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EFI303

Is there a trade-off between economic return and ESG rating?

A study of publicly traded companies in Sweden

Bachelor thesis 15 credits

Anton Bornlid

Alexander Eriksson

Supervisor: Charles Nadeau

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Abstract

ESG scores have during the last 15 years been used to categorize firms by rating according to environmental, social and governance aspects. Earlier research looking at performance and ESG indicates various results for different markets, publishing dates and time frames. In this study 60 Swedish firms with an ESG rating at the start of the time frame, 2017, were divided into two portfolios, High ESG and Low ESG. Weekly returns were collected during a five-year period and used as a dependent variable when regressions were made with the four Carhart factors as independent variables. Results showed that the Low ESG outperformed High ESG but were also more volatile. None of the portfolios could be proven to beat the Swedish index market due to lack of statistical power. Graphs of the risk-adjusted cumulative returns showed that the Low ESG portfolio reached the lowest point during the beginning of Covid-19 but also the highest point a year later. The discussion interpreting the results concluded that there is a trade-off between economic return and ESG rating for Swedish companies during the time period.

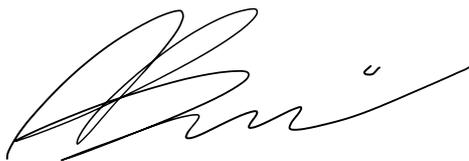
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Anton Bornlid



Alexander Eriksson

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1. Background

Investing in ESG is an investing form that prioritizes sustainability in the three different pillars. The more traditional way of investing and analyzing companies includes key figures, liquidity, revenues, etc. ESG investing is an extension of the traditional way since it also considers the environment, human rights, wellbeing, and financial sustainability (ADEC Innovations, 2022) to the equation. This way of analyzing firms has lately become a rapidly growing trend as investors and organizations become more aware of social, environmental, and economic threats and issues (Daugaard, 2019). The natural consequence of a more sustainably thinking population is that the demand for sustainable firms to invest in is increasing. The companies need to adjust to meet the demand, but changing supply chains, finding more sustainable suppliers, and contributing to the local society could be costly. There are obviously more aspects to consider than the financial aspect when deciding to what extent a company decides to focus on sustainability, but the question of whether it is financially profitable to be sustainable still exists.

ESG stands for *Environmental, Social & Governance* and each pillar is affected by different factors. There is no official list of what factors are included in each part, but Refinitiv (2022) have listed examples of what they include in each pillar (Appendix A). In general, *Environmental* explains how a company or government is contributing to climate change in different ways such as greenhouse gas emissions, along with waste management and energy efficiency. *Social* focuses on the health and safety of everyone involved in a company including all stakeholders, and how well integrated the company is with its local community. *Governance* is referring to rules and principles between different stakeholders in the governance of corporations. According to Robeco (2022) a company has succeeded with *Governance* when there is a balance between all stakeholder's interests.

There are many companies aiming to reach a high ESG score, for different reasons. One of the reasons is that consumers prefer to buy from sustainable companies (SmartestEnergy, 2015), but also because they feel responsible to support the United Nation's Sustainable Development Goals since the company itself and others possibly will suffer if they do not. The United Nation's 13th goal is to "Take urgent action to combat climate change and its impact". Not only do individuals suffer from climate change, but companies and organizations also face risks where assets can be damaged by extreme weather conditions, supply chains can be disturbed, and political policies can raise prices on necessary

components (e.g., oil). The United Nation's 5th goal is to "Achieve gender equality and empower all women and girls" and their 10th goal is to "Reduce inequality within and among countries" (United Nations, 2022). A company that is, consciously or unconsciously, not giving people of a different gender or race the same opportunities are risking not to exploit the company's full capacity, hence could deselected maximum profit.

2. Problem Discussion and Purpose

2.1. Problem Discussion

As sustainability is more incorporated and important in the daily average life than ever before, it's no surprise that firms incorporate ESG as well. According to CFA institute (2022) sustainable investing can be seen as a part of the evolution of investing. There is a growing recognition among industry participants that some ESG factors are economic factors, and therefore, important to incorporate material ESG factors such as worker safety and board diversity. Sweden is one of the most sustainable countries in the world and was the most sustainable country in 2020 (Mulhern, 2020). Sweden, as a therefore guiding polestar when discussing sustainability and green countries, is a result of ESG factors implemented from small firms to governmental level and multinational listed firms based in Sweden.

Milton Friedman, who received the Nobel Memorial Prize in Economic Sciences 1976, wrote about the Shareholder's Theory in an article that New York Times published 1970:

There is one and only one social responsibility of business - to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception fraud. (Friedman, 1970).

Has the strong focus on sustainability shifted focus from what the publicly traded companies traditionally were supposed to do, maximize the shareholder's value by generating profit? Or is the wide implementation of ESG actually contributing to firm's profitability? 50 years later, the world has clearly changed but the core idea of firms and businesses striving for profit still remains. However, our study is not only focusing on expected return, but we will also examine Swedish firms to see if they sacrifice profit to reach a high ESG rating. The aspect of social responsibility has another significance today along with the added environmental and governance aspect that forms ESG as we know it today. In this thesis we would like to investigate if this theory is outdated as time has passed, to see if there is a trade-off between expected return and sustainability or if the new take on sustainability adds to the economic return.

2.2. Purpose and Hypothesis

To make a small contribution to the field of sustainability investing and understanding of ESG, the purpose of this thesis is to examine how Swedish publicly traded firms with various ESG ratings have performed during a time period of five years. Further, the purpose is to give investors information about their potential investments and to answer if there is a trade-off between economic return and ESG rating for companies. As a result, the hypothesis is specified as: *“There is a trade-off between economic return and ESG rating for companies”*.

3. Literature Review

According to Porter and van der Linde (1995) detailed case studies of hundreds of industries, based in dozens of countries, reveal that internationally competitive companies are not those with the cheapest inputs or the largest scale, but those with the capacity to improve and innovate continually. Innovation offsets can be broadly divided into product offsets and process offsets. Product offsets occur when environmental regulation produces not just less pollution, but also creates better-performing or higher-quality products, safer products, lower product costs, products with higher resale or scrap value or lower costs of product disposal for users. Process offsets occur when environmental regulation not only leads to reduced pollution, but also results in higher resource productivity such as higher process yields, less downtime through more careful monitoring and maintenance, lower energy consumption during the production process, reduced material storage and handling costs, conversion of waste into valuable forms, reduced waste disposal costs or safer workplace conditions. Environmental and social standards will trigger innovation, firms that do not comply with changing policies, regulations, and standards by implementing innovative solutions, will not be successful in the competitive landscape. Looking at Swedish firms, complying to standards will yield a high ESG rating and according to Porter and van der Linde this will affect performance positively.

Cohen, Fenn, and Konar (1997) wrote a paper about the concern whether “green investing” provides a positive financial return relative to a more neutral investment strategy. Two portfolios, one with “high pollution” and one with “low pollution” with the median as the splitting point. They do not know which way the causation runs, if good environmental performance generates better financial performance or if a company with high financial performance has the ability to afford to be sustainable. The environmental measures of interest were divided by the firm’s revenues to adjust for firm size. They did this for two reasons. First, firm size gives the ability of a firm to absorb the financial consequences of environmental risk. Second, firm size has been previously shown to affect environmental performance because larger firms are likely to be exposed to greater risk of environmental accidents, emissions and incidents of non-compliance. This made it possible for the authors to measure the relative environmental performance of a firm’s operations, not its absolute environmental impact. To measure the financial performance, they used return on assets (ROA), return on equity (ROE) and the performance/return of the stock. Since branches have different opportunities to behave

sustainably, they divided the companies into groups with the same branch. Their conclusion was that green investments will meet or exceed the market.

Derwall, J., Guenster, N., Bauer, R. and Koedijk, K. (2005) used eco-efficiency instead of ESG which in this case are interchangeable terms because ESG was not defined at that time. They investigated whether a long run premium or penalty exists for holding green investments during the time frame 1995-2003. They made two portfolios with high and low eco-efficiency scores. The high-ranked (low-ranked) portfolio consists of companies making up the 30 percent of total capitalization rated highest (lowest) by Innovest (a database). Later they ran their tests with 20 percent and 40 percent to see the differences. And as expected, when the portfolios had bigger differences, the outcome changed and became more distinct. They used and presented their result from using CAPM, Fama French Three Factor Model and Carhart's Four Factor Model in that order. Later in the study, they showed how to use their results in practice, that is, how to build an environmentally responsible portfolio. Here, they created two new portfolios, one "Best-in-Class Portfolio" and the other named "Worst-in-Class Portfolio" and they included different transaction cost scenarios in this test. In both the theoretical and practical test, their conclusion was that environmentally responsible investments exceed its counterpart.

Brammer, S., Brooks, C., and Pavelin, S. (2006) did a study where they examined the relationship between corporate social performance and stock return in the UK during a three-year time frame. They first examine the returns to various portfolios formed based on different levels of CSR¹ score, comparing them with FTSE All-Share and an equity weighted portfolio as a benchmark. Later, they run a series of cross-sectional regressions of the stock return on the composite CPT measure and separately on the three constituent indicators (environment, employment, and community) to be able to determine whether there are any differences between them. They point out the importance of regarding the firm characteristic since larger firms more often have higher CSR scores, so they include the Fama French Three-Factor Model, and to regard the momentum factor, they include Carhart's Four Factor Model. As a result, they notice that high scores result in lower average returns than their benchmark. Meanwhile, the zero-scoring portfolio outperforms the market-wide benchmark. On the other

¹ Corporate Social Responsibility is a management concept whereby companies integrate social and environmental concerns in their business operations and interactions with their stakeholders. Seen as internal ESG.

hand, not all factors are decreasing return, a high score in the two factors “environment” and “community” leads to a lower return while a *low* score in the factor “employment” results in a lower return. The reason why high CSR scores result in a worse financial performance is due to the low return on environmental investments. Another discussed reason is that investors feel morally at ease when investing sustainably and therefore are willing to forgo return on the stock. Hence, their conclusion is that corporate social performance does not improve financial performance.

Manescu (2010) examined ESG attributes for large publicly traded U.S. firms during 1992-2008 to see if these attributes had a positive effect on risk-adjusted stock returns. Out of the seven attributes examined, only community relations were found to have a positive effect, and this effect was due to mispricing. Two other attributes that showed significant results were human-rights and product-safety which had a negative impact on risk-adjusted stock returns were also implications of mispricing. There is only weak evidence that a change from positive to negative effect concerning the attribute employee relations is due to compensation for risk. This report will contribute to this thesis by its statements that cases when ESG is highly incorporated and yield a positive effect, is due to mispricing instead of statistically significant risk adjustments. The focus on certain attributes is something that made us understand what compartments ESG stands for and will be used for understanding in this thesis. Updated data and a focus on the Swedish market could alter the conclusion that a positive impact on return when focusing on ESG is only due to mispricing.

Salim and Lindbo (2019) investigated if there is a relationship between financial performance and ESG score over a five-year time period, January 2013 to January 2018, in the US technology sector. They created portfolios, two with large cap firms where one had low ESG scores and the other portfolio had high ESG scores. The other portfolios were divided in the same way, with high and low ESG scores but this time with small cap firms instead. Each portfolio had ten companies in it, so the total paper included 40 companies. The reason why they divided the stocks into four portfolios was that they noticed that firms with large market capitalization generally had a higher ESG score than firms with lower market capitalization. They used Carhart’s four-factor model to see if there was any difference between the different portfolios’ financial performance. Evidence is found that the small cap portfolio with low ESG scores outperformed the small cap portfolio with high ESG scores. Although, no

statistical evidence is found whether there is a relationship between stock performance and ESG score for firms with large market capitalization.

Björkil and Martinsson (2020) analyzed if ESG rating would have an influence on the stock return of Swedish firms during the Covid-19 pandemic. 152 firms from 10 different industry sectors were chosen and examined by different periods of time, the periods used were the periods between different social restrictions implemented by Sweden concerning maximum amount of people allowed to gather. A panel data of the firms from Refinitiv Eikon were used for all firms instead of funds, which according to this paper stands out in relation to previous ESG performance studies. By focusing on Sweden and using the pandemic as a factor the article could contribute to the research field with a nished study during a contemporary crisis. To test the hypotheses if ESG scores had a positive effect on stock return during Covid-19, different regressions were made in Stata and gave only a significant result when the restriction of 50 people were studied. We would like to use aspects from this paper on how the panel data is conducted by Swedish firms and how they are arranged in various ESG rating groups. Further, our thesis is focusing on a different period of time than just during a crisis, which separates our contribution to the research field of study.

Atz, U., Whelan, T., Van Holt, T., and Clark, C. (2020) states that 58% out of 1000 studies found a positive relationship between ESG and financial performance, 34% mixed or neutral, and only 8% showing a negative correlation. The authors examined more than 1000 research papers that were published between 2015-2020. These papers put a focus on operational metrics such as ROE, ROA or stock price. Some of the conclusions from the report are that improved financial performance due to ESG becomes more marked over longer time horizons. Better financial performance is due to improved risk management when sustainable strategies are implemented and more innovation. On the other hand, ESG investing appears to provide downside protection, especially during a social or economic crisis. Also, ESG disclosure on its own does not drive financial performance. This meta-study is heavily significant when discussing ESG and performance because of its broad data collection. It is not written in the report if the studies are focusing on the US or any particular sector. By exclusively examining Swedish firms in our thesis, we might contribute to the next meta-study which according to the authors will be done by 2025.

4. Theory Review

4.1. Carhart's Four Factor Model

Previous studies have, as mentioned earlier, used the Carhart's four factor model (1997), and so are we. Carhart's four factor model is a refinement of the Fama and French three factor model (1993) which in turn is an extension of the capital pricing model, CAPM, introduced by Sharpe (1964). CAPM is a known model for asset pricing, and it describes the relation between market risk and expected return. Eugene Fama and Kenneth French added two factors to the model due. The small-minus-big factor and the high-minus-low factor since small cap stocks outperform large cap stocks and value stocks are outperforming growth stocks. Later, Carhart added another factor, momentum since stocks have a tendency to continue their current path, both for rising and falling stocks. These additional three factors will lead to more adjusted returns, taking various risks and factors into account.

$$r_{i,t} - r_{f,t} = a_{i,t} + \beta_{1,i}MKT_t + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \beta_{4,i}UMD_t + \varepsilon_{i,t} \quad (1)$$

where

$r_{i,t}$ = return on the individual portfolio at time t ,

$r_{f,t}$ = risk – free rate at time t ,

$a_{i,t}$ = four factor alpha, risk – adjusted return for the individual portfolio at time t ,

$r_{m,t} - r_{f,t}$ = market excess return at time t ,

MKT_t = market excess return at time t ,

SMB_t = small – minus – big factor at time t ,

HML_t = high – minus low factor at time t ,

MOM_t = momentum factor at time t ,

$\varepsilon_{i,t}$ = error term for portfolio i at time t .

4.1.1. CAPM

According to Bodie, Z., Kane, A., and Marcus, A. J. (2014) the model gives us a precise prediction of the relationship that we should observe between the risk of an asset and its expected return. Some assumptions that need to hold are that investors have homogeneous expectations, are rational and investors can borrow/lend at the risk-free rate. CAPM implies that the risk premium on an asset or portfolio is the product of the market risk premium and the beta coefficient. The market risk premium is the risk-free rate subtracted from the market return (Sharpe, 1964). When discussing factor models that build upon CAPM the market risk

premium factor is usually called MKT. A beta below one shows that the portfolio is subject to lower risk and hence lower return. If the beta exceeds one the portfolio indicates higher risk and higher return than the market index. A positive alpha indicates that the portfolio beats the market, even after accounting for the composition of the Carhart factors in the portfolio. A negative alpha indicates that the portfolio comes short. However, if the portfolio aligns well with the index market the alpha and MKT beta will be close to zero.

4.1.2. High-minus-low Factor

The factor high-minus-low (HML) is the factor accounting from the spread between value stocks and growth stocks. Fama and French (1992) discuss that stocks with high book-to-market ratios perform better than its contrariety, growth stocks. The HML factor is determined by taking the difference, each day, between the average of returns on the high book-to-market portfolio and the low book-to-market portfolio. A positive (negative) sign on the coefficient's beta indicates that there is a positive (negative) relationship between the portfolio and value premium or that the portfolio does (not) have a large exposure to value stocks.

4.1.3.. Small-minus-big Factor

Fama and French's (1992) second factor is the small-minus-big (SMB) factor which considers the company's market capitalization and explains how it affects the return differently, with the fundamental idea that companies with small market capitalization outperform bigger companies in the long run. SMB is calculated by taking the difference of the average return of a small-company portfolio and a big-company portfolio. The coefficient's beta is determined by the portfolio's exposure towards small cap companies where a positive (negative) sign indicates that the excess (insufficient) return is explained by the large (limited) number of small cap companies in the portfolio.

4.1.4.. Up-minus-down Factor

The third factor in the econometric model is the up-minus-down (UMD) factor, also referred to as the momentum factor. Carhart (1997) noticed that high performing firms tend to continue to perform well while low performing firms tend to keep on performing poorly. The factor is determined by subtracting two portfolios where one portfolio includes equally weighted average high performing firms, and the other portfolio consists of equally weighted average low performing firms. A positive (negative) beta indicates that the portfolio's stocks have an

excess (insufficient) return that are driven by previous performance. A company with good (bad) historical performance often continues to perform good (bad) in the future.

5. Data

To test our topic if there is a trade-off between economic return and ESG rating in the Swedish market, we had to collect most available data. The fact that ESG rating is a quite modern rating and that publicly traded companies in Sweden are relatively few, made us in need of as much information as possible. Too few Swedish companies with unreliable ESG ratings would reduce the credibility and our ability to make qualified statements.

5.1. Market

As previously mentioned, Sweden is one of the most sustainable countries in the world and it was the most sustainable country in 2020 (Mulhern, 2020). Also, Sweden is one of the countries with the best gender equality (Statista, 2020). We find it interesting to exclusively focus on the Swedish market since Swedish companies and their stakeholders have a more sustainable mindset than other countries, and thus make the ESG ratings more justified because of the earned reputation as a whole nation. Also, because we as authors and our main target group of readers are Swedish, we tend to suffer from home bias. According to Chan, K., Covrig, V., and Ng, L. (2005) investors do not exploit international diversification opportunities, as they allocate a relatively large fraction of their wealth to domestic equities, called home bias. Sweden is of interest because a lot of earlier research that was found targets the U.S, by targeting Sweden that's not quite as examined there is a niched possibility of contributing to the ESG field.

5.2. Sample of Companies

To find companies within this chosen market, we used Refinitiv, which is one of the world's largest providers of financial markets data and infrastructure (Refinitiv, 2022). We screened all companies listed on OMX Stockholm, though we restricted our sample to only those companies who met our criteria. The first criterion was that the company must have been listed on the Swedish stock market during the whole examined time frame. The second criterion require the company to have an ESG score per 2017-01-01. 60 firms fit our criteria which were arranged in two portfolios with 30 firms in each. The risk we saw was that too few companies would yield a narrow ESG score spectrum with no distinctive high or low ratings. A portfolio with 30 firms is to be seen as a possible number of stocks in a portfolio for the general investor.

5.3. Time Frame

We analyzed our sampled companies through the five most recent years, that is 2017-2021. The Swedish stock market has, even though the financial crisis during the Covid-19 outbreak, been booming during examined time frame with an increase of 93,8 percent from the 1st of January 2017 to the last of December 2021. We found it interesting to investigate this time period because of two reasons. First, ESG investments has increased during the last years (ADEC Innovations, 2022), and its popularity is constantly growing. Companies are, due to the ESG pressure from stakeholders, therefore reforming themselves to more sustainable supply chains, more diversified employees etc., and our belief is that it could have affected the financial performance. Second, the Covid-19 outbreak has been a challenging time for Swedish companies where strategies and business models have had to change, adjust, and improve. We wanted to include this time period too since we believe that companies with high ESG scores prior to the Covid-19 crisis, might have been affected by the pandemic differently than those with low ESG score.

5.4. ESG Score

Refinitiv (2022) are transparently and objectively measuring the companies' relative ESG performance, commitment, and effectiveness that they base on each company's reported data. They are including 10 themes (Appendix A) and they grade each company both with a percentage rate (0 percent to 100 percent) and also letter grades (D- to A+), where we have decided to use the percentage rate in our analysis to more precisely be able to differentiate the companies. Refinitiv are updating their data weekly they are changing the score retrospectively meaning that a late discovery about a company scandal can change the company's ESG score during the time the scandal happened. Only events older than five years will have no effect on the firms ESG score so the date prior five years back are therefore seen as definitive. A company's ESG score on 2017-01-01 will determine which portfolio the company will be categorized into.

5.5. Independent Variables

Historical Carhart factors were collected from a data set published by Applied Quantitative Research, AQR, which has made Fama-French and Carhart factors available for the Swedish market since 1986 (AQR, 2022). Earlier studies often use Kenneth R. French's own website and data library, which is based on the U.S market. Because we solely researched the Swedish

market the data from AQR is more relevant, despite the U.S.-based factors being a well-tested and great benchmark. These Swedish factors were used for risk-adjusting the portfolio returns collected from Refinitiv Eikon.

5.6. Risk-Free Rate

The risk-free rate is the return an investor would receive when doing an investment with zero risk over a specified period. The risk-free rate is used in various financial models, but it is only a theoretical concept since there are no risk-free investments. We received the risk-free rate from AQR since that is the rate used when computing the MKT variable. AQR (2022) is using the daily U.S. Treasury bill rates, T-bills, which were compounded into weekly rates to fit our model (3). The U.S. Treasury bill rates were used as a risk-free rate because it is considered a general term for the risk-free rate and by collecting the risk-free rate from AQR we could be consistent with the rates that were used for the MKT variable.

6. Methodology

This thesis characterizes a deductive approach where existing studies and theories are fundamentals for the hypothesis constructed in the thesis. By using earlier documentations based on the ESG-field, which is well documented, it's possible to contribute to the field by testing theories with up-to-date data and a different market approach. Up-to-date data was collected from databases and therefore the thesis is of a quantitative nature. The quantitative data and database mostly used is historical weekly closing prices from the financial database Refinitiv Eikon. Besides data, the research is based on the theories mentioned in the theoretical framework but also by the inputs given from the literature review.

6.1. Portfolio Construction

We wanted to examine if there is a trade-off between ESG rating and economic return, in other words, does a high ESG score worsen financial performance? To do so, we needed a portfolio of firms with high ESG scores. We constructed two portfolios, one called High ESG and one called Low ESG. High ESG is a portfolio containing all companies, that meet the required criteria's, with higher ESG score than the median (59.75). The other companies formed the second portfolio, Low ESG. The two different portfolios were risk-adjusted by the Carhart factors and then compared to both graphically and by statistical significance.

6.2. Statistical Tests

We collected the closing price for each company that met the criteria described in 4.2. After dividing the companies into two portfolios, and calculating the value of each portfolio by taking the sum of all companies' weekly closing price, we calculated the weekly return with the formula

$$r_j = \frac{P_t - P_{t-1}}{P_{t-1}} \quad (2)$$

where

r_j = Return of portfolio j ,

P_t = Price of portfolio at time t ,

P_{t-1} = Price of portfolio at time $t - 1$.

The portfolios' return was later subtracted by the weekly risk-free rate ($r_{i,t} - r_{f,t}$). The variables HML, SMB and UMD were only available with a daily frequency, so to make it fit our regression, we had to convert the daily variables to weekly by using the formula

$$x_{Weekly} = \left(\prod_{i \in day} \left(\frac{x_i}{100} + 1 \right) - 1 \right) * 100 \quad (3)$$

where

x_{Weekly} = *Weekly compounded variable*,

x_i = *Daily variable at day i*.

When all variables were converted to weekly, we put all 261 observations per factor into panel data in excel, and then we ran a OLS-regression with robust standard errors using the Carhart's four factor model (1) in STATA.

According to Frost (2022) the variance of the errors should be consistent for all observations. In other words, the variance does not change for each observation. This preferred condition is known as homoskedasticity. If the variance of the errors is not consistent, there is heteroskedasticity which reduces the precision of the estimates in the OLS regression. To correct this bias, heteroskedasticity, we will use robust standard errors when doing the regressions.

Another problem that may arise when doing the regression analysis is multicollinearity. Frost (2022) discusses that this correlation is a problem because independent variables should be independent. A key goal is to isolate the relationship between each independent variable and the dependent variable. When there is multicollinearity, changing one variable will also affect another. This is a problem because the dependent variable, in our case expected return, will have trouble estimating the relationship between each independent variable and the expected return. The independent variables in our OLS will be the Carhart and if these factors correlate too much it will be difficult to draw statements and the regression will lose statistical power. Frost explains that the variance inflation factor (VIF) identifies correlation and the strength of it. By calculating VIF for each variable we could test the correlation.

7. Empirical Result

7.1. Portfolio Performance

In this part results from the OLS-regression are presented. To test for heteroskedasticity, the OLS-regression is made with robust standard errors. The outcome can be found in Table 2. To test if there is multicollinearity, a VIF test was made (Table 1).

7.1.1. VIF Test

The conducted VIF test gave low results on each variable with a mean VIF of 1.11. There are different opinions about what a good VIF value is. Field (2014) means that there is multicollinearity when the VIF value is greater than 10, while Johnston, Jones, and Manley (2018) are more conservative, saying that there is multicollinearity when the VIF value is above 2.5. Nevertheless, our result of 1.11 indicates that there is almost no multicollinearity between the independent variables.

Table 1. VIF test.

Variable	VIF	1/VIF
MKT	1.07	0.937161
HML	1.15	0.870392
SMB	1.06	0.942086
UMD	1.18	0.849337
Mean VIF	1.11	

Note: This table presents the VIF test made test multicollinearity between the independent variables in Table 1.

7.1.2. High ESG Portfolio

The regression analysis for the portfolio considering high ESG rated companies resulted in a R-squared value of 0.9579, which is a very high goodness-of-fit value. The used regression model fits the data used very well. The variables HML and SMB are significant on a 5 percent significance level, while MKT and MOM are significant on a 1 percent level.

The MKT factor is highly significant, even below a 1 percent significance level. Beta for MKT is 0.9677 which tells us that investing in the “High ESG” portfolio during 2017-2021 would imply lower volatility and lower return, than the Swedish market. Alpha is close to zero and insignificant on our used significance levels that stretches up to 10 percent. The ability to beat the market can therefore not be discussed with statistical evidence. The HML factor in the portfolio provided a positive beta (0.09007), indicating that the portfolio has an exposure towards value stocks rather than growth stocks and that there is a positive relationship between the portfolio and value premium. The SMB factor, on the other hand, shows a negative beta (-0.09949). Hence, the portfolio includes more large cap companies than small cap companies which, according to Fama and French (1992), result in an insufficiency in return compared to the benchmark since small cap companies historically have outperformed the market while large cap companies have done the opposite. These statements for these variables are proved statistically with a 5 percent significance level. The UMD factor provided a negative beta (-0.12823) in the test. This beta indicates that the historical performance affects the portfolio in a negative way. This statement is proved statistically with a 1 percent significance level.

7.1.3. Low ESG Portfolio

R-squared for the regression considering the Low ESG portfolio resulted in a goodness-of-fit value of 0.9194. Not as high as the other portfolio but still relatively high, which shows good strength between the dependent variable and the used regression model. Only MKT is significant on a 1 percent significance level and HML is significant on a 10 percent level. The other factors are insignificant, including alpha.

MKT is significant on a 1 percent level and the beta is 1.04394 which implies that the portfolio of Low ESG rated firms is subject to a higher volatility and hence according to Sharpe (1964), should obtain a higher expected rate of return by incurring additional risk. The volatility is higher relatively to the Swedish market and the return should therefore also be higher than the market. Alpha is close to zero and insignificant, we can therefore not describe the ability of the Low ESG portfolio to beat the market either. The HML factors beta is positive (0.12166), meaning that the portfolio is containing more value stocks than growth stocks and that there is a positive relationship between the portfolio and value premium. This factor is statistically significant at 10 percent. The SMB factor shows a positive (0.02874) relationship between company size and return. The UMD factors’ negative (-0.04179) beta indicates that the

historical performance affects the portfolio negatively. Though, neither the SMB factor or the UMD factor are statistically significant and can therefore not be used when making conclusions.

Table 2. Carhart's Four Factor Model Portfolio Performance.

Variable	High ESG	Low ESG
α	-0.00036 (0.00045)	-0.00065 (0.00067)
MKT	0.96770*** (0.02164)	1.04394*** (0.03386)
HML	0.09007** (0.03882)	0.12166* (0.07518)
SMB	-0.09949** (0.03962)	0.02874 (0.06720)
UMD	-0.12823*** (0.02577)	-0.04179 (0.04891)
R^2	0.9579	0.9194

Note: This table presents the outcome from the OLS-regression including the variables MKT, HML, SMB, UMD and the four-factor alpha. Each portfolio includes 30 companies and is calculated based on weekly return. Weekly T-bill is used as risk-free rate. Robust standard errors are written in parentheses. The used model when computing the OLS-regression is:

$$r_{i,t} - r_{f,t} = \alpha_{i,t} + \beta_{1,i}MKT_t + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \beta_{4,i}UMD_t + \varepsilon_{i,t}$$

* Significant at a 10% level

** Significant at a 5% level

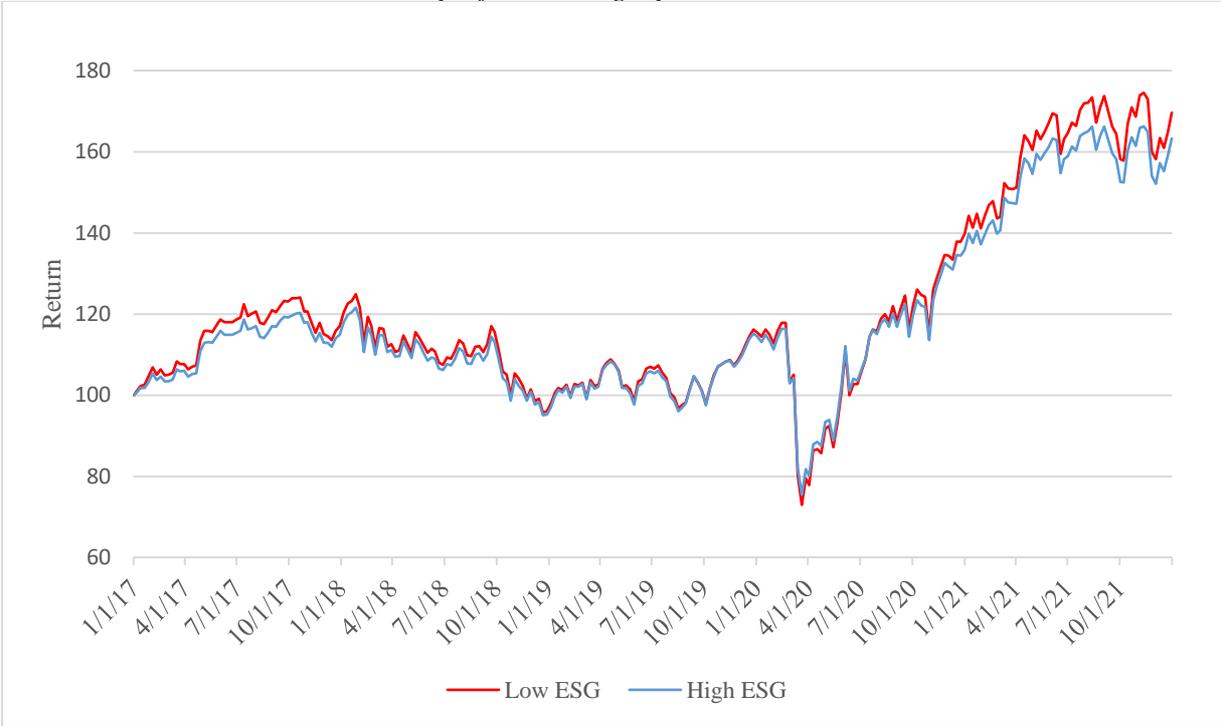
*** Significant at a 1% level

7.2. Cumulative Performance

By creating an index with 2017-01-01 as a value of 100 and then multiplying by the risk-adjusted weekly returns we received one graph for each portfolio and its performance during the time frame as per Table 3. We can observe that the portfolios are moving similarly from the beginning until the Covid-19 outbreak in March 2020 where Low ESG suffered a slightly severe loss. The big difference between the portfolios occurred during the rehabilitation period from the Covid-19 stock market crash. The Low ESG portfolio gained 96.7 percentage points from the outbreak until the end of our time frame, while the High ESG portfolio only gained 87.8 percentage points. This is in line with the conclusion Atz, U., Whelan, T., Van Holt, T.,

and Clark, C. (2020) stated that ESG investing appears to provide downside protection during social and economic crisis. Overall, the Low ESG portfolio ended up with a 69.58 percent cumulative performance while the High ESG portfolio performed 6,39 percentage points worse with a cumulative performance of 63.19 percent as per Table 4.

Table 3. Cumulative performance graph 2017-01-01 to 2021-12-31.



Note: This table illustrates the development of the risk-adjusted return in the two portfolios “High ESG” and “Low ESG” during the time frame 2017-01-01 to 2021-12-31 with index 100 at the beginning of the period.

Table 4. Cumulative performance table 2017-01-01 to 2021-12-31.

Date	Low ESG	High ESG
2017-01-01	100,00	100,00
2017-01-06	100,92	100,58
2017-01-13	102,29	101,78
...
<u>2020-03-20</u>	<u>72,94</u>	<u>75,45</u>
...
<u>2021-11-12</u>	<u>174,53</u>	<u>166,26</u>
...
2021-12-17	160,93	155,13
2021-12-24	164,90	159,06
2021-12-31	169,58	163,19

Note: The table show how the risk-adjusted portfolios have developed during our time frame. Underlined numbers represent the lowest values during our time frame and the double underlined numbers are representing the highest values during our time frame.

8. Discussion

8.1. Interpreting the Results

The alpha values for both regressions were insignificant by an extent which hindered us from making qualified statistical statements regarding the ability to beat the market. Both alphas are very close to zero (-0.00036 and -0.00065) which would suggest an extremely small difference from the market. A significant alpha would therefore show the edge of the market even after accounting for the composition of the Carhart factors in each portfolio. But because the portfolios essentially are the market, they cannot beat or come short of the market. The alpha is insignificant because the true alpha is zero or very close to zero. Meaning that a rejection of the null hypothesis, that alpha is non-zero, would make it impossible for the alpha to be zero and perfectly align with the market. Another explanation for the alphas being close to zero is that the portfolios are not managed by professionals with the intention to beat the market, they are just divided by ESG score and then are the same firms held in the portfolio during the entire period.

MKT is significant on a 1% level and way below for both portfolios: This factor is highly important for our conclusion and to answer the question if there is a trade-off between ESG score and economic return. The Low ESG portfolio returned a beta of 1.04394 which indicates that investing in this portfolio results in a higher economic return than the index market, however according to CAPM, the return is therefore subject to a higher risk. Because the beta for High ESG firms resulted in 0.96770, the portfolio indicates a lower risk and lower return than the index market. The difference between the portfolios tells us that there is both a statistical and economically significant difference between risk and return. This result aligns with Brammer, Brooks and Pavelin's (2006) conclusion where corporate social investments do not improve financial performance. On the other hand, our result is inconsistent with Cohen, Fenn, and Konar's (1997) result where green investments are proved to meet or exceed the market. Derwall, J., Guenster, N., Bauer, R. and Koedijk, K. (2005) are also discussing the contrary to our result, where environmentally responsible investments are proved to exceed its counterpart. Reasons why our study both align with, and differs from, other studies could be that different markets and industries are examined during different time frames.

The factors in Fama and French (1992) and Carhart (1997) are all significant in the portfolio with high ESG scores, while HML is the only significant factor in the portfolio with low ESG scores, though on a 10% significance level. Hence, it is difficult to make any conclusions about specific properties. Therefore, the factors might contribute to mispricing as in Manescu's (2010) conclusion when looking at ESG factors, rather than significant statistical risk adjustments for risk premiums when calculating the risk-adjusted returns.

The factor SMB indicates that firms with higher market capitalization more often have a better ESG score than its contrary. Cohen, M.A., Fenn, S.A. and Konar, S. (1997) are discussing in their thesis whether being sustainable as a company gives you higher market capitalization or if you can afford to be sustainable because you have a large market capitalization. Firms with small capitalization are historically performing *better* than its opposite and this is our results indicating concerning the negative SMB beta for the High ESG portfolio and the positive, though not significant, beta for the Low ESG portfolio. When calculating the cumulative performance, we observe that the major differences in performance are during the Covid-19 crisis where the small capitalization companies suffered a greater loss in the beginning of the crisis. Small cap companies could be less prepared for a crisis when it comes to financial buffer, shareholder loyalty and possibilities of renegotiating loans than large cap firms. This could be a reason why the market expected the small cap companies, hence also the Low ESG portfolio, to perform worse than its opposite. On the other hand, the firms with small capitalization and lower ESG showed a better performance after the crisis. A reason for this could be that small cap firms are more agile and flexible than the bigger companies, they could therefore tackle the crisis better than the stiffer large capitalization firms. Hence, we cannot surely say whether the better performance from the Low ESG portfolio is due to its market capitalization size or if it is thanks to less money spent on ESG.

8.2. Conclusion

Referring to our hypothesis "*There is a trade-off between economic return and ESG rating for companies*" we found minor evidence that this might be true. The evidence is based on the Swedish market as an index and a sample of 60 firms listed on the market. Sweden was chosen, among other factors, by its sustainable awareness and is therefore a good fit for conducting sustainably based research. Because of this awareness the ESG scores would be better justified and add credibility to the thesis.

After conducting the regressions of the two different portfolios we can conclude that any of them beat the market by statistical power. However, we found evidence that there is a difference between the risk and return of the portfolios. Investing 5 years in the Low ESG portfolio equals more risk and fluctuations during the time period. By looking at the cumulative returns we can see that bigger fluctuations occurred specifically during and after the covid-19 pandemic. The Low ESG portfolio indicated a lower return during the beginning of 2020 but then did a significant recovery to overtake the High ESG portfolio a year later. ESG might therefore have an effect that firms with high ESG ratings are a less risky investment with more stabilized but lower returns, indicating that there is a trade-off between ESG score and economic return. This aligns with Atz, U., Whelan, T., Van Holt, T., and Clark, C. (2020) that ESG investing appears to provide downside protection, especially during a social or economic crisis. Though, the development during the pandemic could also correlate with market capitalization size. Lower risk for High ESG firms could partly be explained by Porter and Van der Linde (1995) that complying with environmental standards by continuous innovation will result in higher resource productivity such as higher process yields and lower production costs, especially when resources become scarce during a crisis such as Covid-19.

The aim of the study was to focus on ESG ratings and its impact on performance. Our sample of 60 firms that were divided into two portfolios, solely were sampled, and divided according to the ESG score they had been given 2017-01-01. ESG as a measure is relatively modern and therefore quite few Swedish companies received an ESG score in 2017. These companies were and still are amongst the biggest, most mature and most liquidity traded companies on the Swedish stock market, which make the two portfolios consisting of firms that mostly drive and affect the market. Firms in the Low ESG portfolio might in 2017 be considered as growth stocks that during the short time frame developed towards value stocks after great economic performance, with less volatility and even a higher ESG score that would place them in the opposite portfolio. This could be an explanation why the Low ESG portfolio resulted in a greater economic return. To answer the topic of this thesis, yes there is a trade-off between economic return and ESG rating for Swedish companies, during a time frame of 5 years between 2017 and 2021. The hypothesis is therefore considered true. However, the aim for a high ESG rating reduces volatility and therefore risk in the exchange for less economic return. Because the difference is quite small in economic terms, we think that investing in firms that think about ESG factors will eventually overtake the firms that don't in the future. Complying with CFA

institute (2022) that ESG is the evolution of investing and the sustainable awareness for investors and other stakeholders will continue to grow during the time ahead of us.

8.3 Further research

It would be interesting to do a research with a longer time frame, in Sweden this comes with some complications. We did only receive 60 firms with an ESG rating as late as 2017 out of +300 publicly listed companies, a time frame of 10 years with a start date in 2012 would most certainly decrease this amount. A research with fewer firms but a longer time period would be possible but it feels like the ESG scores are not as justified in 2012 as in 2017 when returns until 2021 are used in our model. Further research could be to use the 60 firms we used but carry through with an updated ESG rating every year. This would be quite extensive to re-do the portfolios every year and to interpret the final results. By doing regressions each year and discuss each year's results it could be possible to find conclusions based on the evidence collected.

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Appendix A

Table over Refinitiv's factors in ESG.

Pillars	Categories	Themes
Environmental	Emission	Emissions
		Waste
		Biodiversity
		Environmental management systems
	Innovation	Product innovation
		Green revenues, R&D, CapEx
	Resource use	Water
		Energy
		Sustainable packing
		Environmental supply chain
Social	Community	Equally important to all industry groups, hence a median weight of five is assigned to all
	Human rights	Human rights
	Product responsibility	Responsible marketing
		Product quality
		Data privacy
	Workforce	Diversity and inclusion
		Career development and training
		Working conditions
		Health and safety
	Governance	CSR strategy
ESG reporting and transparency		
Management		Structure (independence, diversity, committees)
		Compensation
Shareholders		Shareholder rights
		Takeover defenses

Appendix B

Table of all companies in the portfolios “Low ESG” and “High ESG”.

Low ESG		High ESG	
Company Common Name	ESG Score	Company Common Name	ESG Score
Lundin Energy AB	59,6	Svenska Cellulosa SCA AB	83,3
Nobia AB	58,1	BillerudKorsnas AB (publ)	82,3
Trelleborg AB	58,0	Telia Company AB	82,0
Skanska AB	56,6	Castellum AB	80,7
Hexpol AB	56,2	Telefonaktiebolaget LM Ericsson	80,5
Getinge AB	56,1	Swedbank AB	79,9
Wihlborgs Fastigheter AB	53,7	Alfa Laval AB	79,8
Hufvudstaden AB	53,6	Boliden AB	78,2
Securitas AB	53,2	JM AB	77,7
Autoliv Inc	52,7	SKF AB	77,3
Nederman Holding AB	49,7	Electrolux AB	77,0
Ratos AB	49,5	Fabege AB	76,9
Eniro Group AB	49,5	Modern Times Group MTG AB	76,6
Intrum AB	48,8	Sandvik AB	76,4
Ncc AB	48,7	Elekta AB (publ)	75,7
Nolato AB	48,4	Atlas Copco AB	75,4
Kinnevik AB	48,3	Skandinaviska Enskilda Banken AB	74,4
Lindab International AB	44,3	Volvo AB	72,6
Investor AB	39,4	SAS AB	71,6
Hexagon AB	34,0	Husqvarna AB	71,4
Swedish Orphan Biovitrum AB (publ)	33,2	Axfood AB	69,4
Bergman & Beving AB	29,5	H & M Hennes & Mauritz AB	68,8
Loomis AB	29,3	Swedish Match AB	67,8
Sectra AB	29,3	Saab AB	67,8
Industrivarden AB	28,7	Tele2 AB	67,2
Fingerprint Cards AB	28,0	Nibe Industrier AB	66,9
Fastighets AB Balder	26,0	Holmen AB	62,7
Beijer Ref AB (publ)	21,7	SSAB AB	62,7
VBG Group AB (publ)	17,7	Assa Abloy AB	61,5
L E Lundbergforetagen AB (publ)	13,4	Svenska Handelsbanken AB	59,9

