Master's thesis

NTNU
Norwegian University of Science and Technology
NTNU Business School

Einar T. Sandaas & Pauline Johnsen Sjøvold

The Impact of Socially Responsible Criteria on Financial Performance

An empirical study of the European Market

Master's thesis in Finance and Investment
Supervisor: Hans Marius Eikseth
June 2020

NTNU
Norwegian University of
Science and Technology

Einar T. Sandaas & Pauline Johnsen Sjøvold

The Impact of Socially Responsible Criteria on Financial Performance

An empirical study of the European Market

Master's thesis in Finance and Investment
Supervisor: Hans Marius Eikseth
June 2020

Norwegian University of Science and Technology
NTNU Business School

NTNU
Norwegian University of
Science and Technology

Preface

This master thesis is the final product of a master's degree in Economics and Business Administration with a specialization within Finance and Investment at NTNU Business School. This study has allowed us to dive deeper into the topic of sustainable responsible investment, which we believe will become even more and more relevant in the future. This study has also given us valuable insight into asset pricing models. Furthermore, it has allowed us to develop more econometric modeling skills and learn better programming language.

We would like to thank our supervisor Hans Marius Eikseth for his feedback and support. We would also like to express our appreciation to our family and friends who have continued to motivate us throughout this project.

NTNU Business School
Trondheim, May 2020

Pauline Johnsen Sjøvold

Einar T. Sandaas

Abstract

This study examines the impact of various socially responsible criteria on financial performance. Despite a large number of previous studies in this field, a consensus has not yet been reached. This research contributes to the discussion by focusing on companies within the European market for the sample period 2004-2019. An empirical analysis examines excess returns of trading strategies based on responsible criteria measured by environmental, social and governance indicators obtained from the Refinitiv ESG database. Holding a long position in top ranked companies and short position in bottom ranked companies are applied as well as a long-short strategy. CAPM, Fama and French three-factor model and the Carhart four-factor model are used to measure the financial performance. In order to achieve a broad perspective, the analysis is performed based on both UK and US investor viewpoints when applying factor models. The results of this analysis show a negative relationship between financial performance and responsible investment. However, with a few exceptions, all negative abnormal performances appears to be insignificant.

Sammendrag

Denne masteroppgaven undersøker sammenhengen mellom ansvarlige investeringer og finansiell prestasjon. Fra tidligere finnes det flere studier innenfor emnefeltet, men forskerne har ikke funnet en entydig konklusjon. Oppgaven bidrar til denne diskusjonen ved å foreta en empirisk analyse av europeiske selskaper i tidsperioden januar 2004 til desember 2019. Analysen undersøker om det oppstår unormal meravkastning ved å konstruere porteføljer og investeringsstrategier basert på kriterier knyttet til ansvarlige investeringer. Det blir holdt lang posisjon i selskaper med høy rangering og kort posisjon i selskaper med lav rangering, i tillegg til en kombinasjon av lang og kort posisjon. Kapitalverdimodellen, Fama og French tre-faktor modell og Carharts fire-faktor modell er benyttet til å undersøke om det oppstår unormal meravkastning. For å sikre et bredt perspektiv, er analysene gjennomført basert på synet til en investor fra både Storbritannia og USA. Resultatene fra vår analyse viser et negativt forhold mellom økonomisk ytelse og ansvarlig investering. Med noen unntak, så eksisterer det ikke en signifikant relasjon.

List of figures

List of tables

Abbreviations

CAPM - Capital Asset Pricing Model

CSR - Corporate Social Responsibility

DKK - Danish Krone

ENV - Environmental

ESG - Environmental, Social and Governance

ESGC - ESG combined score

GBP - British Pound

GOV - Governance

GSIA - Global Sustainable investment review

HML - High minus low

ISIN - International security identification number

NOK - Norwegian Krone

OLS - Ordinary least square

PRI - Principles for responsible investment

SEK - Swedish Krona

SIC - Standard Industrial Classification

SMB - Small minus big

SOC - Social

SRI - Socially Responsible Investing

USD - United States Dollar

WML - Winners minus Losers

1 Introduction

Investors have traditionally applied financial returns as a measure of the outcome of their investments. However, in the last few decades, the global focus on how economic activity affects society and the environment has been increasing. The younger generation is generally becoming more aware of the responsibility that comes with wealth and the positive impact that sustainable factors may have on returns (Deutsche Bank, 2019). Today, many consumers prefer to buy more environmentally friendly products. Similarly, increased numbers of investors are looking to invest in companies that are profitable, and sustainable in the long term for the community as a whole. The concept of socially responsible investment has become highly relevant for many investors, and the idea has gained attention in academic literature (Derwall, Guenster, Bauer, & Koedjik, 2005).

In 2019, sustainable debt issuance reached a record of USD 350 billion, which is a more than 30 % increase from 2018 (Institute of International Finance, 2019). Similarly, the green bond issuance hit a record of USD 255 billion in 2019 (Cooper, 2020). In January 2020, one of the world's most prominent asset manager, BlackRock, announced that it would be putting more than USD 7 trillion into green and sustainable investments (Grey, 2020). In response to the rapidly increasing interest in sustainability and with support of the United Nations behind it, the Principles of Responsible Investment (PRI) network was developed. Today, the PRI is the world's leading proponent of responsible investment supported by the United Nations. It encourages investors to use responsible investment to improve returns and better manage risk (PRI, 2020).

The increasing focus on sustainable investment may originate from the sustainability problems our planet currently faces and the fact that sustainability is among the biggest issues of our time (PRI, 2019). Most corporate leaders understand that businesses play a crucial role in tackling urgent challenges such as climate change (Eccles & Klimenko, 2019). The main factors motivating investors to choose for socially responsible investment are linked to these problems, coupled with the desire to address climate change and other environmental issues (Eurosif, 2018).

Despite the expanded focus on sustainable investment in the last few decades, the search for a relationship between corporate financial performance and socially responsible investments can be traced back as far as the early 1970s (Gunnar, Busch, & Bassen, 2015). More research

has been done since then within this field exploring this link. Several researchers have concluded that there is a positive relationship between environmental investments and financial performance. Most of the research has been conducted in the US. Although the majority is positive, the diversity of relationships found in recent studies indicate that the link is not consistent (Gunnar et al., 2015; Orlitzky, Schmidt, & Rynes, 2003). More research on this topic appears to be necessary.

This report aims to investigate the impact of the various socially responsible criteria on financial performance. We will look at companies across the European market, rather than focusing on companies from a single or few countries, as many existing research has done. Our goal is to contribute to the broader picture and generalizing conclusions. We will do this by analyzing the excess returns of companies with environmental, social and governance ranking. Trading strategies based on these scores are used to evaluate their performance. To investigate the relationship between these two components, the thesis will address the following research question:

Does a long-short trading strategy in stocks, based on past environmental, social and governance ratings, lead to a significant abnormal performance in European companies?

To answer this question, we will examine several socially responsible criteria. The database available in Eikon is used to measure companies' social responsibility while the financial data is retrieved from Compustat. In order to analyze the effects of socially responsible criteria on financial performance, we will construct portfolios consisting of European companies based on one-year lagged environmental, social and governance ratings. Furthermore, we will examine the trading strategies of holding a long position in the portfolio of high-rated companies and a short position in the portfolios of low-rated companies respectively. In addition, we have also constructed a long-short strategy. To measure the financial performance, we will employ CAPM, Fama and French three-factor model and the Carhart four-factor model. In order to achieve a broad perspective, we have opted to take the view of both UK and US-based investors when applying factor models. Our portfolios were constructed at the start of each year, beginning in 2004 and ending in 2019. Portfolio excess return is measured on a monthly basis.

This thesis is organized as follows. Section One consists of an introduction. In Section Two, we present necessary concept definitions within socially responsible investment, in addition to environmental, social and governance factors. The most relevant literature and theories are reviewed in the third section, which comprises a brief overview of definitions and relevant terms followed by existing papers and relevant studies. The last part of Section Three presents the hypothesis development. The methods applied in this paper are detailed in Section Four along with portfolio construction. Section Five comprises data selection and description. In Section Six, the empirical results are outlined, followed by a discussion in Section Seven. Finally, Section Eight summarizes the findings and aims to form a conclusion.

2 Background

The following section outlines necessary concept definitions within socially responsible investment and its trading strategies. In addition, the European market of socially responsible investment is presented. Furthermore, the environmental, social and governance (ESG) factors are defined.

2.1 Socially Responsible Investment

Socially Responsible Investment (SRI), also often called ethical investments or sustainable investments, is an investment process that integrates social, environmental, and ethical considerations into investment decision making. According to Eurosif, SRI is a long-term oriented investment approach which integrates ESG factors (Eurosif, 2016). SRI applies a set of screens to select or exclude assets based on ecological, social, corporate governance or ethical criteria (Renneboog, Horst, & Zhang, 2008).

Eurosif (2016) classified SRI-strategies into seven distinct categories: (1) sustainability themed investment, (2) best-in-class investment selection, (3) exclusion of holdnings from the investment universe, (4) norms-based screening, (5) ESG integration factors in financial analysis, (6) engagement and voting on sustainability matters and (7) impact investing. In addition, it is also common to group in negative and positive screening (Eurosif, 2016).

2.1.1 Negative Screening

Negative screening is known as the oldest and most basic SRI strategy (Renneboog et al., 2008). This strategy refers to the practice of excluding of companies engaged in undesirable activities or involving controversial business areas such as tobacco, alcohol, gambling or weapons manufacturing from the portfolio (Renneboog et al., 2008; Schyndel, 2019). In other words, negative screening is to avoid investments in controversial companies (Trinks & Scholtens, 2015). In 2016, the largest SRI strategy globally was negative screening (GSIA, 2019).

2.1.2 Positive Screening

Positive screening is an umbrella term that covers several SRI strategies. This type of screening is often referred to as companies that were not excluded in the negative screening process. Positive screening favors investments in companies with strong records in specific areas such as the environment, labor relations, sustainability, employee or diversity (Schyndel, 2019). Positive screenings are also often used to select companies with a good record regarding renewable energy usage or community involvement (Renneboog et al., 2008).

The use of positive screens is often combined with best-in-class strategy. The best-in-class approach focuses on the top percentage of the companies. A best-in-class portfolio typically includes companies that meet both ESG and a financial evaluation (Eurosif, 2016).

2.2 The Market of SRI

The market of SRI has been exposed to an outstanding growth around the world. According to the Global Sustainable Investment Review (GSIA, 2019), sustainable investing assets had reached more than USD 30.7 trillion in the five major markets at the start of 2018. This is amounts to around a 34 percent increase in two years.

In the European market, the total assets attributed to sustainable and responsible investment strategies reached EUR 12.3 trillion in 2018. This is roughly an 11 percent increase from 2016. The strategy of negative screening dominates, accounting for EUR 9.5 trillion. The second most widely practiced strategy is corporate engagement and shareholder action (GSIA, 2019). Best-in-class also shows positive growth and is popular in France, for example (Eurosif, 2018). The European market is still a growing segment and is in an early stage of development (Mavridis, 2015).

2.3 Environmental, Social and Governance

There are multiple definitions of ESG investment, but most of them overlap considerably. In general, ESG refers to three main areas of concern regarding sustainability and the ethical impact an investment has for a company or business. This is an approach that focuses on several non-financial dimensions of a stock's performance, including the impact of the

company on the environment, a social dimension and governance (Duuren, Plantinga, & Scholtens, 2015).

ESG consists of several criteria. Environment may include a company’s resource efficiency in terms of waste, energy use, natural resource conservation, climate change, greenhouse gas emissions and ethical treatment of animals (James, 2020). Social criteria includes human rights and labor standards, and focusing on how well a company is integrated with its local community and working conditions (Robeco, 2020). In regard to governance, it includes the quality of a company's management, culture, risk profile and other characteristics, e.g. strategic management of social and environmental performance (Eurosif, 2020).

3 Literature Review

This section initially presents an initial overview of relevant literature and studies for the later analysis and discussion. First, some relevant economic theories will be presented, followed by an outline of studies addressing the financial performance of ESG, divided into positive and negative results. The last part presents the hypothesis development.

3.1 Economic Theories

In this subsection, we will dive deeper into some relevant economic theories when looking at the relationship between responsible investment and financial performance. According to traditional economic theory, it limits investment decisions to the dimensions of return and risk in narrow of financial sense. The concept of responsible investment widens this notion by adding ethical preferences. Furthermore, traditional economics arguments suggests that managers should maximize the wealth of their company's equity holders (Friedman, 1962). Hence, if the sustainable activities are inconsistent with economic objective, traditional economic theory suggests they are avoided. The efficient market hypothesis concurs with traditional economics theory. This theory states that all available information is "fully reflected" in stock prices (Fama, 1970). Hence, socially responsible investors should not earn an abnormal performance by screening their investment.

In contrast, according to stakeholder theory, organizations are expected to acknowledge a duty of care towards traditional interest groups as well as stakeholders – such as local communities and the environment (Simmons, 2004). Consequently, responsible investments are supported. Another relevant economic theory that agrees with the stakeholder theory is risk management theory. This theory suggests that even in times of crises, a company's corporate social performance activities alleviate adverse reactions by stakeholder, which reduces long-term financial risk (Godfrey, 2005).

3.2 Existing Studies About Performance

In this section, existing academic literature on the financial performance of responsible investments will be reviewed. The first academic studies on this relationship were published back in the seventies, and there are now more than 2 000 studies in existence investigating the link between corporate financial performance and ESG (Gunnar et al., 2015). A profound

meta-study conducted by Clark, Feinar, and Viehs (2015) looked at 41 studies, where 80 % of the papers show a positive correlation between good sustainability and superior financial performance. Orlitzky et al. (2003) also conducted a meta-study of 52 studies that showed a positive correlation between performance and ESG. Still, the studies within ESG research vary considerably in their findings and some researchers argue that the results on this topic are inconclusive (Gunnar et al., 2015). It seems that researchers find it hard to generalize the results regarding the link between ESG criteria and financial performance. Therefore, we will now present some existing studies, first with significant positive performance followed by negative or insignificant performance. The last part lays out some of the challenges related to existing literature.

3.2.1 Positive Financial Performance

In regard to finding a positive relationship between SRI and financial performance, as early as seventies, Moskowitz (1972) considers companies with solid corporate performance as more likely to show high financial performance. Kempf and Osthoff (2007) agrees and find a positive abnormal performance of the trading strategy based on going long in the high-rated portfolio and short in the low-rated portfolio. Their research is based on a sample period from 1992 to 2004. Statman and Glushkov (2009) made the same findings for the sample period from 1992 to 2007.

Another study that suggest positive abnormal performance is Gompers, Ishii, and Metrick (2003). Their research is based on 1 500 large US companies during the 1990s. By applying long-short investment strategy, their research results in an 8,5 % abnormal annual return after adjusting for factor exposures of the portfolios using the Carhart (1997) model (Gompers et al., 2003). Derived from the same long-short strategy, Drobetz, Schillhofer, and Zimmermann (2004) analyzed the impact of corporate governance on stock returns over the period 1998-2002 in Germany. Their results showed an annual excess return of 16,4 %.

Derwall et al. (2005) state in their research that the benefits of considering environmental criteria in the investment process can be substantial. They found a significant positive performance by using the best-in-class strategy. The best-in-class portfolio outperformed the worst-in-class portfolio by 5,96 % with a 5 % significance level (Derwall et al., 2005).

3.2.2 Negative Financial Performance

When looking at the negative relationship between SRI and financial performance, Hong and Kacperczyk (2005) reported higher expected returns for companies involved in producing alcohol, tobacco and gambling. These controversial forms of businesses are usually excluded from a portfolio because of negatives issues (Hong & Kacperczyk, 2005). Other works, such as Mackey, Mackey, and Barney (2007) and Graff and Small (2005), argue that investors expect companies to maximize their wealth without taking ESG into account, and assert that ESG engagement should be done separately.

Other researchers who have not found a significant abnormal performance between companies with high and low ESG ratings are Halbritter and Dorfleitner (2015). Their research is based on the US market between 1991 and 2012. ESG data is based on ASSET4, Bloomberg and KLD (Halbritter & Dorfleitner, 2015). Auer and Schuhmacher (2016) use a new database that reevaluates the ESG score more frequently and the findings agree with Halbritter and Dorfleitner (2015). In the paper written by Blankenberg and Gottschalk (2018), their research also indicates that a sustainable portfolio does not perform significantly differently from a conventional one.

From 1990 to 1998, Statman (2000) investigated the performance of 31 SRI funds in the US. Statman found an average monthly alpha equal -0,42 % for SRI funds and -0,62 % for non-SRI funds, but the difference is not significant. The findings suggest no significant differences between SRI funds and non-SRI funds. Bauer, Koedikj, and Otten (2005) agreed with Statman (2000) results, stating that here is no evidence of a statistically significant difference in returns between SRI funds and conventional funds. Their research is based on German, UK and US ethical mutual funds by applying the Carhart (1997) model.

In agreement with the Efficient Market Hypothesis, Adler and Kritzmanm (2008) found through Monte Carlo simulations that imposing sustainability limitation on the portfolio carries additional costs to the investment approach (Fama, 1970). Similarly, Renneboog et al. (2008) found that the performance of mutual funds suffers when applying ethical considerations. They also state that empirical literature on SRI hints, but does not signify that SRI investors are willing to accept suboptimal financial performance when enforcing social objectives.

3.2.3 Additional Aspects

One challenge is that most empirical studies on this topic compare the performance of socially responsible investment funds with the performance of traditional investment funds. These studies' weak point means that the performance of investment funds relies to a large extent on the fund managers abilities (Kempf & Osthoff, 2007). This is an issue because it is difficult to separate the effect of socially responsible investing from good management skills. A second issue is that many studies define socially responsible investing exclusively on the environmental criteria. Kempf and Osthoff (2007) argue, on the other hand, that most investors consider multiple ESG criteria. In order to overcome this problem, they have applied several ESG criteria in their research and concludes with a significant alpha of approximately 4 % per year (Kempf & Osthoff, 2007). Gunnar et al. (2015) claims that their study allows for generalization because it is the most fully comprehensive academic research overview.

There are also issues connected to the causal relationship between social responsibility and financial performance. According to Waddock and Graves (1997), the causality of the link is potentially a two-way relationship. They depict two alternatives where either slack resources or good management describe the link. According to slack resources theory, good financial performance leads to better corporate social performance because of excess resources. In contrast, good management theory states the opposite (Waddock & Graves, 1997).

In spite of the fact that the majority of existing literature ultimately suggest that there is a positive correlation between socially responsible investment and financial performance (Gunnar et al., 2015), more research on this topic appears to be necessary. The variety of relationships found in recent studies indicate that the link between ESG and financial performance is inconsistent. Many factors and circumstances may contribute to this relationship and affect it both positively or negatively.

3.3 Hypothesis Development

On the basis of prior research and economics theories, we have constructed the research hypotheses which will guide the analysis of our results. The hypotheses are deconstructed into two segments. The first segment investigates the overall relationship we want to examine. The

second segment looks separately at each pillar and deepens the understanding of the ESG score.

Despite the efficient market hypothesis and traditional economic theories that indicate no abnormal return, there seems to be an overarching proportion of existing ESG literature that shows a positive relationship between ESG and a company's operating performance. A positive hypothesis will therefore be applied in this study. Furthermore, the ESG information may have a time lag, which is why we have chosen to look at one-year lagged ESG ratings (Goss & Roberts, 2011). Lagged ESG rating is also a tool variable to prevent the causality issue. This leads to our first hypothesis in segment one. This hypothesis is applicable for both the normal ESG scores and the combined ESG score, regardless of the investor viewpoint.

Hypothesis I: *There is a significant positive lagged relationship between the annual ESG ratings of a company and its financial performance*

Segment two will contribute insight into how the three pillars scores contribute to a company's performance. This will provide validity to our results in segment one. We postulate our second hypothesis as follows:

Hypothesis II a: *There is a significant relationship between environmental score of a firm and its financial performance*

Hypothesis II b: *There is a significant relationship between the environmental score of a company and its financial performance*

Hypothesis II c: *There is a significant relationship between the governance score of a company and its financial performance*

4 Methodological Approach

In the following section, relevant methodology will be presented. First, we start by introducing a performance evaluation of ESG portfolios. In order to measure performance, we impose three different factor models: Capital Asset Pricing Model, Fama-French three-factor model and the Carhart (1997) four-factor model. We will also present the portfolio construction followed by robustness tests.

4.1 Performance Evaluation

In this subsequent subsection, the steps to evaluate the performance of the trading strategies are presented. The standards for performance measurement in academic ESG-related research are factor models (Hiller, Grinblatt, & Titman, 2012). It is common to distinguish between single factor models and multi factor models. A single factor model is a model that consists of only one factor. A multi factor model consists of several factors (Hiller et al., 2012). The idea is that with several factors, additional aspects of risk beyond market risk can be taken into account (Hiller et al., 2012). These models require less restrictive assumptions than a single factor model (Hiller et al., 2012). A multifactor model is normally estimated by multiple linear regression where the dependent variable is the return on an individual asset and the independent variables are returns on different risk factors (Alexander, 2008).

To evaluate the performance based on factor models, we will use abnormal return. Abnormal return is calculated as the difference between expected return and actual return of an asset or portfolio (Alexander, 2008). We will use monthly return on the portfolio as actual return. The abnormal return could either be positive or negative. Alpha in factor models is often interpreted as abnormal return (Jensen, 1968). Alpha is the risk-adjusted performance that represents the average return on a portfolio or investment (Chen, 2019).

To choose performance benchmarks, we follow the standard in ESG literature. Firstly, the capital asset pricing model will be estimated. Secondly, we estimate Fama and French three-factor models, followed by a Carhart four-factor model. Betas will be estimated from an ordinary least squares (OLS) time series regression of excess return. The standard errors will be estimated using the Newey and West (1987) method.

4.1.1 Capital Asset Pricing Model

The model that will be employed in step one of our analysis is the Capital Asset Pricing Model (CAPM). The CAPM is a well-known single factor model and a cornerstone of empirical analysis. The model is built upon the mean-variance efficient portfolio of Markowitz (1952), and is based on the risk-return relationship of all assets. In CAPM, return is explained by the single factor market excess return. In other words, asset return is a function of the covariance with the market portfolio (Copeland, Weston, & Shastri, 2014). The theoretical CAPM is expressed as a simple model:

$$E(R_j) = R_f + [E(R_m) - R_f]\beta_j$$

Where $E(R_j)$ is the expected return on portfolio j. $E(R_m)$ is the expected return on market portfolio. R_f is the risk-free rate of return and beta is the risk factor sensitive of the asset. Most academics use the short-term treasury bill return as the risk-free return (Hiller et al., 2012). The model slope, beta, is a product of the market correlation and the portfolio's relative volatility with respect to the market portfolio. The beta equals the systematic risk, which involves the general perils of investing that cannot be diversified away (Alexander, 2008). Beta can be obtained from a linear regression with the left-hand side as the asset return, and the right side as a proxy for the market return (Hiller et al., 2012).

When CAPM is used for empirics, the theoretical is transformed from expectation (ex-ante) into an ex-post using observed data. The resulting formula is as follows:

$$R_t - R_{f,t} = \alpha + \beta(Rm_t - R_{f,t}) + u_t$$

Where R_t is the portfolio returns and $R_{f,t}$ is the risk-free rate. The difference equals excess returns. u_t is the error-term. The intercept is the Jensen's alpha (Jensen, 1968).

4.1.2 Fama-French Three-Factor Model

The Fama-French three-factor model is the second model that will be employed. This model is an extended version of CAPM that adds size risk and value risk factors to the market risk factor. Fama and French's research concludes that returns on the stocks of small companies

covary more with one another than with returns on the stocks of large firms. Return on companies with high book-to-market ratios (value stock) covary more with one another than returns on companies with low book-to-market ratios (growth stock) (Fama & French, 2004). Based on this evidence, Fama and French developed a three-factor model:

$$R_{it} + F_{ft} = \alpha_{it} + \beta_1(R_{Mt} - R_{ft}) + \beta_2 SMB_t + \beta_3 HML + \varepsilon_{it}$$

The dependent variable is the excess return on the portfolio in month t and α is the three-factor alpha (Jensen's alpha). SMB is the difference between the returns on diversified portfolios of small and big stocks. HML is the difference between the returns on diversified portfolios of high and low book to market stocks. The Bs are factor sensitivity that explain how the asset or portfolio is affected by market risk (β_1), capitalization (β_2) and book-to-market ratio (β_3). ($R_m - R_f$) is the market risk premium (Fama & French, 2004).

The Fama-French three-factor model provides a more accurate description of average asset returns, and it captures most of the average return irregularity missed by the CAPM (Fama & French, 1996). Because of its accuracy, this model is widely used in empirical research (Fama & French, 2004). On the other hand, this model is not free of shortcomings. The explanatory variables of returns are not motivated by states that concerns investors. Instead, they are constructed to capture the patterns on how stock returns vary with size and book-to-market ratio, but these concerns are not fatal (Fama & French, 2004). A problem that has been pointed out by researchers in both CAPM and the three-factor model is that companies with a high cash flow tend to have higher returns that are not captured by these models (Fama & French, 2004).

The most severe problem with the model developed by Fama and French (2004), is that the momentum effect is not accounted for. This effect was discovered in Jegadeesh and Titman (1993). Stocks that have performed well relative to the market over the last three to twelve months tend to continue to do well over subsequent months, while stocks that perform poorly tend to continue their downward trajectory (Fama & French, 2004).

4.1.3 Carhart Four-Factor Model

The Carhart four-factor model is the third model. This model is an extended version of Fama and French's three factor model, where a fourth factor is added (Carhart, 1997). Carhart's empirical findings showed that the performance of mutual funds is not explained by stock-picking skills among fund managers, but rather by common factors in the stock market (Carhart, 1997). The four-factor model may explain considerable variations in returns and the model eliminates close to all patterns in pricing errors (Carhart, 1997). The momentum effect is short-lived, which makes it irrelevant for estimating the cost of equity capital on a long-term basis (Fama & French, 2004). The four-factor model can be expressed in following way:

$$R_t + R_{ft} = \alpha + \beta_1\left(R_{Mt} - R_{ft}\right) + \beta_2 SMB_t + \beta_3 HML + \beta_4 WML + u_t$$

Where α is the four-factor alpha and WML is the difference between stocks with high prior returns and low prior returns. The β's are factor sensitivities. The dependent variable is the excess return.

4.2 Portfolio Construction

In this subsection, we present how the portfolios are constructed. The portfolios are constructed based on the one-year lagged ESG scores where the financial performance is evaluated in the subsequent year. This is the common standard for examining the relationship between ESG and financial performance. The ESG scores used to construct the portfolios are either gathered from the regular ESG score, ESG combined score (ESGC) or separated into environmental (ENV), social (SOC) or governance (GOC) scores. The scores are used as a trading signal. All scores are available at Eikon.

The portfolios are based on a subset of the sample for which the score is above or below a cut-off level based on a percentile of the score distribution for each month. The subset of the sample consists therefore of a percentile of companies that either have a high or low ESG score. Portfolios containing companies with a high ESG score are denoted as "top" and portfolios containing companies with a low ESG score are denoted as "bottom". The portfolio weights are determined by their market capitalization.

Furthermore, our portfolios are constructed with a cut-off level fixed at both top and bottom of 30 %, 20 % and 10 %. These portfolios investigate for abnormal return in both long and short positions. In addition, we have also constructed a long-short strategy. The long position is held in top rated companies and the short position is held in bottom rated companies. All portfolios are rebalanced on the first business day of January each year.

The portfolios based on ESG, ENV, SOC and GOV scores, are constructed with respect to the best-in-class approach. The portfolios based on the ESGC score, are based on both negative and positive screening. The ESGC score is adjusted according to controversiality. This implies that companies involved in any controversial activity will have their rating lowered. The result of this is that the top-rated sample will be relatively free of any controversy, while the bottom rated sample will only consist solely of highly controversial companies. However, this method has at least one drawback. A company with an extremely high ESG score, could theoretically be included in the positive screened sample even through the company is controversial. We are convinced that this is a negligible problem. In our opinion, this is a new and easier approach to the negative and positive screening process in ESG portfolio construction.

4.3 Robustness Test

To possibly help explain the results obtained from conducting the analysis with different portfolio cut-offs as described above, robustness tests are performed. First, the portfolios are re-estimated based on equal weights rather than market capitalization in order to out rule out the possibility that the results are driven by weight and check if the results are sensitive to portfolio construction. Our equally weighted portfolio is calculated as follows:

$$R_{mt} = \sum_{i=1}^{N} \frac{r_{it}}{N\ firms_t}$$

Secondly, we analyze the sensitivity of our results by re-estimating the four-factor model into two different sub-periods. By looking at two different sub-periods, we can see if there is a shift in abnormal returns over time. The first period extends from 2004 until 2009 and the next period from 2010 until 2019. The periods have been chosen based on previous research that indicates that abnormal performance slowly diminishes (Halbritter & Dorfleitner, 2015).

5 Data

This section outlines the data used in the analysis. We start by introducing the data collection followed by more detailed data description. The last section describes our regression sample alongside variables and descriptive statistics.

5.1 Data Collection

The data used in this study is collected from the Thomson Reuters Datastream and Refinitiv available via Eikon, Compustat and XE. The Thomson Reuters Datastream offers both financial and non-financial data that satisfies the need for a sufficient and trustworthy dataset to examine the link between ESG and financial performance. The ESG data available in Eikon is widely used in academic research and will be applied in this study.

We have used the new ESG score in Eikon from Refinitiv - formerly known as Thomson Reuters Financial & Risk business (Thomson Reuters, 2018). This ESG statistical database is designed to transparently and objectively measure relative ESG performance among companies. The database is an enhancement and replacement to the existing equally weighted ASSET4 database. The ratings are based on more than 70 key performance indicators from over 400 data points and comprise more than 9 000 companies globally (Refinitiv, 2020). The calculations are based on company-reported data such as annual reports, company websites, NGO websites, stock exchange filings, corporate social responsibility (CSR) reports and news resources. Their scores are calculated by algorithms and human process selection based on several categories in the environmental, social and governance pillar (Refinitiv, 2020). In contrast to the ASSET 4 database, the ESG scores are not equally weighted. The weights for the total ESG score as well as for the pillar scores can be seen in table 5.1.

Table 5.1 Weights of Categories in the ESG and Pillar Score

Pillar	Category	Indicators in rating	Weights	Pillar weights
Environmental (ENV)	Resource use	19	11 %	
	Emissions	22	12 %	(11 %+ 12 % + 11 %)
	Innovation	20	11 %	
Social (SOC)	Workforce	29	16 %	
	Human rights	8	4,50 %	(16 % + 4,5 % + 8 % + 7 %)
	Community	14	8 %	
	Product responsibility	12	7 %	
Governance (GOV)	Management	34	19 %	
	Shareholders	12	7 %	(19 % + 7 % + 4,5 %)
	CSR strategy	8	4,5 %	
Total		178	100 %	

There are three overall ESG scores in the model: ESG score, ESG controversy score and ESG combined score (ESGC), where ESGC is the average of the ESG and ESG controversy score (Refinitiv, 2020). We obtained scores from ESG, ESGC and scores for each pillar. Hence, we ended up with annual data for five different scores (ESG, ESGC, ENV, SOC and GOV), which are used as a trading signal for the following analysis.

To gather information about the stock selection, we have used the Stoxx 600 and S&P 350 Europe as a starting point. The Stoxx 600 is a European subset of the global Stoxx 1800 index (Stoxx, 2020). Both indexes are weighted according to their constituent's market capitalization and consist of various companies in 17 European developed countries. The data is collected from the Compustat database, where historical constituents for both indexes, prices, the International Securities Identification Number (ISIN), number of shares and currency codes were found and exported. Historical currency rates are exported from XE.

5.2 Data Description

In the previous section, the database used in this study was presented. In this section we will describe our data in more detailed and present necessary decisions. The data is gathered from a total of 1 088 European public companies over the years from 2004 to 2019. The study period is chosen based on data availability. Companies have been eliminated from the dataset due to lack of ESG information. Despite Eikon's claim to have broad ESG coverage on Stoxx 600 and S&P 350 Europe, we discovered that several of the companies does not have any kind of ESG rating. Furthermore, we have used ISIN codes to match our ESG dataset with the

stock selection. Companies where the ESG reporting or other information is incomplete have also been eliminated. Furthermore, low valued stocks ("penny stocks") are problematic, since they tend to have highly exaggerated returns (Ødegaard, 2020). Thus, we have removed all companies with a price below 1 GPB. Consequently, we ended up with a sample consisting of stocks from the Stoxx 600 and S&P 350 Europe with stock prices above 1 GPB.

Furthermore, we were forced to use annual ESG data because of infrequent reporting. Therefore, all portfolios are revisited at the start of each year and held until new ESG data is available at the beginning of next year. In addition to the stock return, we have used a monthly time series on each portfolio in order to utilize variations in share prices and avoid potential noise when using more frequent data.

Regarding currency, potential foreign exchange rate differences should not be reflected in the returns for each company. Therefore, all data is collected in the respective currencies. Still, when calculating market capitalization based on company size, we need the data in the same currency. We will therefore amass foreign exchange rates from CHF, CZK, EUR, GBP, NOK, PLN and SEK into either USD or GBP depending on whether we take the view of an US investor or UK investor who can choose to invest in European companies. The data in GBP is matched with variables from the UK, and the data in USD is matched with variables for the US. Furthermore, exchange rate risk is ignored in accordance with Fama and French tests of international asset pricing models. This implies that Fama and French either assume complete purchasing power parity or the asset they consider cannot be used to hedge exchange risk (Fama & French, 2012).

5.3 Regression Sample

In this subsection, the final sample will be presented. First the dependent variable and independent variables for our regression sample will be defined. Afterwards we will dive deeper into the sample and present some descriptive statistics.

5.3.1 Dependent Variable and Independent Variables

As defined in the model of this study, the dependent variables represent financial performance. In this paper the financial performances are measured by excess return equal to

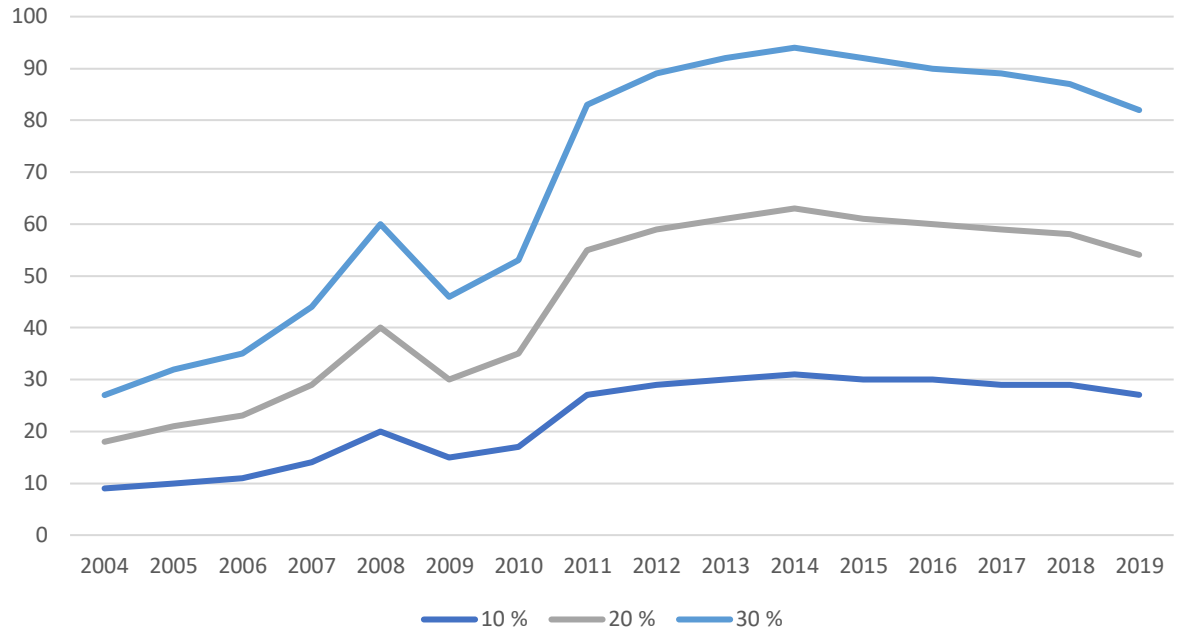
the return on portfolio minus the risk-free rate of return. The risk-free rate is calculated from a one-month T-bill by Kenneth French available on his website for the portfolios from the viewpoint of a US investor. Regarding the viewpoint of a UK investor, the risk-free rate is collected from the University of Exeter Business School (2020). The dependent variables are winsorized at the 5 % and 95 % levels to limit outliers in the distribution of data. This implies that variables with values above the 95th percentile and below the 5th percentile are replaced by the values of 95th and 5th percentiles (Adams, Hayunga, Mansi, Reeb, & Verardi, 2018).

The independent variables are an excess return from the market portfolio, SMB, HML and WML. These are the variables included in CAPM, the Fama-French three-factors model and the Carhart four-factors model. The part of the analysis that investigates the perspective of an US investor who can choose to invest in European companies, uses the factors excess return from the market portfolio, SMB, HML and WML calculated by Kenneth French available on his website (French, 2020). Similarly, the viewpoint of a UK investor uses the factors excess return from the market portfolio, SMB, HML and WML collected from the University of Exeter Business School (2020). Due to some limited data, these factors from the University of Exeter Business School (2020) are only available until 2017. This implies that our regression sample for the UK perspective, consists solely of the time period 2004 to 2017.

5.3.2 Descriptive Statistics

After collecting data and eliminating companies as described in Section 5.3, the final sample consisted of 3 682 observations, representing 605 unique companies. The number of observations per year can be found in figure 2A in Appendix A. The maximum number of observations across all the years is 316 in 2013. The minimum number of observations is 93, reported in 2004. When looking at the number of stocks in the sample divided into the top and bottom percentile, we can see that there are only few companies representing the lowest threshold in 2004. This is illustrated in figure 5.1. This number increases up until 2008, followed by a downward period in 2009. After 2010, the number of stocks has more than doubled. During the following years, the number is sharply higher and more stabilized.

Figure 1 Number of Stocks Traded in the Percentile Strategies



Our remaining sample covers companies representing 12 different countries. Figure 3A in Appendix A shows the distribution of countries in the sample. We can see that the UK represents more than 23 % of the total, followed by France as number two with 15 % and Germany with 13 % respectively. Despite the dominance of these three countries, the sample is well diversified. According to industry, we have used the Standard Industrial Classification (SIC) code to classify industries as unique companies in the sample. Table 5.2 shows the industry breakdown. We can see that manufacturing dominates with 214 unique companies reported, followed by finance and insurance with 88. Activities such as arts, health care and other services have a low representation in this sample, with six, three and two companies respectively. Overall, the final sample consists of companies from 12 different industries.

Table 5.2 Industry Breakdown of the Sample

Industry	Firms	Industry	Firms
Accommodation and Food Services	7	Information	47
Administrative and Support and Waste Management and Remediation Services	14	Manufacturing	214
Arts, Entertainment, and Recreation	6	Mining, Quarrying, and Oil and Gas Extraction	27
Construction	21	Other Services (except Public Administration)	2
Finance and Insurance	88	Professional, Scientific, and Technical Services	28
Health Care and Social Assistance	3	Real Estate and Rental and Leasing	23

The table represents the industry breakdown of the unique firms in the sample. Note that some firms are missing during a lack of sic code.

Table 5.3 shows the descriptive statistics of the independent variables in both investor perspectives. The number of observations is different due to limited data for the UK perspective. In terms of of the risk-free rate, the UK sample is slightly higher compared to the US sample. This implies that the excess return for the sample from the perspective of a UK investor will be somewhat lower. Looking at the excess return from the market portfolio, there are small differences between the investor perspectives regarding the mean. When focusing on minimum and maximum variables, the distribution for the US perspective deviates more than the UK. Regarding SMB, the minimum and maximum variables for the US perspective are much lower than the UK. Hence, the mean of SMB is higher for the perspective of a UK investor. Concerning HML, the distribution for the UK perspective deviates more than the US. Despite this, the mean remains higher for the UK perspective. The last variable, WML, has the lowest minimum value from the perspective of a US investor and highest maximum value from the perspective of a UK investor. Overall, the mean values of the independent variables are higher from a UK perspective compared to a US.

Table 5.3 Descriptive Statistics for the Independent Variables

Variable	Obs	Mean	Standard dev	Min	Max
			UK		
Risk free rate	168	0,0015707	0,0017272	0,000000833	0,0046859
Excess return market	168	0,0059012	0,0365791	-0,1360605	0,0989555
Small minus Big	168	0,001555	0,0325477	-0,01477521	0,15607
High minus low	168	-0,001341	0,0235898	-0,0701474	0,0900572
WML	168	0,0086289	0,0431795	-0,250283	0,1351331
			US		
Risk free rate	192	0,0010516	0,0013278	0	0,0044
Excess Return Market	192	0,0058417	0,0508826	-0,2203	0,1367
Small minus Big	192	0,0013927	0,0177295	-0,049	0,049
High minus low	192	-0,0001708	0,0213898	-0,0498	0,0752
WML	192	0,0079427	0,0351848	-0,261	0,1012

Descriptive statistics for the independent variables. Risk free rate, Excess return market, SMB, HML and WML are reported for both investor perspectives.

Furthermore, Table 5.4 represents the top and bottom annual mean excess return for all ESG scores using a 10 %, 20 % and 30 % portfolio cut-off weighted with market capitalization. Given the results, it is clear that the mean excess return is higher for the US perspective compared to the UK perspective. This is consistent with the risk-free values summarized in Table 5.3. In addition, the mean excess return seems to be higher for the bottom portfolios, especially when looking at the ESGC ratings with a 30 % portfolio cut-off. Here, we can see that the highest value from a US investor's viewpoint is equal to 7,64 % for the bottom portfolio with a view of a US investor. Overall, there are some variations between the differents trading strategies.

Table 5.4 Market-Cap-Weighted Percentile Strategies

Cut-off		10 %	20 %	30 %
		ESG		
Mean excess returns	Top	0,0238 (0,0285)	0,0154 (0,0184)	0,0172 (0,0207)
	Bottom	0,0512 (0,0561)	0,0482 (0,0545)	0,0391 (0,0467)
		ESGC		
Mean excess returns	Top	0,0120 (0,0278)	0,0273 (0,0383)	0,0204 (0,0321)
	Bottom	0,0391 (0,0400)	0,0577 (0,0565)	0,0622 (0,0764)
		ENV		
Mean excess returns	Top	0,0314 (0,0361)	0,0277 (0,0285)	0,0157 (0,0178)
	Bottom	0,0428 (0,0477)	0,0472 (0,0508)	0,0347 (0,0352)
		SOV		
Mean excess returns	Top	0,0246 (0,0331)	0,0063 (0,0142)	0,0219 (0,0273)
	Bottom	0,0490 (0,0550)	0,0591 (0,0647)	0,0477 (0,0574)
		GOV		
Mean excess returns	Top	0,0241 (0,0240)	0,0306 (0,0328)	0,0273 (0,0311)
	Bottom	0,0420 (0,0512)	0,0503 (0,0572)	0,0473 (0,0506)

Annualized mean excess returns from every ESG rating strategies. The value above the parentheses representing the UK perspective and the values in the parentheses representing the US perspective. All portfolio cut-offs are reported.

6 Empirical Results

In this chapter, our empirical results of the relationship between ESG and financial performance are presented. We will look first at the results from the factor models, after which we will present the results of the robustness tests.

6.1 Factor Models

In this section, the strategies will be evaluated by factor models. We will start by presenting the results from portfolios with a fixed cut-off level of 30 % from both the perspective of a UK and a US-based investor weighted with market capitalization. Table 6.1 presents the results of ESG and ESGC trading strategies weighted with market capitalization from the perspective of a UK investor, followed by Table 6.2 showing the results for the ENV, SOC and GOV strategies. Table 6.3 and Table 6.4 presents the results of ESG, ESGC, ENV, SOV and GOV strategies weighted with market capitalization from the perspective of a US investor.

Starting with the CAPM model from the UK perspective, we can see negative alpha's for all portfolios. However, there are still some differences regarding significance. The top portfolios all have significant alphas at the 5 % or 10 % level except for SOC, while the bottom portfolios have no significant intercepts. The long-short strategy does not yield any significant abnormal performance according to the CAPM. The slope remains relatively the same for all portfolios, indicating the same market risk, and its significant at the 1 % level for all portfolios except for the long-short strategy.

Adding the SMB and HML factor to the UK perspective, the alphas change slightly. The negative abnormal performance in the top segment is slightly higher than estimated by the CAPM and is significant for all the top portfolios. This indicates that negative abnormal return increases when additional risk factors are accounted for. Bottom rated companies have no significant alphas when this model is applied, which is the same result as the CAPM. One interesting observation is that the SMB and HML factors are only significant for the bottom ENV, GOC and SOC portfolios. This indicates that companies with low ENV, SOC and GOV strategies varies more with SMB and HML than other companies. The SMB factor is significant generally for the long-short strategy.

Adding the fourth factor to the UK perspective does not change much. Alpha is significant for top rated companies except for GOV, but is slightly lower than anticipated by Fama and French. The slope for the Carhart model's additional factor is generally small in our analysis and only occasionally significant. Bottom rated companies and the long-short strategy does not provide any abnormal performance according to any of our models from a UK-based perspective.

For the long-short strategy, all models have low explanatory abilities from a UK perspective. There are few to non-significant variables when comparing top and bottom portfolios, and the adjusted R^2 is generally negative or below 10.

Table 6.1 Factor Models for the ESG and ESGC with Perspective of UK-based Investor

	t30	t30	t30	b30	b30	b30	ls30	ls30	ls30
	CAPM	FF	Carhart	CAPM	FF	Carhart	CAPM	FF	Carhart
					ESG				
Alpha	-0,0037**	-0,0040**	-0,0036**	-0,0016	-0,0022	-0,0020	-0,0021	-0,0018	-0,0018
RM-rf	0,8664***	0,8909***	0,8901***	0,8897***	0,9073***	0,9065***	-0,0232	-0,0164	-0,0163
SMB		-0,0142	-0,0264		0,2135	0,2013***		-0,2278***	-0,2277***
HML		-0,0796	-0,1046		-0,1062	-0,1315		0,0267	0,0268
WML			-0,0389			-0,0392			0,0003
R^2	0,6567	0,6547	0,6541	0,6672	0,6946	0,6941	-0,0043	0,1155	0,1100
					ESGC				
Alpha	-0,0039**	-0,0045***	-0,0039**	-0,0019	-0,0021	-0,0023	-0,0020	-0,0024	-0,0016
RM-rf	0,8679***	0,9135***	0,9119***	0,8508***	0,8579***	0,8584***	0,0171	0,0556	0,0534
SMB		0,0719	0,0485		0,0240	0,0327		0,0479	0,0157
HML		-0,1697	-0,2178***		-0,0291	-0,0112		-0,1405**	-0,2065***
WML			-0,0749**			0,0279			-0,1027***
R^2	0,6509	0,6571	0,6604	0,6174	0,6133	0,6116	-0,0049	0,0110	0,0095

Results include ESG and ESGC strategies with perspective of a UK investor. Long, short and long-short strategies are applied using 30 % portfolio cut off weighted with market capitalization. Monthly alphas, factor loadings concerning size, value and momentum, including adjusted R^2 are reported. The standard errors are estimated using the Newey and West (1987) method. ***, ** and * indicate significance at the 1 %, 5 % and 10 % level.

Table 6.2 Factor model for ENV, SOC and GOV with Perspective of UK-Based Investor

	t30	t30	t30	b30	b30	b30	ls30	ls30	ls30
	CAPM	FF	Carhart	CAPM	FF	Carhart	CAPM	FF	Carhart
					ENV				
Alpha	-0,0036***	-0,0038***	-0,0035***	-0,0014	-0,0021	-0,0014	-0,0021	-0,0017	-0,0021
RM-rf	0,8725***	0,8995***	0,8987***	0,8483***	0,8732***	0,8715***	0,0282	0,0263	-0,0272
SMB		-0,0096	-0,0213		0,1822***	0,1561**		-0,1918***	-0,1774***
HML		-0,0892	-0,01131		-0,1378*	-0,1913**		0,0487	0,0782
WML			-0,0373			-0,0832*			0,0459
R^2	0,6558	0,6541	0,6533	0,6209	0,6420	0,6467	-0,0035	0,0747	0,0765
					SOC				
Alpha	-0,0027	-0,0031*	-0,0028*	-0,0008	-0,0016	-0,0012	-0,0019	-0,0015	-0,0015
RM-rf	0,8298***	0,8591***	0,8584***	0,8483***	0,8920***	0,8912***	-0,0185	-0,0328	-0,0328
SMB		0,0264	0,0158		0,1653***	0,1533***		-0,1389***	-0,1375***
HML		-0,1051	-0,1268		-0,1842**	-0,2088***		0,0791	0,0819
WML			-0,0338			-0,0383			0,0045
R^2	0,6431	0,6340	0,6392	0,6631	0,6858	0,6854	-0,0045	0,0557	0,0501
					GOV				
Alpha	-0,0029*	-0,0032*	-0,0027	-0,0015	-0,0019	-0,0019	-0,0014	-0,0012	-0,0008
RM-rf	0,8604***	0,8846***	0,8833***	0,8582***	0,8659***	0,8659***	0,0022	0,0186	0,0174
SMB		-0,0141	-0,0318		0,1567**	0,1652***		-0,1799***	-0,1970***
HML		-0,0784	-0,1147		-0,0626	-0,0637		-0,0158	-0,0509
WML			-0,0564			-0,0017			-0,0548
R^2	0,6550	0,6529	0,6540	0,6446	0,6595	0,6574	-0,0060	0,0548	0,0584

Results include ENV, SOC and GOV strategies with perspective of a UK investor. Long, short and long-short strategies are applied using 30 % portfolio cut off weighted with market capitalization. Monthly alphas, factor loadings concerning size, value and momentum, including adjusted R^2 are reported. The standard errors are estimated using the Newey and West (1987) method. ***, ** and * indicate significance at the 1%, 5% and 10% level.

From US perspective, all alphas are negative according to the CAPM for the top-rated portfolios. Overall, the remain closer to zero than those provided by the UK perspective, but none of them are significant. For the bottom-rated portfolios, all have positive intercepts except for ESGC. For the long-short strategy, all portfolios have negatively insignificant abnormal performance. The market beta is generally lower than from the UK perspective, which indicates a lower market risk from a US perspective.

The Fama-French model, from a US perspective, forces the intercept closer to zero for the top ESG, ESGC and ENV portfolios compared to the CAPM, while the top GOV and SOC portfolios all have positive alphas. All the bottom-rated portfolios have positive alphas while the long-short strategy has negative intercepts. All of the long-short intercepts are insignificant except for ENV. The SMB factor is generally significant for all of the top portfolios as well as most of the bottom and the long-short strategy-based portfolios. HML is only occasionally significant.

Carhart's model yields positive alphas for all bottom and top portfolios except for ESG top, ENV top and ESGC bottom. The long-short strategy has negative alphas except for ESGC, which is significant at the 10 % level. No other alphas are significant according to Carhart's model. The WML factor is rarely significant.

The long-short strategy has better explanatory capabilities from a US perspective than a UK. In general, the adjusted R^2 rates are higher while the left side variables are more frequently significant.

Table 6.3 Factor Models for the ESG and ESGC with Perspective of US-Based Investor

	t30	t30	t30	b30	b30	b30	ls30	ls30	ls30
	CAPM	FF	Carhart	CAPM	FF	Carhart	CAPM	FF	Carhart
					ESG				
Alpha	-0,0013	-0,0003	-0,0004	0.0006	0,0007	0,0009	-0,0018	-0,0010	-0,0014
RM-rf	0,5713***	0,5497***	0,5515**	0,6120***	0,6177***	0,6132***	-0,0407	-0,0681**	-0,0616*
SMB		-0,5819***	-0,5822***		-0,1198	-0,1191		-0,4621***	-0,4631***
HML		0,1000	0,1067		-0,0287	-0,0457		0,1288**	0,1524**
WML			0,0112			-0,0285			0,0397
R^2	0,6187	0,6980	0,6964	0,6311	0,6303	0,6288	0,0057	0,1875	0,1869
					ESGC				
Alpha	-0,0009	-0,0004	0,00018	-0,0001	0,0005	-0,0001	-0,0008	-0,0009	0,0003
RM-rf	0,5925***	0,5955***	0,5845***	0,5870***	0,5712***	0,5851***	0,0055	0,0243	-0,0006
SMB		-0,4285***	-0,4268***		-0,4591***	-0,4613***		0,0306	0,0344
HML		-0,0177	-0,0582		0,0731	0,1245		-0,0909	-0,1828**
WML			-0,0681			0,0860			-0,1545***
R^2	0,6259	0,6624	0,6645	0,6051	0,6487	0,6273	-0,0050	-0,0059	0,0541

Results include ESG and ESGC strategies with perspective of a US investor. Long, short and long-short strategies are applied using 30 % portfolio cut off weighted with market capitalization. Monthly alphas, factor loadings concerning size, value and momentum, including adjusted R^2 are reported. The standard errors are estimated using the Newey and West (1987) method. ***, ** and * indicate significance at the 1 %, 5 % and 10 % level.

Table 6.4 Factor Model for ENV, SOC and GOV with Perspective of US-Based Investor

	t30	t30	t30	b30	b30	b30	ls30	ls30	ls30
	CAPM	FF	Carhart	CAPM	FF	Carhart	CAPM	FF	Carhart
					ENV				
Alpha	-0,0021	-0,0012	-0,0014	0,0011	0,0014	0,0021	-0,0032	-0,0027**	-0,0035**
RM-rf	0,5870***	0,5722***	0,5767***	0,5657***	0,5552***	0,5436***	0,0213	0,0170	0,0330
SMB		-0,5641***	-0,5648***		-0,2177***	-0,2159***		-0,3464***	-0,3489**
HML		0,0673*	0,0837		0,0494	0,0069		0,0179	0,0767
WML			0,0276			-0,0713			0,0989
R^2	0,6379	0,7068	0,7057	0,5890	0,5962	0,5974	-0,0024	0,0805	0,0975
					GOV				
Alpha	-0,0005	0,0004	0,0039	0,0011	0,0015	0,0015	-0,0017	-0,0011	-0,0011
RM-rf	0,5603***	0,5374***	0,5369***	0,5524***	0,5785***	0,5774***	0,0121	-0,0412	-0,0405
SMB		-0,5500***	-0,5499***		-0,2683***	-0,2681***		-0,2817***	-0,2819***
HML		0,1067*	0,1053*		-0,0318	-0,0359		0,1385*	0,1412*
WML			-0,0024			-0,0069			-0,0045
R^2	0,6174	0,6736	0,6874	0,5809	0,5923	0,5901	-0,0044	0,0601	0,0551
					SOC				
Alpha	-0,0023	0,0006	0,0004	0,0013	0,0014	0,0015	-0,0015	-0,0008	-0,0011
RM-rf	0,5423***	0,5256***	0,5286***	0,5873***	0,6106***	0,6085***	-0,0448***	-0,0851***	-0,0799***
SMB		-0,5213***	-0,5217***		-0,2247**	-0,2244**		-0,2965***	-0,2973***
HML		0,0778	0,0890		-0,1151	-0,1227		0,1929***	0,2117**
WML			0,0188			-0,0128			0,0316
R^2	0,5864	0,6517	0,6501	0,6294	0,6396	0,6378	0,0125	0,1483	0,1469

Results include ENV, SOC and GOV strategies with perspective of a US investor. Long, short and long-short strategies are applied using 30 % portfolio cut off weighted with market capitalization. Monthly alphas, factor loadings concerning size, value and momentum, including adjusted R^2 are reported. The standard errors are estimated using the Newey and West (1987) method. ***, ** and * indicate significance at the 1%, 5% and 10% level.

The results for other cut-off levels and score types can be found in Tables 10.1, Table 10.2, Table 10.3 and Table 10.4 in Appendix B. Regarding the factor loadings of the Carhart (1997) four-factor model using portfolio cut-off points of 10 % and 20 %, we can see that there are no notable differences between the slopes of the portfolios with low or higher cut-offs. From the viewpoint of a UK investor however, there are just two portfolios with significant alphas at a 10 % cut-off linked to ESGC and GOV and three portfolios at a 20 % cut-off linked to ESG, ESGC and SOC, all of them top portfolios. This is consistent with our results from a 30 % cut-off point, but the number of significant alphas seems to decline when the cut-off level is fixed at a lower percentile. There are no significant alphas in the bottom portfolios at 10 % and 20 %, which is consistent with our results from the portfolios with cut-off level at 30%. In regard to the US perspective, the significance alphas disappear when using a 10 % and 20 % threshold. The slopes remain relatively the same as that for 30 %. This implies that there is more or less no differences between the thresholds. Altogether, there seems to be a possible difference in significance from the UK perspective and no difference for the US perspective with respect to cut-off level.

Overall, our findings suggest that a strategy of investing in companies with high ESG scores does not result in better financial performance, regardless of the viewpoint of the investor. Our analysis does not find any statistically significant differences besides for some significant alphas. When comparing these results with previous research, we can see that our results appear to point in the opposite direction. For instance, Kempf and Osthoff (2007) find an annualized alpha of 4,9 % and Statman and Glushkov (2009) find an alpha of 5 %. Both studies used the KLD database for scores during the sample period of 1992-2007 (Statman & Glushkov, 2009) and 1992-2004 (Kempf & Osthoff, 2007). However, some later studies that find no significant relationship, for example Halbritter and Dorfleitner (2015), who employ the KLD, Bloomberg and ASSET4 database for the sample period 1992-2012. These results are in line with our research. To possibly help explain the results obtained from this analysis, we will use the next subsection to look at the results of the robustness tests.

6.2 Robustness Test

This subsection presents the results from the tests we performed in order to assess the robustness and sensitivity of our results. First, we re-constructed our models based on equal weights instead of market capitalization to see if the weights have any impact on the results. Secondly, we re-estimated the four-factor model into two different sub-periods.

6.2.1 Equally Weighted Portfolios

Regarding the weights of our portfolios, Table 6.5 and Table 6.6 presents the annualized abnormal returns from Carhart (1997) four-factor model for both equally weighted and market capitalization weighted portfolios with long-, short- and long-short trading strategies. The portfolios in Table 6.5 represents the perspective of a UK investor while the portfolios in Table 6.6 represents the perspective of a US investor. Overall, there are some variations between market capitalization weighted portfolios and equally weighted portfolios. However, with a few exceptions, all abnormal returns are insignificant.

Broadly, there is no pattern according to the different trading strategies regarding the type of weighting, except that there are more significant alphas related to a long trading strategy or long-short trading strategy. Furthermore, there seems to be more significant abnormal performance linked to higher cut-off levels regardless of the type of weighting. From the perspective of a UK investor, all alphas are negative. In addition, there are more significant alphas weighted with market capitalization (Table 6.5). In contrast, from the perspective of a US investor, there are more significant annualized alphas based on equally weighted portfolios. The alphas have both positive and negative values (Table 6.6). All in all, due too only slightly significant annualized abnormal performance, it makes no difference whether the portfolios are market capitalization weighted or equally weighted.

Table 6.5 Robustness Test - Equally Weighted Portfolios with Perspective of UK-Based Investor

		Market capitalization weighted			Equally weighted		
		10 %	20 %	30 %	10 %	20 %	30 %
ESG	High-rated	-0,0174	-0,0351*	-0,0441**	-0,0135	-0,0208	-0,0078
	Low-rated	-0,0382	-0,0161	-0,0230	-0,0205	-0,0031	-0,0004
	Long-short	0,0212	-0,0190	-0,0212	0,0070	-0,0177	-0,0074
ESGC	High-rated	-0,0455**	-0,0405*	-0,0472**	-0,0219	-0,0368	-0,0386*
	Low-rated	-0,0019	-0,0098	-0,0280	0,0135	0,0141	0,0050
	Long-short	-0,0191*	-0,0307	-0,0191	-0,0354**	-0,0509**	-0,0436
ENV	High-rated	-0,0295	-0,0306	-0,0422**	-0,0423	-0,0247	-0,0142
	Low-rated	-0,0373	-0,0167	-0,0167	-0,0199	-0,0195	0,0003
	Long-short	0,0078	-0,0139	-0,0254	-0,0224	-0,0052	-0,0145
SOC	High-rated	-0,0207	-0,0331*	-0,0336*	-0,0013	-0,0180	-0,0198
	Low-rated	-0,0329	-0,0209	-0,0150	0,0119	-0,0077	-0,0053
	Long-short	0,0121	-0,0122	-0,0186	-0,0106	-0,0104	-0,0145
GOV	High-rated	-0,0379*	-0,0296	-0,0330	-0,0274	-0,0168	0,0036
	Low-rated	-0,0198	-0,0197	-0,0231	-0,0192	-0,0067	0,0077
	Long-short	-0,0181	-0,0099	-0,0099	-0,0082	-0,0101	-0,0113

Results of Carhart (1997) four-factor model. Portfolio cut-off 10%, 20% and 30%. Long, short and long-short strategy are applied, both in market capitalization and equally weighted variants. Perspective of a UK investor. Annualized abnormal returns are reported. The standard errors are estimated using Newey and West (1987) method. ***, ** and * indicate significance at 1%, 5% and 10% level.

Table 6.6 Robustness Test - Equally Weighted Portfolios with Perspective of US-Based Investor

		Market capitalization weighted			Equally weighted		
		10 %	20 %	30 %	10 %	20 %	30 %
ESG	High-rated	0,0125	-0,0005	-0,0051	0,0157	0,0094	0,0149
	Low-rated	0,0037	0,0183	0,0113	0,0160	0,0347	0,0327
	Long-short	-0,0164	-0,0187	-0,0164	-0,0003	-0,0253	-0,0178
ESGC	High-rated	0,0030	0,0039	0,0022	0,0157	0,0120	-0,0253
	Low-rated	0,0377	0,0070	-0,0021	0,0420*	0,0361	0,0304
	Long-short	0,0043	-0,0031	0,0043	-0,0263	-0,0240	-0,0282*
ENV	High-rated	0,0060	-0,0021	-0,0179	-0,0063	-0,0087	0,0055
	Low-rated	-0,0012	0,0163	0,0253	0,0102	0,0191	0,0380
	Long-short	0,0071	-0,0184	-0,0431**	-0,0164	-0,0278	-0,0325*
SOC	High-rated	0,0191	0,0010	0,0053	0,0368*	0,0193	0,0162
	Low-rated	0,0153	0,0227	0,0188	0,0356	0,0315	0,0313
	Long-short	0,038	-0,0217	-0,0135	0,0012	-0,0122	-0,0151
GOV	High-rated	-0,0099	0,0016	0,0046	0,0061	0,0138	0,0254
	Low-rated	0,0048	0,0110	0,0184	0,0023	0,0111	0,0258
	Long-short	-0,0148	-0,0094	-0,0138	0,0038	0,00026	-0,0004

Results of Carhart (1997) four-factor model. Portfolio cut-off 10%, 20% and 30%. Long, short and long-short strategy are applied, both in market capitalization and equally weighted variant. Perspective of a US investor. Annualized abnormal returns are reported. The standard errors are estimated using Newey and West (1987) method. ***, ** and * indicate significance at 1%, 5% and 10% level.

6.2.2 Two Sub-Periods

According to prior studies, there could be a link between financial performance and ESG in previous years. For instance, did Kempf and Osthoff (2007) appeared to have found a significant abnormal return for the period 1992 to 2004, while Halbritter and Dorfleitner (2015) found no significant abnormal return for the period 1992 to 2012. We have therefore re-estimated our models into two sub-periods to see if there is a shift in abnormal returns over time. The first period is from 2004-2009 and the second sub-period is from 2010-2019.

Tables 6.7 and 6.8 presents the annualized abnormal performance of the portfolios for the two sub-periods as well as the full sample. Long, short and long-short trading strategies are applied, both in market capitalization and equally weighted variant. The performance is estimated by Carhart's (1997) four-factor model, and the cut-off level is set at 30 %.

Concerning the UK perspective, each portfolio exhibits predominantly negative alphas during both sub-periods (Table 6.7). All alphas are insignificant, except a few from the last sub-period linked to ESGC and ENV strategies. From the viewpoint of a US investor, similar to the UK perspective, we can see that there are only significant alphas during the last sub-period (Table 6.8). The US perspective results in both positive and negative alphas. The results are contrary to previous research, but it is essential to emphasize that our research began in 2004 using ESG scores from Eikon. Studies that have found significant alphas in the early years are often based on ESG scores from the KLD database from the 1990s (Halbritter & Dorfleitner, 2015). Overall, in all samples the ESG scores show a lower influence on the financial performance than previous studies indicate. The results exhibit more significant alphas in the second sub-period. However, despite some significant alphas, most are insignificant. The model thus shows therefore no sign to notable disturbances regarding a shift in abnormal returns over time.

Table 6.7 Robustness Test for Two Sub-Periods with Perspective of UK-Based Investor

		Market capitalization weighted			Equally weighted		
		Full sample	2004-2009	2010-2017	Full sample	2004-2009	2010-2017
ESG	High-rated (t30)	-0,0441**	-0,0482	-0,0424	-0,0078	-0,0038	-0,0232
	Low-rated (b30)	-0,0230	-0,0368	-0,0171	-0,0004	-0,0150	0,0045
	Long-short (ls30)	-0,0212	-0,0114	-0,0253	-0,0074	0,0111	-0,0276
ESGC	High-rated (t30)	-0,0472**	-0,0395	-0,0628**	-0,0386*	-0,0316	-0,0499*
	Low-rated (b30)	-0,0280	-0,0049	-0,0484	0,0050	0,0015	-0,0005
	Long-short (ls30)	-0,0191	-0,0346	-0,0144	-0,0436	-0,0331	-0,0494***
ENV	High-rated (t30)	-0,0422**	-0,0370	-0,0519*	-0,0142	-0,0070	-0,0355
	Low-rated (b30)	-0,0167	-0,0439	-0,0084	0,0003	-0,0209	0,0075
	Long-short (ls30)	-0,0254	0,0068	-0,0436**	0,0145	0,0139	-0,0430**
SOC	High-rated (t30)	-0,0336*	-0,0288	-0,0334	-0,0198	-0,0242	-0,0180
	Low-rated (b30)	-0,0150	-0,0218	-0,0157	-0,0053	-0,0217	-0,0007
	Long-short (ls30)	-0,0186	-0,0071	-0,0177	-0,0145	-0,0025	-0,0174
GOV	High-rated (t30)	-0,0330	-0,0348	-0,0356	0,0036	0,0159	-0,0213
	Low-rated (b30)	-0,0231	-0,0245	-0,0228	-0,0077	-0,0220	0,0077
	Long-short (ls30)	-0,0099	-0,0103	-0,0128	-0,0113	0,0269	-0,0136

Results of Carhart (1997) four-factor model. Portfolio cut-off level set to 30%. Long, short and long-short trading strategy are applied, both in market capitalization and equally weighted variant. Perspective of UK investor. Annualized abnormal returns are reported for two sub-periods as well as full sample period. The standard errors are estimated using Newey and West (1987) method. ***, ** and * indicate significance at 1%, 5% and 10% level.

Table 6.8 Robustness Test for Two Sub-Periods with Perspective of US-Based Investor

		Market capitalization weighted			Equally weighted		
		Full sample	2004-2009	2010-2019	Full sample	2004-2009	2010-2019
ESG	High-rated (t30)	-0,0051	-0,0283	0,0047	0,0149	-0,0138	0,0271
	Low-rated (b30)	0,0113	-0,0430	0,0338	0,0327	-0,0254	0,0560**
	Long-short (ls30)	-0,0164	0,0147	-0,0291	-0,0178	0,0116	-0,0289
ESGC	High-rated (t30)	0,0022	-0,0283	0,0115	0,0022	-0,0373	0,0189
	Low-rated (b30)	-0,0021	-0,0102	-0,0060	0,0304	-0,0095	0,0443*
	Long-short (ls30)	0,0043	-0,0180	0,0176	-0,0282*	-0,0278	-0,0254
ENV	High-rated (t30)	-0,0179	-0,0388	-0,0083	0,0055	-0,0223	0,0132
	Low-rated (b30)	0,0253	-0,0349	0,0460*	0,0380	-0,0282	0,0656**
	Long-short (ls30)	-0,0431**	-0,0038	-0,0543***	-0,0325*	0,0059	-0,0523***
SOC	High-rated (t30)	0,0053	-0,0164	0,0106	0,0162	-0,0196	0,0324
	Low-rated (b30)	0,0188	-0,0257	0,0314	0,0313	-0,0271	-0,0557**
	Long-short (ls30)	-0,0135	0,0093	-0,0208	-0,0151	0,0075	-0,0232
GOV	High-rated (t30)	0,0046	-0,0120	0,0131	0,0254	0,0098	0,0304
	Low-rated (b30)	0,0184	-0,0279	0,0331	0,0258	-0,0231	0,0438
	Long-short (ls30)	-0,0138	0,0160	-0,0199	-0,0004	0,0328	-0,0135

Results of Carhart (1997) four-factor model. Portfolio cut-off level set to 30%. Long, short and long-short trading strategy are applied, both in market capitalization and equally weighted variant. Perspective of US investor. Annualized abnormal returns are reported for two sub-periods as well as full sample period. The standard errors are estimated using Newey and West (1987) method. ***, ** and * indicate significance at 1%, 5% and 10% level.

7 Discussion

In this section, we will discuss the results and limitations discovered in our thesis. By comparing our results with earlier studies using the same trading approach and adjusting data using Carhart (1997) four-factor model, we acknowledge that our results are somewhat contradictory. We assume that there are several reasons for this, some of which may be connected to the ESG ratings. The quality of SRI research is subject to the quality of the database that distributes the ESG information. The researchers have no choice but to assume that the ratings are correct. It is therefore relevant to point out that the results of an SRI analysis are tied to the information extracted from a specific ESG score's database. Our outcome is therefore highly dependent on the Refintiv ESG database as the only proxy for level of ESG activities.

The ESG data is generally not transparent and access to the data tends to be limited. When reliable information about ESG is provided to the market by companies, the impact of ESG activities on the corporate performance can be evaluated with less effort. Furthermore, as with any study of financial performance, this thesis is based on historical data. As a result, the analysis should be interpreted with caution. The market's preference of certain types of ESG screens may also change over time. However, because there is no explicit way of measuring ESG score and the fact that the perception of ESG has changed over time, our sample consist of what we define as "good" or "bad" ESG scores.

An additional aspect is that CSR scores are higher in civil law countries than in common law countries, and on average companies with a Scandinavian legal origin have the highest CSR scores (Liang & Renneboog, 2016). Our dataset includes companies from multiple countries included Scandinavian, and this may affect the ratings.

In contrast to existing research, we have applied the viewpoint of two different investors. This implies that we have used data from two databases when using Carhart's (1997) four-factor model. Since factor values for asset pricing models has a strong impact on the regression analysis, our results are consequently driven by the data extracted from the website of Kenneth French and University of Exeter Business School. We experience that the values from Exeter Business School are somewhat higher compared to the values of Kenneth French. This is reflected in our results.

The findings in this study are subject to some limitations. One of the limitations is that our data sample can be characterized as thin and could possibly be biased. Several companies were removed due to lack of an ESG rating or other missing data, such as price or number of shares. We cannot rule out the possibility that selection bias may have affected our results. Some of our portfolios consist of very few companies, such as the 10 % cut-off level portfolios, especially for the early period. It is difficult to draw any conclusions based on this, and the contribution from this part of our analysis is to provide increased insight only. Nevertheless, we believe it is better to have fewer companies rather than including multiple companies with a lack of information.

Lastly, we have chosen to ignore exchange rate risk and transaction cost in our analysis. For the long-short strategy, we assume that there is no collateral and no payment of deposit to the margin account. Therefore, payoffs from portfolios and strategies are unclear after incorporating transaction and exchange costs. The consequence of this choice is that aspects relevant to investors may have been left out and unaccounted for.

8 Conclusion

This thesis investigates whether there is a relationship between responsible investment and financial performance based on historical ESG scores used as a trading signal. The ESG score was gathered from the Refinitiv ESG score database available at Eikon. In contrast to most of the previous empirical literature, this paper focuses on European companies. Carhart's (1997) four-factor model is used to measure the financial performance. Furthermore, this study takes both a US and UK investor perspective into account, who can choose to invest in the European market as an alternative to their home market. Portfolios were constructed during the time period from 2004 to 2019 using a sample of 3 682 observations. These results are robust for different thresholds.

In light of the main research questions at hand, we find a negative relationship between financial performance and responsible investment. However, with a few exceptions, all negative abnormal performances are insignificant. Our results indicate that the models do not support evidence for the link between financial performance and ESG. Hence, there is no significant relationship between sustainability, ESG rating and financial performance in the European market. These findings are also consistent when deconstructing the ESG score into three pillar scores. Additionally, there are no notable differences between the US and UK investor perspectives.

Our results are supported by efficient market hypothesis and traditional economic theories. Researchers like e.g. Halbritter and Dorfleitner (2015) agrees with these results. Still, a lot of research results to the contrary. Common for studies with positive significant relationship is often an older time perspective and an older ESG database, for instance KLD Research and Analytics.

In summary, this study is strongly questions whether there is actually a link between level of ESG activities and financial performance which is useable with a trading strategy in sense of Carhart (1997) four-factor model. As a suggestion for future research, an alternative portfolio weighting approach could be used for the portfolio construction. Stocks that lack an ESG rating would not be excluded from the analysis, but instead given a lower weight. Furthermore, another strategy could be used where the trading signal was not be based on the ESG score but instead utilized the information of the change in the ESG score. The strategy

would then invest in companies depending on whether their ESG score had increased or decreased over a given time period.

9 References

Adams, J. C., Hayunga, D. K., Mansi, S., Reeb, D. M., & Verardi, V. (2018). Identifying and Treating Outliers in Finance. doi:10.2139/ssrn.2986928

Adler, T., & Kritzmanm, M. (2008). The cost of socially responsible investing. *The Journal of Portfolio Management, 35*(1), 52-56.

Alexander, C. (2008). *Practical Financial Econometrics*. England: John Wiley & sons Ltd.

Auer, B. R., & Schuhmacher, F. (2016). Do socially (ir)responsible investments pay? New evidence from international ESG data. *The Quarterly Review of Economics and Finance, 59*(C), 51-62. doi:10.1016/j.qref.2015.07.002

Bauer, R., Koedikj, K., & Otten, R. (2005). International evidence on ethical mutual fund performance and investment style. *Journal of Banking & Finance, 29*(2005), 1751-1767. doi:10.1016/j.jbankfin.2004.06.035

Blankenberg, A.-K., & Gottschalk, J. F. A. (2018). *Is Socially responsible investing (SRI) in stocks a competitive capital investment? A comparative analysis based on the performance of sustainable stocks*. Retrieved from University of Göttingen, Center for European, Governance and Econmic Development Research:

Carhart, M. M. (1997). On Persistence in Mutual Fund Performance. *The Journal of Finance, 52*(1), 57-82. doi:10.2307/2329556

Chen, J. (2019). Jensen's Measure. Retrieved from https://www.investopedia.com/terms/j/jensensmeasure.asp

Clark, G. L., Feinar, A., & Viehs, M. (2015). *From the Stockholder To the Stakeholder: How Sustainability Can Drive Financial Outperformance*. Retrieved from https://ssrn.com/abstract=2508281

Cooper, R. (2020, 21.january). Green Bonds issuance hit $255 billion in 2019. *Climate Action*. Retrieved from http://www.climateaction.org/news/green-bonds-issuance-hit-255-billion-in-2019

Copeland, T. E., Weston, J. F., & Shastri, K. (2014). *Financial Theory and Corporate Policy* Edinburg: Pearson Education Limited.

Derwall, J., Guenster, N., Bauer, R., & Koedjik, K. (2005). The Eco-Efficiency Premium Puzzle. *Financial analysts Journal, 61*(2), 51-63. doi:10.2469/faj.v61.n2.2716

Deutsche Bank. (2019). *Deutsche Bank Wealth Management accelerates ESG strategy: «Adding purpose to performance»*. Retrieved from

https://www.db.com/newsroom_news/2019/deutsche-bank-wealth-management-accelerates-esg-strategy-adding-purpose-to-performance-en-11582.htm

Drobetz, W., Schillhofer, A., & Zimmermann, H. (2004). Corporate Governance and Expected Stock Returns: Evidence from Germany. *European Financial Management, 10*(2), 267-293.

Duuren, E. v., Plantinga, A., & Scholtens, B. (2015). ESG Integration and the Investment Management Process: Fundamental Investing Reinveted. *Journal of Business Ethics, 138*, 525-533. doi:10.1007/s10551-015-2610-8

Eccles, R. G., & Klimenko, S. (2019). The Investor Revolution. *Harvard Business Review*, 106-116. Retrieved from https://hbr.org/2019/05/the-investor-revolution

Eurosif. (2016). *European SRI Study*. Retrieved from http://www.eurosif.org/wp-content/uploads/2016/11/SRI-study-2016-HR.pdf

Eurosif. (2018). *European SRI Study*. Retrieved from http://www.eurosif.org/wp-content/uploads/2018/11/European-SRI-2018-Study.pdf

Eurosif. (2020). Responsible Investment Strategies. Retrieved from http://www.eurosif.org/responsible-investment-strategies/

Fama, E. F. (1970). Efficient Capital Markets: A Review of a Theory and Empirical Work. *Journal of Finance 25*(5), 383-417.

Fama, E. F., & French, K. R. (1996). The CAPM is Wanted, Dead or Alice. *The Journal of Finance, 51*(5). doi:10.1111/j.1540-6261.1996.tb05233.x

Fama, E. F., & French, K. R. (2004). The Capital Asset Pricing Model: Theopry and Evidence. *Journal of Economic Perspectives, 18*(3), 25-46.

Fama, E. F., & French, K. R. (2012). Size, Value, and momentum in international stock returns *Journal of Financial Economics, 105*(2012), 457-472. doi:10.1016/j.jfineco.2012.05.011

French, K. R. (2020). Current Research Returns. Retrieved from https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Friedman, M. (1962). *Capitalism and Freedom*. Chicago: University of Chicago Press.

Godfrey, P. C. (2005). The Relationship Between Corporate Philanthropy And Shareholder Wealth: A Risk Management Perspective. *Academy of Management Review, 30*(4). doi:10.5465/amr.2005.18378878

Gompers, P. A., Ishii, J. L., & Metrick, A. (2003). Corporate Governance and Equity Prices. *Quarterly Journal of Economics, 118*(1), 107-155.

Goss, A., & Roberts, G. S. (2011). The impact of corporate social responsibility on the cost of bank loans *Journal of Banking & Finance, 35*(7), 1794-1810. doi:10.1016/j.jbankfin.2010.12.002

Graff, Z. J., & Small, A. (2005). A Modigliani-Miller Theory of Altrustic Corporate Social Responsibility. *The B.E. Journal of Economic Analysis & Policy, 5*(1), 1-21.

Grey, J. (2020, 15.january). US$7 trillion investment behemoth BlackRock goes green. *NZ Herald*. Retrieved from https://www.nzherald.co.nz/business/news/article.cfm?c_id=3&objectid=12300682

GSIA. (2019). *Global Sustainable Investment Alliance*. Retrieved from http://www.gsi-alliance.org/wp-content/uploads/2019/12/Global-Sustainable-Investment-Alliance-TCFD-Poll.pdf

Gunnar, F., Busch, T., & Bassen, A. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. *Journal of sustainable Finance & Investment, 5*(4), 210-233. doi:10.1080/20430795.2015.1118917

Halbritter, G., & Dorfleitner, G. (2015). The wages of social responsibility - where are they? A critical review of ESG investing. *Review of Financial Economics 26*(2015), 25-35.

Hiller, D., Grinblatt, M., & Titman, S. (2012). *Financial Markets and Corporate Strategy: UK*. Wallingford: McGraw Hill Education.

Hong, H. G., & Kacperczyk, M. T. (2005). The price of sin: the effects of social norms on markets. *Sauder School of Business Working Paper*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=766465##

Institute of International Finance. (2019). *Sustainable Finance in Focus: Green Is The New Gold*. Retrieved from https://www.iif.com/Publications/ID/3557/Sustainable-Finance-in-Focus-Green-Is-The-New-Gold

James, C. (2020). Environmental, Social, and Governance (ESG) Criteria. Retrieved from https://www.investopedia.com/terms/e/environmental-social-and-governance-esg-criteria.asp

Jegadeesh, N., & Titman, S. (1993). Return to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance, 48*, 65-91.

Jensen, M. C. (1968). The Performance of Mutual Funds in the Period 1945-1964. *The Journal of Finance, 23*(2), 389-416.

Kempf, A., & Osthoff, P. (2007). The effect of socially responsible investing on portfolio performance. *European Financial Management, 13*(5), 908-922. doi:doi.org/10.1111/j.1468-036X.2007.00402.x

Liang, H., & Renneboog, L. (2016). On the Foundations of Corporate Social Responsibility. *The Journal of Finance, 72*(2). doi:10.1111/jofi.12487

Mackey, A., Mackey, T. B., & Barney, J. B. (2007). Corporate Social Responsibility and Firm Performance: Investor Preferences and Corporate Strategies. *The Academy of Management Review, 32*(3), 817-835. doi:10.2307/20159337

Markowitz, H. (1952). Portfolio Selection. *The Journal of Finance, 7*(1), 77-91.

Mavridis, D. (2015, 17.june). The State of SRI in Europe - Past, Present and Future. *Greenmoney*. Retrieved from https://greenmoney.com/europe/

Moskowitz, M. R. (1972). Choosing Socially Responsible Stocks. *Business and Society*, 71-75.

Newey, W., & West, K. (1987). A simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix. *Econometrica, 55*(3), 703-708.

Orlitzky, M., Schmidt, F. L., & Rynes, S. L. (2003). Corporate social and financial performance: A meta-analysis. . *Organization Studies, 24*(3), 403-441.

PRI. (2019). *Principles for Responsible Investment*. Retrieved from https://www.unpri.org/download?ac=6303

PRI. (2020). *About the PRI*. Retrieved from https://www.unpri.org/pri/about-the-pri

Refinitiv. (2020). *Environmental, Social and Governance (ESG) Scores from Refinitiv*.

Renneboog, L., Horst, J. T., & Zhang, C. (2008). Socially responsible investments: Institutional aspects, performance, and investor behavior. *Journal of Banking & Finance, 32*(9), 1723-1742. doi:10.1016/j.jbankfin.2007.12.039

Robeco. (2020). ESG definition. Retrieved from https://www.robeco.com/en/key-strengths/sustainable-investing/glossary/esg-definition.html

Schyndel, Z. V. (2019). Go Green With Socially Responsible Investing. Retrieved from https://www.investopedia.com/articles/07/clean_and_green.asp

Simmons, J. (2004). Managing in the post-managerialist era: Towards socially responsible corporate governance. *Management Decision, 42*(3), 601-611. doi:10.1108/00251740410518985

Statman, M. (2000). Socially Responsible Mutual funds. *Financial analysts Journal, 56*(3), 30-39. doi:10.2469/faj.v56.n3.2358

Statman, M., & Glushkov, D. (2009). The Wages of Social Responsibility. *Financial analysts Journal, 65*(4), 33-46. doi:10.2469/faj.v65.n4.5

Stoxx. (2020). STOXX Europe 600. Retrieved from https://www.stoxx.com/index-details?symbol=SXXP

Thomson Reuters. (2018). Thomson Reuters Financial & Risk Business Announces New Company Name: Refinitiv. Retrieved from https://www.thomsonreuters.com/en/press-releases/2018/july/thomson-reuters-financial-and-risk-business-announces-new-company-name-refinitiv.html

Trinks, P. J., & Scholtens, B. (2015). The Opportunity Cost of Negative Screening in Socially Responsible Investing. *Journal of Business Ethics, 140*(2), 193-208. doi:10.1007/s10551-015-2684-3

University of Exeter Business School. (2020). Fama-French and Momentum Factors, Portfolios and other Benchmark Portfolio Data. Retrieved from http://business-school.exeter.ac.uk/research/centres/xfi/famafrench/files/

Waddock, S. A., & Graves, S. B. (1997). The Corporate Social Performance-Financial Performance Link. *Strategic Management Journal, 18*(4), 303-319.

Ødegaard, B. A. (2020). *Empirics of the Oslo Stock Exchange. Basic, descriptive, results 1980-2019*. Retrieved from University of Stavanger (UiS): http://finance.bi.no/~bernt/wps/empirics_ose_basics/empirics_ose_basics_2020_03.pdf

10 Appendix

10.1 Appendix A – Data Description

Figure 2A - Number of Stocks in the Sample

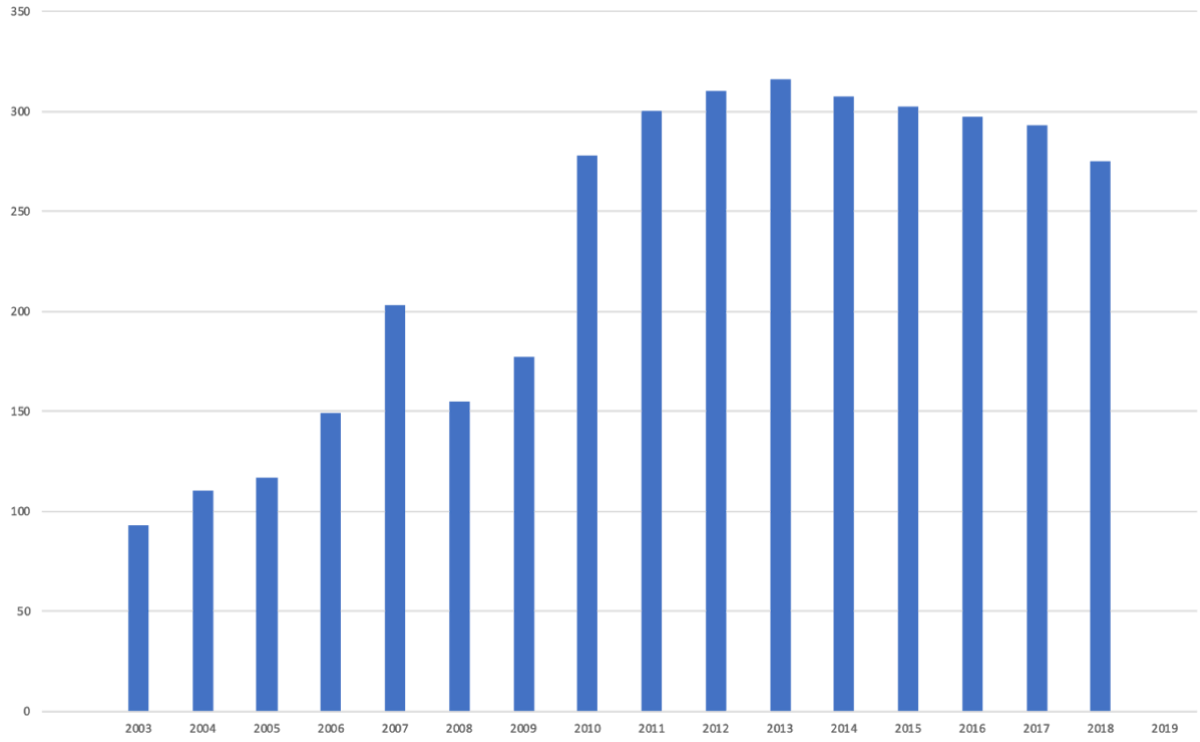
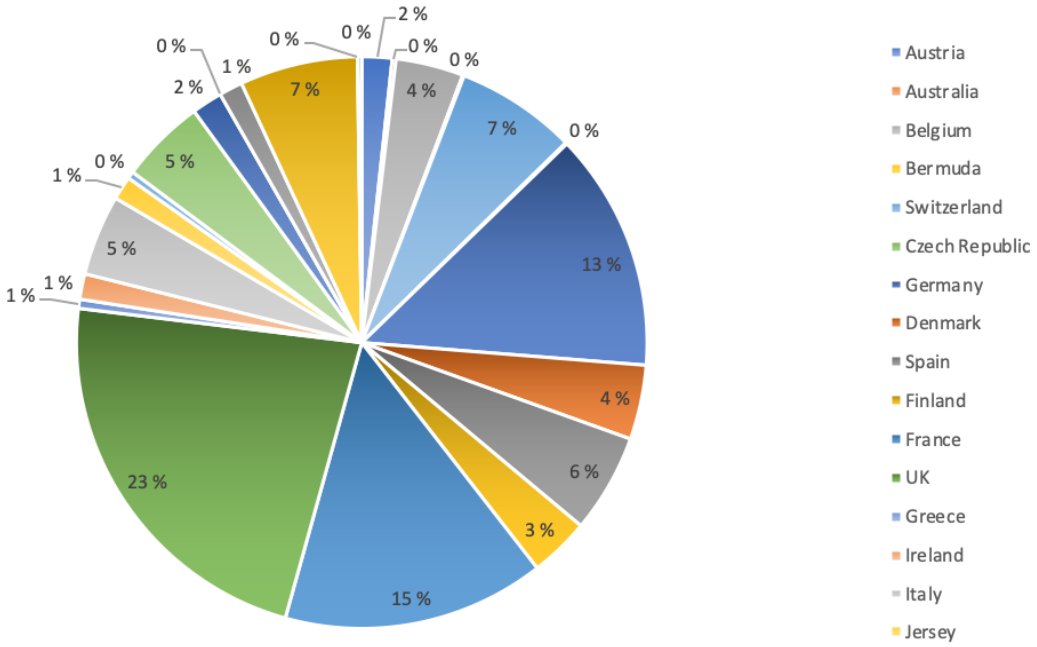


Figure 3A - Distribution of Countries in the Sample



10.2 Appendix B – Factor Models

Table 10.1 Carhart Four-Factor model using 10 % cut-off

U.K		Alpha	RM-rf	SMB	HML	WML	R^2
ESG	High-rated (t10)	-0,0174	0,7896***	-0,0475	-0,0437	-0,0646	0,5430
	Low-rated (b10)	-0,0382	0,8660***	0,2288***	-0,0485	0,0120	0,6257
	long-short (ls10)	0,0208	-0,0764	-0,2763***	0,0048	-0,0766	0,0937
ESGC	High-rated (t10)	-0,0455**	0,8741***	0,0378	-0,2486***	-0,1152***	0,5843
	Low-rated (b10)	-0,0019	0,8688***	0,1694***	-0,2108**	-0,0542	0,5777
	long-short (ls10)	-0,0436*	0,0053	-0,1316**	-0,0378	-0,0610	0,0041
ENV	High-rated (t10)	-0,0295	0,8215***	0,0697	-0,0937	-0,0429	0,5151
	Low-rated (b10)	0,0373	0,9121***	0,2271***	-0,1002	-0,0212	0,6065
	long-short (ls10)	0,0078	-0,0906**	-0,1574**	0,0065	-0,0217	0,0383
SOC	High-rated (t10)	-0,0207	0,8060***	-0,0368	-0,0365	-0,0426	0,5799
	Low-rated (b10)	-0,0329	0,9376***	0,1839***	-0,0857	-0,0184	0,6606
	long-short (ls10)	0,0121	-0,1316***	-0,2207***	0,0492	-0,0242	0,1032
GOV	High-rated (t10)	0,0379*	0,8590***	-0,0630	0,0150	-0,0079	0,6310
	Low-rated (b10)	-0,0198	0,7827***	0,2299***	-0,1229	0,0321	0,5387
	long-short (ls10)	-0,0181	0,0763	-0,2929***	0,1379	-0,0400	0,1169

Results of Carhart (1997) four-factor model with perspective of a UK investor. Long, short and long short trading strategies are applied using 10 % portfolio cut off. Weighted with market capitalization. Annualized alphas, factor loadings concerning size, value and momentum including adjusted R^2 are reported. The standard errors are estimated using the Newey and West (1987) method. ***, ** and * indicate significance at the 1%, 5% and 10% level

Table 10.2 Carhart Four-Factor model using 10 % cut-off

U.S		Alpha	RM-rf	SMB	HML	WML	R^2
ESG	High-rated (t10)	0,0125	0,4982***	-0,6415***	0,1330	-0,0235	0,6136
	Low-rated (b10)	0,0037	0,5721***	-0,1716	0,0827	0,0075	0,5548
	long-short (ls10)	0,0088	-0,0739**	-0,4699***	0,0502	-0,0311	0,0942
ESGC	High-rated (t10)	0,0030	0,5530***	-0,4447***	-0,0110	-0,1027	0,5915
	Low-rated (b10)	0,0377	0,5748***	-0,1586	-0,0856	-0,0007	0,5058
	long-short (ls10)	-0,0347	-0,0218	-0,2861***	0,0746	-0,1020*	0,0467
ENV	High-rated (t10)	0,0060	0,5250***	-0,5598***	0,2163**	-0,0071	0,5938
	Low-rated (b10)	-0,0012	0,5584***	-0,1739	0,2241*	0,0058	0,5611
	long-short (ls10)	0,0071	-0,0334	0,3859***	-0,0078	-0,0129	0,0720
SOC	High-rated (t10)	0,0191	0,5034***	-0,6147***	-0,0073	-0,0044	0,5650
	Low-rated (b10)	0,0153	0,5999***	-0,2691***	0,0601	-0,0177	0,5911
	long-short (ls10)	0,0038	-0,0966***	-0,3456***	-0,0675	0,0133	0,1134
GOV	High-rated (t10)	-0,0099	0,5658***	-0,6155***	0,1495*	0,0160	0,7032
	Low-rated (b10)	0,0048	0,5514***	-0,1306	-0,0021	0,0739	0,4989
	long-short (ls10)	-0,0148	0,0144	-0,4849***	0,1516	-0,0579	0,1286

Results of Carhart (1997) four-factor model with perspective of a U.S investor. Long, short and long short trading strategies are applied using 10 % portfolio cut off. Weighted with market capitalization. Annualized alphas, factor loadings concerning size, value and momentum including adjusted R^2 are reported. The standard errors are estimated using the Newey and West (1987) method. ***, ** and * indicate significance at the 1%, 5% and 10% level

Table 10.3 Carhart Four-Factor Model using 20 % Cut-off

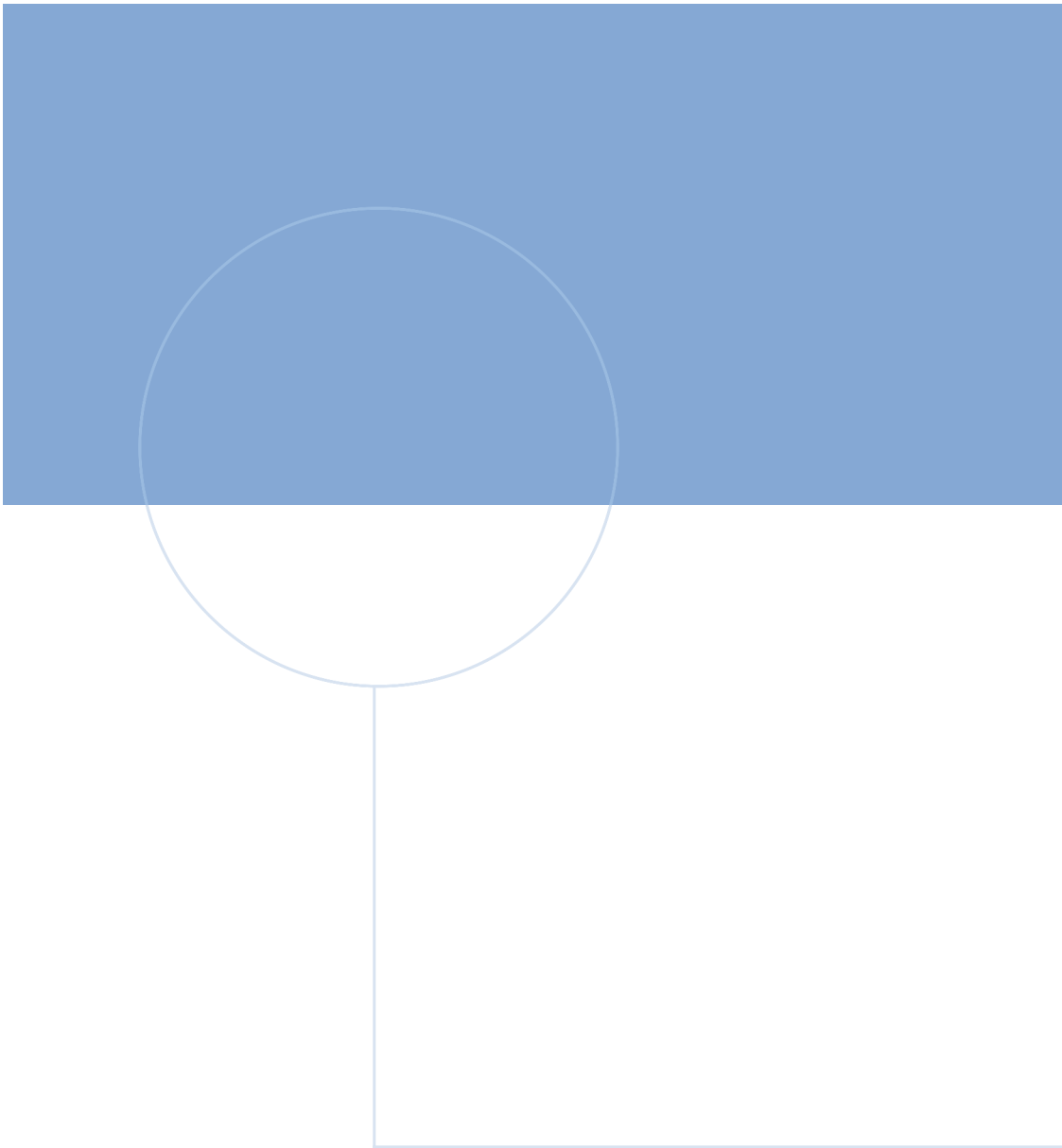
U.K		Alpha	RM-rf	SMB	HML	WML	R^2
ESG	High-rated (t20)	-0,0351*	0,8674***	-0,0346	-0,1302	-0,0567	0,6421
	Low-rated (b20)	-0,0161	0,8760***	0,2022***	-0,1589	-0,0411	0,6703
	long-short (ls20)	-0,0190	-0,0087	-0,2368***	0,0287	-0,0156	0,1066
ESGC	High-rated (t20)	-0,0405*	0,9091***	0,0696	-0,2410***	-0,0632	0,6392
	Low-rated (b20)	-0,0098	0,8463***	0,0507	-0,1507	-0,0107	0,5580
	long-short (ls20)	-0,0307	0,0628	0,0189	-0,0903	-0,0525	-0,0047
ENV	High-rated (t20)	-0,3055	0,8869***	0,0274	-0,0697	0,0055	0,5963
	Low-rated (b20)	-0,0167	0,8518***	0,1949***	-0,1604**	-0,0698	0,6347
	long-short (ls20)	-0,0139	0,0351	-0,1674***	0,0907	0,0753	0,0703
SOC	High-rated (t20)	-0,0331*	0,8195***	-0,0311	-0,0913	-0,0481	0,6173
	Low-rated (b20)	-0,0209	0,9495***	0,1790***	-0,1794*	-0,0201	0,6905
	long-short (ls20)	-0,0122	-0,1300***	-0,2101***	0,0881	-0,0280	0,1262
GOV	High-rated (t20)	-0,0296	0,8758***	-0,0733	-0,0759	-0,0607	0,6450
	Low-rated (b20)	-0,0197	0,8350***	0,2504***	-0,1373	0,0085	0,6277
	long-short (ls20)	-0,0099	0,0408	-0,3236***	0,0614	-0,0692	0,1431

Results of Carhart (1997) four-factor model with perspective of a U.K investor. Long, short and long short trading strategies are applied using 20 % portfolio cut off. Weighted with market capitalization. Annualized alphas, factor loadings concerning size, value and momentum including adjusted R^2 are reported. The standard errors are estimated using the Newey and West (1987) method. ***, ** and * indicate significance at the 1%, 5% and 10% level

Table 10.4 Carhart Four-Factor Model using 20 % Cut-Off

U.S		Alpha	RM-rf	SMB	HML	WML	R^2
ESG	High-rated (t20)	-0,0005	0,5253***	-0,5786***	0,0598	-0,0007	0,6655
	Low-rated (b20)	0,0183	0,5946***	-0,1348	-0,0720	-0,0315	0,6071
	long-short (ls20)	-0,0187	-0,0693**	-0,4438***	0,1319**	0,0308	0,1561
ESGC	High-rated (t20)	0,0039	0,5912***	-0,4059***	-0,0276	-0,0441	0,6460
	Low-rated (b20)	0,0070	0,6103***	-0,3808***	-0,0593	0,0779	0,5991
	long-short (ls20)	-0,0031	-0,0191	-0,0251	0,0318	-0,1220	0,0187
ENV	High-rated (t20)	-0,0021	0,5923***	-0,5451***	0,1349	0,0456	0,6713
	Low-rated (b20)	0,0163	0,5474***	-0,1575	0,0883	-0,0517	0,5759
	long-short (ls20)	-0,0184	0,0449	-0,3876***	0,0466	0,0973	0,0957
SOC	High-rated (t20)	0,0010	0,5110***	-0,5310***	0,0710	0,0166	0,6220
	Low-rated (b20)	0,0227	0,6179***	-0,2315**	-0,0203	0,0078	0,6344
	long-short (ls20)	-0,0217	-0,1069***	-0,2995***	0,0912	0,0087	0,1106
GOV	High-rated (t20)	0,0016	0,5514***	-0,6320***	0,1277	-0,0249	0,6995
	Low-rated (b20)	0,0110	0,5861***	-0,0737	-0,0180	0,0428	0,5558
	long-short (ls20)	-0,0094	-0,0346	0,5583***	0,1457	-0,0677	0,1744

Results of Carhart (1997) four-factor model with perspective of a U.S investor. Long, short and long short trading strategies are applied using 20 % portfolio cut off. Weighted with market capitalization. Annualized alphas, factor loadings concerning size, value and momentum including adjusted R^2 are reported. The standard errors are estimated using the Newey and West (1987) method. ***, ** and * indicate significance at the 1%, 5% and 10% level



NTNU

Norwegian University of
Science and Technology