating.

H1: Firms of higher ESG rating perform better during the first restriction period (500 people) of Covid-19 in Sweden.

H2: Firms of higher ESG rating perform better during the second restriction period (50 people) of Covid-19 in Sweden.

1.6 Disposition

The content of the study will be presented in the following way. The second section *"Theoretical Framework"* will provide a background to the theories and other relevant content that the study is based on. The third section, *"Previous Research and our contribution"*, will present results of similar previous research that is relevant for this study, followed by a motivation for how we wish to contribute to the field. The fourth section, *"Data and Methodology"*, describes the procedure used to analyze the study's hypotheses. In this section the research approach is introduced, followed by information regarding the data collection and variables. Then, the econometric model is presented followed by a discussion of the limitations of the methodology and the data. In section 5 *"Results and analysis"* the results of the study are presented, interpreted and discussed. The final section *"Conclusions"* will summarize the study as a whole.

2. Theoretical Framework

2.1 Sustainability

The measure of sustainability used in this study is the ESG and it is introduced in this section. Other sustainability related terminology that is useful for the scope of this study is also presented.

Environmental, Social and Governance (ESG)

ESG, short for Environment, Social and Governance, is used to screen the market for assets that goes in line with the values and wishes of the investor. ESG focuses not only on the sustainability parameter of an asset, but also considers the financial properties such as expected return and risk. ESG has gained popularity in recent years and are used by financial operators worldwide (Chen, reviewed by Scott, 2020). When handling the theme of sustainability in general and ESG criteria in particular, it is important to bear in mind that it is an ethical and subjective concept and that there can be as many interpretations as there are interpreters. There is no clear framework for ESG, and it is up to every investor or researcher to verify that the source used is in line with what one aims to examine. The term ESG disclosure refers to the transparency of ESG related matters that is provided from the companies. ESG disclosure metrics are mostly taken from company annual reports, press releases etc. Today there is a lack of standardized ESG disclosure metrics. However, since firms are presenting more and more comparable ESG data, there are rating agencies that provide ESG information that is affecting investment decisions (Silk et al., 2020). One of these providers is Refinitiv Eikon that has been used

for collecting ESG ratings in this study. More details on how Refinitiv Eikon produce their ESG rating is provided in section 4.3.2.

CSR, SRI and Greenwashing

There are several terms other than ESG that are strongly associated with responsible investing in economics. CSR (Corporate Social Responsibility) refers to companies acting outside the scope of their own business to do good for the society (Fernando, reviewed by Scott, 2020). CSR does not naturally have to affect a firm's financial strategy, but rather its marketing strategy. For this reason, it is not of great importance for this study. It is still worth mentioning since it is common to refer to CSR while discussing sustainable economics. SRI (Socially Responsible Investing) is another common term. It is the action of investing in assets that are considered sustainable (Chen, reviewed by Scott, 2020). Greenwashing is a term for describing the incentive to capitalize on the increasing demand for sustainable products and assets (Kenton, 2020). Since ESG is not a standardized measure, and rather is based on ESG disclosure from the companies, it is important to consider the risk of manipulated ESG metrics.

2.2 Factors that affect stock return

The dependent variable of this research is stock return. Below follows a short presentation of factors that affects stock return. Note that the variables will be discussed in further detail in the section 4.3.

Capital Asset Pricing Model (CAPM)

$$CAPM: \quad R = R_f + \beta_1 * (R_m - R_f) + u$$

The Capital Asset Pricing Model (CAPM) is probably the most common model used for pricing assets in financial economics. CAPM provides a prediction of the relationship between the systematic risk (market risk) and the expected return of an asset. In CAPM, expected return is given by the risk-free rate plus a term for the systematic risk: *beta * market risk premium*. The key insight is that according to CAPM, the main factor that affects stock return is the systematic risk (Bodie et al., 2014).

Fama and French three factor model (FF)

$$FF: \quad R = R_f + \beta_1 * (R_m - R_f) + \beta_2(SMB) + \beta_3(HML) + u$$

In 1993, Eugene Fama and Kenneth French released a three-factor asset pricing model that was built on from the CAPM. It has become one of the most used models for asset pricing. In addition to the

market risk two other factors are used, since they have been empirically proven to have a good predictive power on stock return (Bodie et al., 2014). First, a size factor called SMB (small minus big) is added, since long term observations has shown that small stocks tend to outperform large stocks. Then, a factor related to the book to market value is added, to capture the observed pattern of value stocks outperforming growth stocks. This factor is called the HML (high minus low) factor (Bodie et al., 2014).

Efficient market hypothesis (EMH)

EMH is a theory that states that all available information is incorporated in the stock price. If the EMH holds, it is impossible for investors to beat the market, since stocks always are traded at their fair value. Hence, the only way to gain a higher return is by obtaining riskier assets (Bodie et al., 2014).

2.3 Shareholder and stakeholder theory

Shareholder theory was developed by Milton Friedman in 1962. The key takeaway from this theory is that the main responsibility of a firm is to increase profits for its shareholders (Friedman, 1962). In 1970, Friedman released a follow up titled "The Social Responsibility of Business is to Increase Its Profits", where he emphasizes the Shareholder theory further, arguing that a firm has no social responsibilities to the society, but rather just to its shareholders, and it is taken by maximizing profits (Friedman, 1970). Stakeholder theory was developed in the 1980's by Edward Freeman among others. It draws attention to the influence of other actors than the shareholders that affects a company's long-term performance. Stakeholders are for example, except for shareholders, employees, suppliers, customers, media etc. Stakeholder theory states that long term company success is ensured by considering the perspective of all these actors. The purpose of the Stakeholder Theory is to illustrate the controversy of ethics in capitalism (Freeman et al., 2010).

3. Previous research and our contribution

3.1 Previous research findings

There is a lot of previous and ongoing research done on how sustainability factors affect economic performance. The fact that sustainability can be measured and interpreted in several ways, as discussed in the section 2.1, makes it a bit difficult to compare findings. In this section we will present some previous studies that partly go in line with our hypotheses.

Broadstock et al. (2020) investigate the impact of ESG performance in China during the economic crisis related to the Covid-19 pandemic. They find that high ESG portfolios typically outperform low ESG portfolios, and they do find a significant relationship between ESG score and short-term aggregate return (both raw and abnormal) on Chinese stocks during the pandemic (Broadstock et al., 2020). The authors also uncover moderate proof of lower price volatility of the high ESG rated firms during the pandemic, affirming that high ESG firms are more resilient than others. They state that ESG performance is of greater importance to Chinese investors during times of crisis, meaning that it can be used as a signal of future stock performance and to mitigate risk (Broadstock et al., 2020).

Nofsinger and Varma (2014) looked at socially responsible mutual funds (focusing on ESG) compared to conventional funds in the US during market crisis situations. They found that the ESG funds outperformed the benchmark during volatile markets, but during non-crisis periods the ESG funds underperformed. The authors state that both during bear and bull market situations, individual firms that focus on SRI and ESG are less probable to suffer negative events, but that they are underperforming during periods of no crisis. They also stress that the patterns they have observed are not due to characteristics of the firms in or the management of the observed funds, but rather just the attributes of the funds SRI and ESG strategies. Nofsinger and Varma (2014) argue that investors are willing to accept the asymmetric performance of the SRI/ESG funds because they priorate the gain of doing better in volatile markets over the loss in less volatile situations.

Buchanan, Xuying Cao and Chen (2018) conducted a study on 261 U.S. firms that looked at the combined effect of CSR and institutional ownership on firm value around the financial crisis of 2008. They found a positive relation between the firm value and CSR, and that the effect of CSR was significantly affected by the level of institutional ownership. In the aspect of the crisis, the firms concerned in CSR were valued higher prior to the crisis but lost more value as a result of the crisis than the firms without CSR scores. The authors claim that this bigger loss in value for the CSR firms can be explained by an overinvestment in those firms (B. Buchanan et al., 2018). In summary, they find that CSR is affecting the firm value, and that this effect is positive before the 2008 crisis. However, the authors do not provide a clean evidence of the relationship between CSR and firm value, since the causal effect they find is influenced by institutional ownership in relation to CSR.

Fatemi, Glaum and Kaiser (2017) made a study that focuses on the effect of ESG on firm value in relation to their ESG disclosure. In other words, if the firm's valuation is affected by how much of their

ESG related work that is reported to investors. The study includes 403 U.S. companies, and the observations are made between 2006 and 2011. Their general findings are that firms with higher ESG scores tend to be valued higher than firms with lower ESG scores. In the meantime, ESG disclosure generally decreases firm value. Disclosure has the effect of both mitigating the negative effect of weaknesses and the positive effect of strengths, and thus effects the ESG score and further the valuation of the firm (A. Fatemi et al., 2017). In short, the firm valuation is affected by the ESG and the ESG score on its own is affected by the ESG disclosure.

Renneboog et al. found in 2008 that generally SRI funds around the globe underperformed their domestic benchmark, and that their risk adjusted returns were not statistically deviating from the performance, with exceptions for a few countries, Sweden included (Renneboog et al., 2008). This is interesting in relation to our study since it strengthens our hypothesis that the Swedish market is (and has been for some years) of particular interest when looking at the performance of sustainable investments.

Zhang (2011) analyses shareholder and stakeholder theory, with the conclusion that the shareholder perspective of solely focus on profit maximation is of a short-term nature and can cause problems of development in the long term. Zhang claims that to maximize lasting profits for all stakeholders (shareholders included), companies must focus on environmental and social factors.

Andreou et al. (2017) found that companies with younger CEOs have a higher possibility of stock price crash experiences. The authors suggest that younger CEOs of less experience due to their age are more likely to exploit opportunities associated with weak governance, in order to benefit their own interests. In general, their study suggests that CEO age is a crucial determinant of stock price crash risk.

Too summarize the results of the previous research presented above, it is difficult to find research that clearly provides a pure interpretation of the effect of ESG alone on stock performance. There are several research results indicating positive relationships between high ESG scores and performance, to varying levels of significance or lack of significance. One must keep in mind that the research questions and approaches differs between the presented studies, with different control variables, different markets and other factors that affect. Thus, the conclusion that we draw and that shapes our hypotheses, is that it is likely that companies with high ESG scores enjoy a positive effect from the

score on the return of their stocks. However, it is probable that this relationship is not statistically significant, and rather can have another explanation than just the fact that the ESG score is high.

3.2 Contribution to the research field

The fact that we are conducting the study on the Swedish market, where sustainability is of great importance, contributes with a new aspect to the existing research on the field. That we are looking at firms rather than funds also stands out in relation to previous studies regarding ESG performance. The specification of examining the relationship between ESG and stock performance specifically during Covid-19 adds a compelling aspect, since it is a contemporary crisis. Thus, it provides an opportunity to examine the role of sustainability today in relation to the financial market, when sustainability is of greater importance than it has been during prior critical market situations.

4. Data and Methodology

This section provides the reader with all the information regarding data and methodology needed to understand the analysis. The research approach will quickly be declared, followed by a detailed description of the raw data and how it is being processed into the variables that builds the final model. The section is closed by a discussion of the limitations of the methodology.

4.1 Research approach

The purpose of the study is to investigate if ESG rating affects the stock performance during the Covid-19 pandemic. To meet the purpose a quantitative research approach is used, which means that numerical values are measured and statistically described (Patel and Davidson, 2011). This is done by applying a panel data method to the data, where the variables of interest are built in the form of interaction dummy variables. The choice of dummy, rather than continuous variables, is made to capture the isolated effects during different time periods, enabling the researchers to compare results between firms of different qualities. The data is organized as panel data in order to be able to observe both common and individual characteristics of the observed firms. A hypothetical-deductive method is adopted, meaning that the hypotheses are formed based on existing theories and previous research (Patel and Davidson, 2011).

4.2 Data selection and collection

This section is meant to describe how the data is collected and organized, as well as the limitations of the data.

Source of data

The data is collected from Refinitiv Eikon, formerly known as the Thomson Reuters Eikon, that claims to be one of the world's biggest and most credible delivers of wide spectrum financial analysis data and news (Refinitiv, 2020). A more detailed motivation for using Refinitiv can be found in the section 4.3 *"Variables"*.

Time frame

Since the aim is to look at effects of ESG score in relation to the Covid-19 pandemic, the chosen time frame logically must include this period. The first case of Covid-19 was detected in Sweden on the 31st of January 2020 (Krisinformation.se, 2020). The end of the pandemic has not yet come in the writing of this study and can therefore not be observed. A period before the outbreak of Covid-19 is also included to serve as a control. Based on these arguments the selected observation period is dates between January 4 of 2019 until November 20 of 2020. The observations are made weekly on Fridays. The weeks observed are 99 in total, 52 in 2019 and 47 in 2020.

Market

Based on the argumentation described in the section 1.3 *"Choice of market"*, we are limiting the observation for Swedish firms listed on Nasdaq Stockholm.

Screening

The selection of companies is made through the Refinitiv Eikon Equity screener based on the available data of combined ESG scores. A screening is made for companies on the Swedish market with a result of 158 suitable companies.

Limitations

Due to missing values, 5 of the 158 companies are excluded from the study. Further, one additional company, Eniro AB, is excluded due to extreme values. After excluding these, a total of 152 companies are qualified for analysis, resulting in a total of 15,048 observations (152 firms * 99 weeks). A list of the firms used in the study as well as the excluded firms is provided in the appendix II.

4.3 Variables

In this section the variables included in the econometric model are presented.

4.3.1 Dependent Variable

The purpose of this study is to investigate if ESG score has had an impact on the stock performance during Covid-19. In order to study this from a performance perspective, the weekly stock return in each company is selected as the dependent variable. The weekly stock return is collected from Refinitiv Eikon and represents the percentual change in the closing price from one Friday to the next.

4.3.2 Variable of interest

The model is built aspiring to isolate the effect of a given ESG score on the stock return, in combination with a certain time period during the pandemic. The reason for this is that we find it plausible that ESG score has a significance not for all, but for some rating, and for some time period. In the section below we will describe how we have formed our variables of interest as interaction dummy variables built on both a time aspect and an ESG aspect. First, an explanation regarding the ESG part will be provided, followed by a part dedicated to the time period aspect. Last, we will combine these two components into the final interaction variables that are found in the regression model.

ESG score from Refinitiv Eikon

Refinitiv Eikon, earlier Thomson Reuters, have provided ESG scores for over 10,000 companies worldwide since 2002, using 450 ESG related variables to provide reliable data. They assure that the data collecting process is transparent and of the highest class, as well as that their ESG score is calculated in a way to minimize company transparency and size biases (Refinitiv, 2020). Refinitiv Eikon examine company reported data and divides the components of ESG into 10 subcategories to clarify the concept. This is shown in the table below. Note that the percentage is the weight the category has on the score.

Environment (44%)	Social (31%)	Governance (26%)
Resource use 15%	Work force 13%	Management 17%
Emissions 15%	Human rights 5%	Shareholders 5%
Innovations 13%	Community 9%	CRS strategy 3%
	Product responsibility 4%	

Source: Refinitiv 2020

Taking account of these factors, Refinitiv assigns the companies a combined ESG score on a numerical scale in 12 parts (from 0 to 100), which is also converted to a letter from D- to A+, where A+ is the highest score (Refinitiv, 2020).

ESG dummy variables

We are using dummy variables for the ESG score to be able to compare the differences between firms with different ESG scores. The ESG dummies used in the model are listed below:

ESGB: takes on the value 1 if the ESG score is level B (values between 50 and 75), and 0 otherwise.

ESGC: takes on the value 1 if the ESG score is level C (values between 25 and 50), and 0 otherwise.

ESGD: takes on the value 1 if the ESG score is level D (values between 0 and 25), and 0 otherwise.

The control group is firms of ESG score level A, the highest score (values between 75 and 100). We have chosen this as the control group since the companies rewarded with this score are generally big, stable companies that has been on the market for several years. The ESG dummies are presented in the model partly on their own as control variables, as well as parts of the interaction variables.

Table 1: Frequency of ESG score

Group	Firms	Percent
ESGA	11	7.24%
ESGB	61	40.13%
ESGC	67	44.08%
ESGD	13	8.55%
Total	152	100%

Table 1 shows the frequency of firms of the different ESG scores in our sample.

Time dummy variables on restrictions

Two time dummy variables are used to be able to observe the different periods of the pandemic. These variables are constructed based on the restrictions on the number of gathered people implemented by the Swedish government. We have chosen this approach since we find it plausible that the restriction dates are uncorrelated with the market movements, and therefore minimizing risk of endogeneity. Due to lack of time, we have chosen not to include observations later than November 20, 2020. Restriction500 takes on the value 1 for dates between 6 Mars 2020 until 20 Mars 2020, and 0 otherwise. This is the restriction on max 500 people gatherings. Restriction50 is activated between 27 Mars 2020 until 20 November 2020. Observations for dates prior to 6 Mars 2020 are the control group for the time dummies that make it possible to see if the returns have deviated during the periods of restrictions compared to a period before Covid-19. The time dummies, just like the ESG dummies, are presented partly on their own as control variables, as well as parts of the interaction variables.

Interaction variables for time and ESG score

Since the aim of the study is to analyze whether the ESG score has had an impact on the stock performance during Covid-19, the variables of interest are formed as interaction dummies in our regression model. The interaction is made between the ESG score dummy variables and the time dummy variables based on the social restrictions. The purpose of these interaction dummies is to examine the difference in return among the different levels of ESG ratings during the different time periods of interest. There are six interactions variables of this kind in the model. Two for each ESG score B, C and D based on the restrictions mentioned above. For example, Restriction500*ESGB is the interaction variable that is activated when observing a company of ESG level B during the 500 people restriction. The control group for the interaction dummy variables is firms of ESG score A, during the same period shown by the time dummy variable.

4.3.3 Control variables

To make a correct analysis of the impact of ESG score on the stock performance during Covid-19 several control variables are included in the model. These variables are collected from Refinitiv Eikon and are listed below.

Market return

For the market return control variable, we have chosen the OMXSPI. This index is also called Stockholm all-share and the index that represents all equities on the Stockholm exchange market. It is referred to as "Market Return" in the model. The theory of capital asset pricing model (CAPM) states that the systematic risk or market risk is the most important factor that determines the return of a firm. Based on this theory, we have included the OMXSPI value for the weeks observed as a control variable to adjust for market risk. If the beta coefficient is positive, this is interpreted as a positive marginal effect of market return on stock return in terms of percentage points.

Market Capitalization

The market capitalization, referred to as "log(Marketcap)" in the model, is defined as the total market value of a firm's outstanding shares (Chen reviewed by Scott, 2020). Fama and French (1993) found that it is of high relevance to add a size factor to the pricing model since it has been shown that small firms outperform big ones on a regular basis in terms of return. Based on their arguments we have included the market cap variable to adjust for this aspect. Refinitiv (2020) provides data on market cap computed as *sum of all company shares * closing price*. The market cap data is measured in SEK. In the regression it is replaced with its logged value to make the data behave more normally distributed, since we observe a greater mean than median of the market cap.

Price to book ratio

The price to book ratio, referred to as "Pricetobook" in the model, is given by dividing the company's latest closing price by its book value per share. Book value per share is calculated by dividing total equity from latest fiscal period by current total shares outstanding (Refinitiv, 2020). In other words, the price to book ratio reflects how the company's equity, measured as assets minus liabilities, is valued by the market. A price to book ratio that is high indicates an overpriced stock, while a low ratio indicates an undervalued one (McClure, 2020). The argument to add this variable as a control is based on the theory developed by Fama and French (1993). They added a value factor to their pricing model, since they found that value stocks in the long run outperforms growth stocks. This is traditionally measured by the book to market ratio, but due to lack of data we have used the price to book as a liable substitute. In the data set there is a considerably large number of observations with negative price to book ratio. This can occur if the firms have a negative book value, caused by greater liabilities than assets. It can also be an effect from buybacks or share repurchases (McClure, 2020).

Industry

We have included industry as a control variable since it is plausible to assume that different sectors are hit differently by a pandemic. For example, the airline industry will probably never be the same after Covid-19. Also, since we are looking at sustainability of firms it is logical to adjust for industry since there is great variability in ESG factors, especially environmental, between different sectors. The 10 industries included in this study are: Industrials, Consumer Discretionary, Health Care, Real Estate, Financials, Basic Materials, Consumer Staples, Technology, Telecommunications and Energy. In the regression model, the industry variables are set up as dummy variables, that take on the value 1 if the firm belongs to that sector, and 0 otherwise. Since there are 10 sectors, 9 dummy variables will be included in the regression model. The control group industry is Real Estate.

Table 2: Frequency of industry

Industry	Firms	Percent
Basic Materials	8	5.26%
Consumer Discretionary	30	19.74%
Consumer Staples	8	5.26%
Energy	1	0.66%
Financials	16	10.53%
Health Care	21	13.82%
Industrials	39	25.66%
Real Estate	18	11.84%
Technology	7	4.61%
Telecommunications	4	2.63%
Total	152	100%

Table 2 shows the frequency of firms of the different industries in our sample.

4.4 Econometric models

Panel data

To investigate if there is a relationship between ESG and stock performance during Covid-19 on the Swedish stock market, a balanced panel data set is gathered and used. In a balanced panel data set the same individuals, in our case companies, are observed repeatedly over time and multiple variables connected to this individual are measured. In other words, balanced panel data has both a cross-

sectional and a time-series dimension where the same individuals are observed during the whole time and no observations are missing (Brooks, 2019).

Panel data regression models

$$Panel\ model\ equation:\ y_{it} = \beta_0 + \beta_1 x_{it} + u_{it} \qquad (1)$$

This study uses panel data regression techniques to estimate the effect of ESG score on stock performance. There are three common models used for analyses of panel data. They are called Pooled OLS model, Fixed effects model and Random effects model. In panel data models the error term (u_{it}) is often divided, partly as individual effects that are considered fixed over time, and partly as remaining effects that varies over time and individual. The main difference between the three models is how the error term is considered (Wooldridge, 2018). The choice among which model to use for estimation depend on the goal of the analysis. Here follows a brief explanation of the three different methods, followed by a brief explanation of the main difference between the models. Which model that is going to be used for analysis is presented in section 5.2 *"Results and analysis"*.

Pooled OLS estimation model (POLS)

$$Pooled\ OLS\ model\ equation:\ y_{it} = \beta_0 + \beta_1 x_{it} + u_{it} \qquad (2)$$

Pooled OLS or pooled ordinary least squares (POLS) estimator is an OLS technique run on panel data. POLS is treating each row of observations in the dataset separately, ignoring the correlation that follows the use of panel data. In other words, the pooled OLS model ignores that fact that the data has individual and time dimensions that are creating correlations between the observations. This is not a problem if the variance in the unobserved fixed effects is in fact zero. The estimates that are estimated with POLS are assumed to be the same for all units. POLS also assume a constant intercept and slope regardless of the individual and time and stocks all the unobserved effects into one error term (Wooldridge, 2018).

Fixed effects estimation model (FE)

$$FE\ model\ equation:\ y_{it} - \bar{y}_i = \beta_1(x_{it} - \bar{x}_i) + u_{it} - \bar{u}_i\ ,\ \ u_{it} = \mu_i + v_{it} \qquad (3)$$

The fixed effects model considers that the error term u_{it} may have both individual fixed effects μ_i and remaining unobserved effects that vary over time and individual v_{it}. The individual fixed effects can

be anything connected to the firm that affects the dependent variable and does not change over time. The fixed effects model calculates a time mean of a cross-sectional object, in our case a company and subtract this mean value from the values of the variable. This process is called the "within transformation" and it partials out all the individual fixed effects and leaves behind stripped variables. This process allows the observed individuals to differ in their intercepts but keeps the slope constant between individuals. This means that if we are interested in effects that do not change over time the fixed effects model is not efficient since it does not estimate these variables but rather controls for them (Brooks, 2019).

Random effects estimation model (RE)

$$RE\ model\ equation\colon\ y_{it} = \alpha + \beta_1 x_{it} + \omega_{it}\ ,\ \omega_{it} = \epsilon_i + v_{it} \qquad (4)$$

The difference between the fixed effects model and the random effects model is that in the random effects model the individual intercept is assumed to appear from a common global intercept α plus a random variable ϵ_i. The common intercept is constant over all individuals and time and the random variable is constant over time but varies over individual. The random variable thus measures the random deviation in the intercept between the global intercept and the individual. This random variable comes with some assumptions, one of them is that it is independent of all the explanatory variables (Brooks, 2019).

Main difference between the models

The main difference between the three models is how the error term is managed. The pooled OLS model gathers all the unobserved effects into one specific error term and can thus be argued to be biased and inconsistent since it is omitting the time constant effects. The fixed effects model partial out the effect of all the individual fixed effects and allows for correlation between the error term and the explanatory variables. The random effects model handles the error term in a similar way as the fixed effects does, but instead of partial the individual constant effects out it includes them in the individual intercepts and does not allow the error term to be correlated with the regressors (Brooks, 2019).

It is appropriate when working with panel data to apply cluster-robust errors to account for serial correlation within a panel, to get the correct test statistics (Wooldridge, 2018). To get better estimations of the errors we will allow for some correlation between the error terms for the same company

observation and some cross-sectional correlation along industries by adding the option vce (cluster industry) to our regressions.

4.5 Presentation of the model

To test our hypotheses that higher ESG score has a positive effect on stock return during Covid-19, a model run through the three estimation models presented above is used. To run the regressions the statistical software program Stata for data science is used (Stata, 2020).

The model we use to test whether there is a positive causal relationship between higher ESG score and the weekly stock return is presented below. The model contains one dependent variable, six variables of interest and seventeen control variables. The variables are further described in section 4.3 *"Variables"*.

The Model

$$R_{i,t} = \beta_{0,i,t} + \beta_1 Marketreturn_{i,t} + \beta_2\, log(Marketcap)_{i,t} + \beta_{3,} Pricetobook_{i,t}$$
$$+ \beta_4 Restriction500_i + \beta_5 Restriction50_i + \beta_6 ESGB_i + \beta_7 ESGC_i + \beta_8 ESGD_i$$
$$+\beta_9 Restriction500_i * ESGB_i + \beta_{10} Restriction50_i * ESGB_i$$
$$+\beta_{11} Restriction500_i * ESGC_i + \beta_{12} Restriction50_i * ESGC_i + \beta_{13} Restriction500_i * ESGD_i$$
$$+ \beta_{14} Restriction50_i * ESGD_i + \sum_{i=1}^{9} \gamma_i Industrydummy_i + e_{i,t}$$

4.6 Methodology Discussion

This section is meant to raise awareness to the restrictions and limitations of this study. First a general discussion regarding weaknesses of the overall study is provided, followed by a more theoretical constructive discussion of the data and methodology.

4.6.1 General discussion

When conducting a quantitative study, it is important to emphasize the reliability and validity. A study has a high level of reliability if another researcher is able to reconstruct it under similar conditions and produce consistent results (Patel and Davidson, 2014). This study is entirely built on secondary data

from Refinitiv Eikon (formerly Thomson Reuters), which is and has been a global provider of financial data since 2008. To increase the reliability further, the aim is to describe and motivate all steps of the process carefully to make the study transparent. Validity is a measurement of the extent to which the study measures its purpose (Patel and Davidson, 2014). The variable of interest, ESG score, can cause a lack of general validity since it is, as described in the section 2.1 *"Sustainability"*, an ethical and therefore subjective measurement. There is a risk that the ESG score mainly reflects the ESG disclosure of the firms, rather than their actual performance on the sustainability field. As argued in the section 1.3 *"Choice of market"*, the hope is to reduce this risk by conducting the study on the Swedish market, where sustainability is strongly incorporated. Another criticism is that the 152 companies observed is a quite small share of the total of Swedish listed firms, and therefore the results may not reflect the Swedish market as a whole. However, the purpose of the study is to analyze ESG scores and therefore it would not be logical to include companies that do not obtain such ratings.

4.6.2 Data and methodology discussion

ESG data

The ESG score in the model is held constant, whereas the other variables are measured weekly. The reason for this is simply that we have not been able to obtain weekly data for the ESG scores. ESG scores from Refinitiv Eikon are updated every second week, but the previous values are not stored for common users to find. We believe that this matter does not affect the model considerably, since the values normally do not change much over a relatively short period as this study is conducted over. The ESG scores are given based on data mainly from the company's ESG disclosure in form of annual reports and CRS reports that are normally submitted yearly (Refinitiv, 2020). As mentioned in the section 2.1 "Sustainability", ESG is a subjective measurement and can differ depending on what database that is used for obtaining the data. To adjust for this, it could have been favorable to use ESG data from several sources for comparison. Anyhow, we have not seen previous researchers use several data sources for ESG scores and thus we believe that it should be sufficient to use Refinitiv Eikon.

Since the study uses ESG data from Refinitiv, it is leaving out Swedish companies that have not received an ESG score from this source. Smaller firms rarely obtain ESG scores, and due to this the whole sample used for this study is of bigger firms. The consequence of this is that the sample of the study differs from the whole population of Swedish firms and may therefore suffer from selection bias. It is also feasible to assume that firms who are actively working on their sustainability approach are

more transparent with their ESG disclosure. This may contribute further to selection bias. However, the aim of the study once again is to measure the effect of ESG on performance, and so it would be inappropriate to include companies that do not have an ESG score.

Covid-19

The choice of using Covid-19 pandemic as the period of interest can be questioned in various ways. First, the end of Covid-19 has not yet come during the writing of this study. Thus, it is impossible to include the whole scope of the crisis and therefore the results may had been different if the whole period could have been observed. Another critic for the chosen event is that the study only covers one critical market situation, and therefore cannot expect a general result for how ESG score affects the performance under such market conditions. This study is examining the effects of a sustainability measure. The interest in sustainability has grown and is still growing, not only in Sweden but all around the globe. Due to this we find it interesting to look at this related to the Corona crisis specifically, since it is a recent (ongoing) crisis.

Omitted variables

According to Brooks (2019) omitted variables bias occurs when a statistical model omits one or more relevant variables from the regression. The size of the bias indicates to which extent the estimated coefficient systematically deviates from the true value. The consequence of this bias can be that the estimated coefficients for all independent variables become biased and inconsistent, and thus make the predictions of the dependent variable biased (Brooks, 2014). Omitted variable bias can be reduced by adding more regressors. However, the regressors need to be relevant for the model. To avoid omitted variable bias all the independent variables chosen for the model are selected according to what previous research has found relevant. Yet, in the research process of deciding what variables to include there have been some limitations. Previous studies done on similar research questions have included control variables regarding the management and ownership structures of the companies. For example, age of the CEO has been found relevant for crash risk (Andreou et al., 2017). During the crisis management of the Covid-19 pandemic, the Swedish Government has provided support for certain companies both financially and politically (Finansdepartementet, 2020). This may affect the performance of the firms that have received this aid. Due to lack of time and insufficient data we have not considered these aspects.

Causality

In statistics causal inference is the process of drawing a conclusion regarding a causal relationship between the variable of interest and the dependent variable. It can be difficult to assure what variable is affecting the other. Reverse causality occurs if the dependent variable does not depend on the variable of interest, but rather an inverse relationship takes place (Brooks, 2014). The purpose of this study is to examine whether high ESG rating has a positive effect on stock return. It might be so that high stock return indicates a prosperous company that can afford to engage in sustainability related matters, and therefore obtain a high ESG score.

5. Results and analysis

5.1 Descriptive statistics

Table 3 present descriptive statistics of the 15,048 observations for the 152 companies observed. The data was collected on 27 November 2020, and the observed period accounts for Fridays between January 4 of 2019 and November 20 of 2020. The mean ESG score is 48.62 points, representing the level C. The mean market cap is around 42,024 million SEK which represent a large cap level. The price to book ratio is on average 4.119, indicating that the stocks of the firms are overpriced on average. The average weekly stock return is approximately 0.6% and the mean market return is around 0.4% during the period.

Table 3: Descriptive statistics

VARIABLES	Obs	Mean	Std. Dev.	Min	Max
Company Return	15048	0.006	0.061	-0.512	0.783
Market Return	15048	0.004	0.032	-0.171	0.08
ESG Score	15048	48.62	17.52	2.300	90.43
Price to Book	15048	4.119	6.651	-76.27	61.88
Market Capitalization*	15048	42,024	69,179	367.8	526,624

*Market Capitalization in million SEK

Table 4 present statistics based on ESG level for the observed companies. The mean ESG score of the companies of ESG level A is 81.128 while the mean ESG score of the firms of ESG level D is 15.479. The difference between the mean of the ESG score are about 20 points from one level to the next. The mean of market cap is descending, meaning that the largest companies belong to group ESGA and the

smallest to group ESGD. The mean market cap of all four ESG groups represent a size of a large market cap company. The average market cap of a company of ESGD is about 20% of the average market cap of a company of ESGA. Hence, all the observed companies are considered large companies, yet there is a considerably large difference between them. For the price to book ratio the pattern is the opposite. The mean of the ESGA group is the smallest and the mean of the ESGD group is the largest. Price to book ratio is in other words increasing the lower the ESG score gets. For the ESGD group the mean of price to book ratio is 9.097, indicating that for the ESGD firms the stock price is about 9 times bigger than the book value per stock, on average. The highest average weekly company return together with the largest standard deviation in relation to the return are found in the ESGD group, where the average return is about 1%. The ESGB group has the lowest average company return with approximately 0.4%.

Table 4: ESG group statistics

	Obs	Mean	Std. Dev.	Min	Max
ESGA FIRMS					
Company Return	1089	0.005	0.051	-0.265	0.293
Market Return	1089	0.004	0.032	-0.171	0.08
ESG Score	1089	81.128	4.121	76.516	90.429
Price to Book	1089	1.531	5.382	-19.899	9.585
Market Capitalization*	1089	92,668	110,112	3,545	526,623
ESGB FIRMS					
Company Return	6039	0.004	0.06	-0.512	0.783
Market Return	6039	0.004	0.032	-0.171	0.08
ESG Score	6039	60.27	6.089	50.226	72.678
Price to Book	6039	2.837	5.33	-76.274	37.721
Market Capitalization*	6039	57,177	80,371	1,351	458,273
ESGC FIRMS					
Company Return	6633	0.006	0.063	-0.389	0.59
Market Return	6633	0.004	0.032	-0.171	0.08
ESG Score	6633	39.107	6.985	25.05	49.823
Price to Book	6633	4.745	5.6	0.321	40.913
Market Capitalization*	6633	24,536	42,72	1,028	309,151
ESGD FIRMS					
Company Return	1287	0.01	0.065	-0.324	0.781
Market Return	1287	0.004	0.032	-0.171	0.08
ESG Score	1287	15.479	7.264	2.3	22.782
Price to Book	1287	9.097	12.561	0.505	61.877
Market Capitalization*	1287	18,201	24,557	368	139,166

*Market Capitalization in million SEK

Table 5 shows the correlation between the explanatory variables. ESG score is positively correlated to market cap, indicating that the bigger the company the higher the ESG score. There is a negative correlation between ESG score and Price to book. These results are consistent with the statistics presented above.

Table 5: Correlation between regressors

	Market Return	Market Cap*	Price to Book	ESG Score
Market Return	1.000			
Market Cap*	0.01	1.000		
Price to Book	0.008	-0.076	1.000	
ESG Score	-0.000	0.319	-0.291	1.000

*Market Capitalization in million SEK

5.2 Results from regression

Table 6 shows the most relevant results of the estimation regressions from the three different panel data models presented in section 4.4 *"Econometric models"*. The Hausman test and LM test are provided to examine which model is the most appropriate for further analysis. The estimated coefficients of the industry dummies can be found in the appendix II.

Table 6: Regression results

VARIABLES	Pooled OLS (1)	Fixed Effects (2)	Random Effects (3)
Market Return	1.007***	1.008***	1.007***
	(20.59)	(20.65)	(20.59)
Market Capitalization (log)	0.001***	0.019***	0.001***
	(5.49)	(6.99)	(5.49)
Price to Book	0.000**	0.000	0.000***
	(2.89)	(0.64)	(2.89)
ESGB	0.001		0.001
	(0.39)		(0.39)
ESGC	0.002		0.002
	(1.39)		(1.39)
ESGD	0.007**		0.007***
	(2.93)		(2.93)
Restriction500	-0.011	-0.008	-0.011
	(-0.94)	(-0.70)	(-0.94)
Restriction50	0.002	0.002	0.002
	(0.77)	(0.49)	(0.77)
Restriction500*ESGB	-0.008	-0.008	-0.008
	(-0.62)	(-0.60)	(-0.62)
Restriction50*ESGB	-0.001	-0.000	-0.001
	(-0.62)	(-0.06)	(-0.62)
Restriction500*ESGC	-0.005	-0.005	-0.005
	(-0.28)	(-0.31)	(-0.28)
Restriction50*ESGC	0.003	0.002	0.003
	(1.56)	(0.51)	(1.56)
Restriction500*ESGD	-0.005	-0.010	-0.005
	(-0.32)	(-0.55)	(-0.32)
Restriction50*ESGD	-0.007**	-0.012***	-0.007***
	(-2.91)	(-3.56)	(-2.91)
Constant	-0.032***	-0.437***	-0.032***
	(-5.98)	(-7.08)	(-5.98)

Observations	15,048	15,048	15,048
Adjusted R-square	0.315	0.319	
Number of id		152	152
Industry dummy	YES	NO	YES
Hausman test		P-value = 0.00***	
LM test		P-value = 1.00	

t - values in parenthesis in regression (1) and (2)
z - values in parenthesis in regression (3)
*** p<0.01, ** p<0.05, * p<0.1

LM and Hausman tests

A Breusch and Pagan Lagrangian multiplier (LM) test for random effects is conducted to investigate whether a random effects model or a pooled OLS model is preferred. The null hypothesis state that the variance in the random effects models error term is zero and thus all individuals have the same intercept and a pooled OLS should be used. We conduct a LM-test and the results come back with a p-value at 1.000 indication that the variance in the error term in the random effects model is zero and a pooled OLS model should be used.

A Hausman test is used to test whether a fixed effects model or a random effects model is preferred. The null hypothesis is that a random effects model is favored and that there is no correlation between the error term and the regressors. When we run the Hausman test it rejects with a p-value at 0.000, indicating that there is correlation between our error term and our explanatory variables. Thus, a fixed effects model is preferred. However, a fixed effects model will not fit the purpose of this study in any case since the ESG scores are provided yearly, and thus are included as a fixed effect in the model. This means that the coefficients we are trying to estimate are partial out and cannot be interpreted through an estimator (Wooldridge, 2018). Hence, an estimation through a fixed effect model can be ruled out as a suitable method for analyzing the hypotheses.

Based on these test results the conclusion is that a pooled OLS estimation is the most favorable method for analyzing the hypothesis.

Bias of pooled OLS

To check for the nature of the biases that can appear because of the conduction of the error term in the pooled OLS model we compute estimates for all three panel models presented in section 4.4 *"Econometric models"* and compare the results. The conclusion is that the pooled OLS seems to be a little bit upward biased when it comes to our variables of interest.

Adjusted R^2

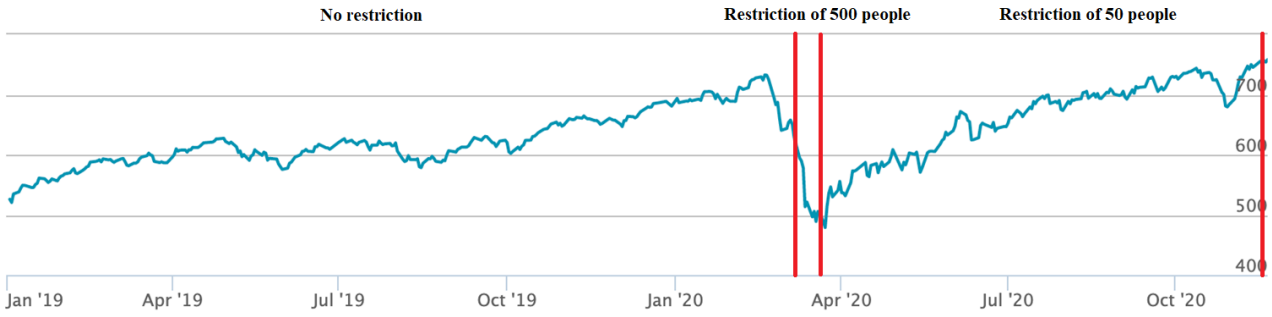
Wooldridge (2018) describes the determination coefficient R^2 as a ratio of the deviation explained in the model compared to the total deviation in the dependent variable. The ordinary R^2 tends to increase in value as variables are increasing, regardless whether if the variable is a good addition to the model or not. Thus, this study uses the adjusted R^2 as a measurement of goodness-of-fit. The adjusted R^2 imposes a penalty for adding additional explanatory variables and solely increases if the explanatory variables affect the dependent variable (Wooldridge, 2018). In regression (1), the pooled OLS regression result in an adjusted R-squared of 0.315. This is interpreted as that 31.5% of the variation in our dependent variable is explained by the model.

5.3 Interpretation of the results

Recall that the purpose of the study is to examine if ESG rating has had an impact on the performance of Swedish stocks during the Covid-19 pandemic. The two hypotheses are that a higher ESG rating will have a positive effect on stock return in Sweden. The first hypothesis applies to the first social restriction of 500 people and the second hypothesis applies to the social restriction of 50 people.

When analyzing the results of our regression it makes sense to look at the financial climate during the observed time period. In terms of OMXSPI, the Swedish market decreased radically during the weeks of the 500 people restriction (lasting between 6 and 20 of Mars 2020). It hit the lowest point on Mars 23, 2020, when the market had lost about 34.6 percent since the all-time high on February 19, 2020. During the weeks of 50 people restriction (from Mars 27, 2020 until November 20, 2020), the Swedish market recovered and was restored to the February level in the beginning of October. The graph below shows the OMXSPI during the observed period. The red lines indicate the periods of restrictions.

Figure 1: OMXSPI market movements



Source: Nasdaq OMX Nordic 2020

Below follows interpretations of the results and short analyses of the variables in regression (1), the pooled OLS regression. The most important results related to the variables of interest are presented first, followed by a brief presentation of the control variables. To keep in mind is that all these interpretations is under the assumption of ceteris paribus. The results presented are all in relationship to the dependent variable weekly stock return.

Variables of interest

As can be seen in the table above the constant in regression (1) is negative. It takes on a value of -0.032 and is significant at the 1% significance level. This constant represents the predicted value of the base case, which is when we observe ESG level A firms during the control period of no restrictions. The estimated coefficient of -0.032 indicates that the intercept of the regression line for the base case is negative and starting at -3.2% in expected weekly stock return.

Table 6 shows that the dummy variable “Restriction500” has a predicted coefficient of -0.011. The negative value indicates that the stock return on average is lower during this period compared to the control period. This makes sense since the market is declining rapidly during this period (see figure 1). The coefficient for the dummy variable “Restriction 50” is 0.002. The fact that it is a positive coefficient is logical since the market is increasing during this period. However, neither of the coefficients for the restriction dummy variables are showing statistical significance at any significant level. Due to this there is no evidence that the weekly stock return is affected solely by the fact that there is a restriction.

Recall that the control group for the ESG dummy variables is companies of ESG level A, that is the highest score. As can be seen in table 6 the dummy variables ESGB and ESGC shows no statistical significance at any significant level. This implies that there is no evidence indicating a general difference in the average return between firms belonging to ESGB or ESGC in relation to firms belonging to ESGA. What is interesting about the data in table 6 is the estimated coefficient on the variable ESGD. It is taking on a positive value of 0.007 and is significant at the 5% level. Adding this coefficient value to the constant gives -0.032 + 0.007 = -0.025. This indicates that the firms belonging to ESGD on average are preforming better than ESG level A firms in terms of weekly stock return. In fact, the estimate on 0.007 indicates that the weekly stock return for ESG level D firms is 0.7% higher on average compared to the companies belonging to ESG level A. This could be interpreted as a shift in the intercept from -3.2% to -2.5% in expected weekly stock return going from ESG level A to level D. This result is not in relation to any restriction time period, rather it accounts for the whole sample period.

Now let us turn to our main variables of interest in this study, the 6 interaction variables. The only interaction variable that shows significance is the "Restriction50*ESGD", which estimated coefficient is -0.007 and is significant at the 5% level. The coefficient -0.007 indicates that the ESG level D companies on average have a 0.7% lower weekly stock return than the ESG level A companies during the 50 people restriction period. The fact that the coefficient on the interaction variable "Restriction50*ESGD" is negative is supported by the second hypothesis. Adding this coefficient value to the constant together with the values of the main dummies of ESGD and Restriction50 gives –0.032 + 0.007 + 0.002 - 0.007 = -0.03. This is the intercept of the weekly stock return of ESGD firms during the restriction 50 period. During the control period ESGD stock return has an intercept of -0.032 + 0.007 = -0.025. During the restriction 50 period the intercept for ESGD firms is hence 0.5% lower than for the control period. Turning to the rest of the interaction variables all coefficients take on negative values except for "Restriction50*ESGC". The interpretation of this is that compared to companies of ESG level A, all other observed companies tend to perform worse on average during the restriction periods of Covid-19 pandemic. These results are in line with both hypotheses. However, as mentioned above there is no significance for any of the interaction variables except for "Restriction50*ESGD", thus there is no evidence that the observed relationships are causal.

Control variables

As shown in table 6 “Market Return” and “Market Capitalization (log)” are affecting our dependent variable “Company Return" at the 1% significance level in the pooled OLS regression (1). "Price to Book” is affecting the dependent variable at the 5% significance level. This is consistent with the Fama and French theory. The effects of “Market Capitalization (log)" and “Price to Book” on the return are expected to be positive but small. The expected effect of “Market Return” is the biggest of the three, with an expected positive value of 1.007, indicating that if the market return rises 1%, the average stock return among the ESG firms is expected to increase by 1.007 percentage points at the 1% significance level.

The industry dummy variables are not shown in table 6 but can be found in appendix II. The coefficients of these variables should be interpreted as the general difference in the intercept on average return between the industries and the baseline intercept of the control group Real Estate. The results indicate that most of the estimated coefficients of the industry variables are taking on negative values, and only three are showing signs of significance at any level.

5.4 Discussion of the results

Based on the results presented above, the conclusion is that the first hypothesis for the restriction of 500 people fails, while the second hypothesis for the restriction of 50 people is confirmed for the ESGD firms.

The results related to the variables associated to companies of ESG level D are the only results that show significance at any significance level. The firms belonging to this group are the smallest, most volatile and has the highest price to book ratings on average among our observation groups. This indicates that this companies may be growth companies. In comparison, the ESGA companies are bigger, more stable value firms that might be better corporate governed, and thus are less risky. This could be the reason why we see a significant difference between ESG level A and ESG level D companies during the restriction 50 period, since the ESG level D companies are more volatile and thus should generate a higher weekly return. This goes in line with the efficient market hypothesis. However, the result is only significant for the second hypothesis where the stricter restriction period of 50 people is analyzed. A question to be asked is why we are not seeing a significant difference between ESG level A firms and ESG level D firms during the restriction of 500 people. An explanation could be that during the first weeks of the pandemic progress in Sweden, the investors did not expect

the consequences to the market to be severe on the long run, and therefor chose to not sell their riskier assets that had generated higher return in the past. Then, when the 50 people restriction hit people maybe realized that the pandemic would be sustained, and thus maybe more volatile stocks were sold. Another explanation could be that the first restriction on 500 people was not hard enough to affect the financial markets. Also, it lasted for a relatively short period of around three weeks. The market was volatile and fluctuating during this period, which could lead to a lack of trustworthy data to conclude if there was a significant difference among the groups during the first restriction.

If we compare the results of this study to the findings of previous research, our results are similar to the ones of Broadstock et al. (2020), who found evidence on the Chinese market that portfolios of high ESG rating on average outperform low rated ones during the first months of the Covid-19 pandemic. Broadstock et al. (2020) claimed that ESG performance is more influential for investors in China during volatile market situations than during normal times. Our findings show that there is a significant negative relationship between a low ESG score and a company's stock return during the second restriction of 50 people where the market is fluctuating. However, the relationship was not significant for the first restriction period when the market was fluctuating even more, hence the results are just partly similar. Nofsinger and Varma (2014), who compared socially responsible mutual funds to conventional ones during times of financial crisis in the U.S., found similar results as the ones of Broadstock et al. (2020). Their findings showed that the socially responsible funds outperformed the conventional funds during volatile situations but underperformed during non-crisis times. Nofsinger and Varma (2014) argue that some investors can accept the asymmetric performance of the sustainable funds since their priority lay in the gain during volatile markets rather than the loss during less volatile markets. This could be one of the reasons why we see a significant difference between ESG level A and ESG level D companies during the 50-restriction. Investors are likely to seek stability in times of fluctuating markets and thus maybe accumulate their ownings in other assets that are less volatile, for example firms in the ESGA group. Buchanan et al. (2018) examined the effects on firm value of CSR combined with institutional ownership in the time of the 2008 financial crisis. The results of Buchanan et al. (2018) are contradicting the ones of Broadstock et al. (2020) and Nofsinger and Varma (2014), and hence also the results of this study. Buchanan et al. (2018) examined the combined effect of CSR and institutional ownership on firm value around the financial crisis of 2008. Their findings were that sustainable firms were valued higher relative to the benchmark before the crisis. Yet, they lost more value during the crisis in comparison to the benchmark. However, their results of the effect of CSR

are in combination with the effect of institutional ownership, which is an aspect that we have not examined. This could be the reason that the results differ. Zhang (2019) stated that companies that focus on environmental and social aspects will gain profit maximization in the long run, and hence outperform companies that has a short-term shareholder perspective that does not necessarily account for sustainability factors. This claim partly goes in line with our findings, since we find that the ESGD firms, that are the ones with the lowest rating of sustainability, are performing worse during the observed period.

To get a better understanding of the impact of ESG rating during the pandemic, there are other control variables that would be of interest to examine, but that have been left out in this study. ESG disclosure for example is a factor that could be relevant for the research. The ESG disclosure is related to how transparent the companies are towards stakeholders regarding their sustainability approach. Fatemi et al. (2017) found that the ESG score is affected by the ESG disclosure, and that this effect is different between different rating levels. However, ESG is a subjective measurement and there is yet no standardized framework for how it should be reported by the companies. Thus, it is difficult to measure ESG disclosure in a reliable way. Another aspect that could have been of relevance for the study is the management of the companies. As mentioned previously, the age of the CEO for example has been proven to influence crash risk (Andreou et al., 2017), and would hence maybe have changed the results if added to the model. It is plausible to assume that the smaller companies in the group ESG level D have younger CEO's, and that the difference we see could be affected due to this circumstance.

To improve the reliability of the study it would be preferable to use weekly or daily data on ESG score, in order to be able to run it as a continuous variable. It would also be desirable to compare the ESG rated companies with equivalent companies without sustainability scores to make a clearer statement about the effect of the score during Covid-19. Since the data required for making such improvements is difficult to obtain, as discussed earlier in section 4.6 *"Methodology Discussion"*, it has been left out. Another interesting application would be to expand the scope of the study to cover the even stricter restriction on 8 people that was decided on November 24 of 2020. Recall that during the writing of this study the Covid-19 pandemic is still in full bloom and thus we have not had the possibilities to examine the full event.

6. Conclusion

The purpose of this study is to investigate if ESG rating influence stock return on the Swedish market during the Covid-19 pandemic. The Swedish market is chosen since it has an integrated sustainability awareness, and thus should be well suited for sustainability related analyses. A panel data analysis is conducted, and the data is collected using Refinitiv Eikon on 152 companies listed on Nasdaq Stockholm with available ESG score.

During the advance of the Covid-19 pandemic, the Swedish government has issued social restrictions, first of 500 people and later of 50 people. These restrictions are used to divide the observed time period in order to examine the relationship between ESG value and stock return during different parts of the pandemic. The variable of interest ESG score is examined first as dummy variables grouped on the ESG level. Secondly, the ESG score is interacted with the two restriction periods in order to observe differences in the relationships. These interaction variables are the main variables of interest of the study. Based on the asset pricing theory of CAPM together with Fama and French several control variables are used in order to optimize the legitimacy of the results. The regression is also controlled for the influence of industry affiliation.

Two hypotheses are formulated. The first hypothesis stated that companies of high ESG rating should perform better during the first social restriction period of 500 people. The conclusion is that the first hypothesis is rejected, since no significant relationships are found between the ESG rating of the observed companies and their stock return during the first restriction period. Thus, the outcome for the first restriction period is not in line with the first hypothesis. The second hypothesis declare that companies with a high ESG rating should perform better during the second restriction period of 50 people. During this period the intercept in expected weekly stock return for ESGD firms is according to the study 0.5% lower than for the control period. During the same restriction period the intercept for ESGA firms is 0.2% higher than for the control period. This indicates that the ESGA firms are performing better during this period. The second hypothesis is confirmed since the results of the study show, on a 5% significance level, that the companies of the lowest ESG level D on average perform worse, than the companies of the highest ESG level A, during the second restriction period of 50 people. One possible explanation for that significance is shown only for the firms of the lowest ESG score could be that these firms are more likely to be growth companies that are more volatile and thus traded more when the market is fluctuating. A possible explanation for that significance is shown only

for the second restriction period could be that it is stricter and longer lasting than the first restriction period.

One of the two hypotheses about a positive relationship between a high ESG score and stock return is confirmed. Thus, the conclusion is that there is some evidence that ESG as a measure of sustainability has had an impact on the stock return in Sweden during Covid-19. It would be interesting for future research to further the analysis by accounting for the whole scope of the pandemic, or other future critical market events, to find out if sustainability and ESG score will be of growing importance for the financial sector.

7. References

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8. Appendix

Appendix I, List of firms and firms excluded

The five companies marked in light grey in the list below has been excluded because of missing values. Eniro AB is marked in darker grey and has been excluded based on extreme values that did not have a connection with Covid-19.

ESGA - Firms
Alfa Laval AB
Atlas Copco AB
BillerudKorsnas AB (publ)
Boliden AB
Castellum AB
Elekta AB (publ)
Granges AB
Husqvarna AB
JM AB
Sandvik AB
Swedish Match AB

ESGB - Firms
AAK AB (publ)
AF Poyry AB
Assa Abloy AB
Attendo AB (publ)
Autoliv Inc
Axfood AB
Biotage AB
Bonava AB (publ)
Bravida Holding AB
Dustin Group AB
Electrolux AB
Epiroc AB
Essity AB (publ)
Fabege AB
Getinge AB
Gunnebo AB
HMS Networks AB
Hexpol AB
Holmen AB
Hufvudstaden AB
ICA Gruppen AB
Investor AB

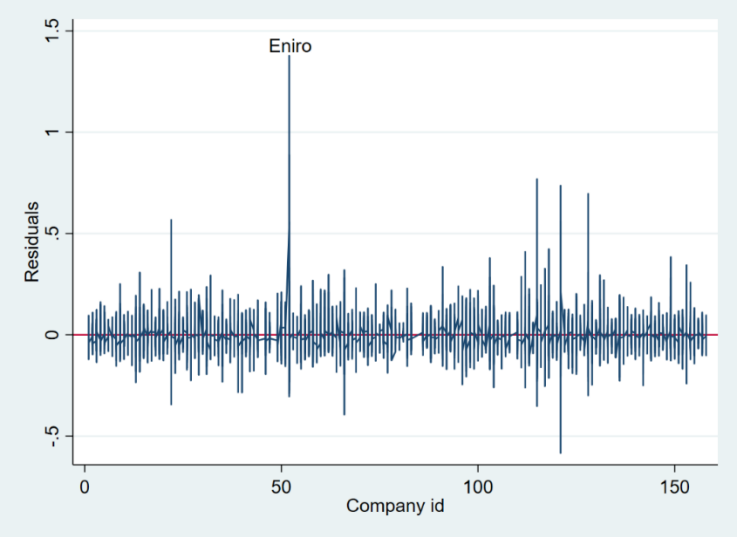
ESGC - Firms
AB SKF
AcadeMedia AB
Addtech AB
Alimak Group AB (publ)
Ambea AB (publ)
Arjo AB (publ)
Atrium Ljungberg AB
Avanza Bank Holding AB
Beijer Ref AB (publ)
Bergman & Beving AB
Betsson AB
Bilia AB
BioArctic AB
Biogaia AB
Boozt AB
Bufab AB (publ)
Camurus AB
Catena AB
CellaVision AB
Cloetta AB
Collector AB
Dios Fastigheter AB
Electrolux Professional publ AB
Eltel AB
Embracer Group AB
Eniro AB
Evolution Gaming Group AB (publ)
Fastighets AB Balder
Fingerprint Cards AB
H & M Hennes & Mauritz AB
Haldex AB
Hansa Biopharma AB
Hexagon AB
Hoist Finance AB (publ)
Humana AB

Inwido AB (publ)
Kungsleden AB
Lindab International AB
Lundin Energy AB
MIPS AB
Mekonomen AB
Modern Times Group MTG AB
NCC AB
Nibe Industrier AB
Nobia AB
Nobina AB (publ)
Nolato AB
Nordic Entertainment Group AB
Nyfosa AB
Pandox AB
Ratos AB
Recipharm AB (publ)
SAS AB
SSAB AB
Saab AB
Scandic Hotels Group AB
Securitas AB
Skandinaviska Enskilda Banken AB
Skanska AB
Svenska Cellulosa SCA AB
Svenska Handelsbanken AB
Swedish Orphan Biovitrum AB (publ)
Tele2 AB
Telefonaktiebolaget LM Ericsson
Telia Company AB
Thule Group AB
Tobii AB
Trelleborg AB
Vitrolife AB
Volvo AB
Wallenstam AB
Wihlborgs Fastigheter AB
Industrivarden AB
Indutrade AB
Instalco AB
Intrum AB
Karo Pharma AB
Kinnevik AB
L E Lundbergforetagen AB (publ)
LeoVegas AB (publ)
Loomis AB
Munters Group AB
Mycronic AB (publ)
Nederman Holding AB
NetEnt AB (publ)
New Wave Group AB
Oncopeptides AB
Paradox Interactive AB (publ)
Peab AB
Probi AB
RaySearch Laboratories AB (publ)
Resurs Holding AB (publ)
Sagax AB
Samhallsbyggnadsbolaget I Norden AB
Scandi Standard AB (publ)
Sectra AB
Sedana Medical AB (publ)
Stillfront Group AB (publ)
Sweco AB (publ)
Swedbank AB
Troax Group AB (publ)
VBG Group AB (publ)
Veoneer Inc
Volati AB

ESGD - Firms

Bure Equity AB
CTT Systems AB
Cibus Nordic Real Estate AB (publ)
Fortnox AB
Investment AB Latour
Investment Oresund AB
John Mattson Fastighetsforetagen publ AB
K-Fast Holding AB
Klovern AB
Lifco AB (publ)

Powercell Sweden AB (publ)
Sinch AB (publ)
SkiStar AB
Storytel AB (publ)
Svedbergs i Dalstorp AB



Appendix II, Full estimation regressions

VARIABLES	Pooled OLS (1)	Fixed Effects (2)	Random Effects (3)
Market Return	1.007***	1.008***	1.007***
	(20.59)	(20.65)	(20.59)
Market Capitalization (log)	0.001***	0.019***	0.001***
	(5.49)	(6.99)	(5.49)
Price to Book	0.000**	0.000	0.000***
	(2.89)	(0.64)	(2.89)
ESGB	0.001		0.001
	(0.39)		(0.39)
ESGC	0.002		0.002
	(1.39)		(1.39)
ESGD	0.007**		0.007***
	(2.93)		(2.93)
Restriction500	-0.011	-0.008	-0.011
	(-0.94)	(-0.70)	(-0.94)
Restriction50	0.002	0.002	0.002
	(0.77)	(0.49)	(0.77)
Restriction500*ESGB	-0.008	-0.008	-0.008
	(-0.62)	(-0.60)	(-0.62)
Restriction50*ESGB	-0.001	-0.000	-0.001
	(-0.62)	(-0.06)	(-0.62)
Restriction500*ESGC	-0.005	-0.005	-0.005
	(-0.28)	(-0.31)	(-0.28)
Restriction50*ESGC	0.003	0.002	0.003
	(1.56)	(0.51)	(1.56)
Restriction500*ESGD	-0.005	-0.010	-0.005
	(-0.32)	(-0.55)	(-0.32)
Restriction50*ESGD	-0.007**	-0.012***	-0.007***
	(-2.91)	(-3.56)	(-2.91)
Basic Materials	-0.001		-0.001*
	(-1.77)		(-1.77)
Consumer Discretionary	-0.000		-0.000
	(-0.19)		(-0.19)
Consumer Staples	-0.003***		-0.003***
	(-13.31)		(-13.31)
Energy	0.002		0.002
	(1.02)		(1.02)

Financials	-0.003***		-0.003***
	(-23.70)		(-23.70)
Health Care	-0.003*		-0.003**
	(-2.18)		(-2.18)
Industrials	-0.000		-0.000
	(-0.97)		(-0.97)
Technology	0.002		0.002*
	(1.69)		(1.69)
Telecommunications	-0.004***		-0.004***
	(-9.17)		(-9.17)
Constant	-0.032***	-0.437***	-0.032***
	(-5.98)	(-7.08)	(-5.98)
Observations	15,048	15,048	15,048
Adjusted R-square	0.315	0.319	
Number of id		152	152
Industry dummy	YES	NO	YES
Hausman test		P-value = 0.00***	
LM test		P-value = 1.00	

t - values in parenthesis in regression (1) and (2)
z - values in parenthesis in regression (3)
*** p<0.01, ** p<0.05, * p<0.1