Master's thesis

NTNU
Norwegian University of Science and Technology

Gustav Follerås and Kim Tveråli Maasø

ESG Investments

Exploring the relationship between corporate social responsibility and financial performance

Master's thesis in Economics and Business Administration – Finance and Investing
Supervisor: Hans Marius Eikseth
Co-supervisor: Florentina Paraschiv

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Preface

This thesis has been written to fulfill the graduation requirements of the master's program in Economiscs and Business Administration – Finance and Investing at NTNU Business School. The thesis investigates the relationship between corporate social responsibility and corporate financial performance. The reason for choosing this topic is the authors' interest in corporate sustainability and the increasing media attention concerning the field.

Working with this thesis has been challenging and time-consuming, yet highly rewarding. We would like to thank our supervisor Hans Marius Eikseth for guidance and support during the process of writing this thesis. We appreciate your effort.

NTNU has no responsibility for views or contents in this thesis. It is solely at the authors' expence and responsibility.

Kim Tveråli Maasø

Gustav Follerås

Abstract

This master thesis investigates the relationship between corporate social responsibility and corporate financial performance in the European stock market. This is done by calculating alphas from a long-short zero investment strategy, going long in stocks with high ESG scores and short in stocks with low ESG scores. To account for differences in the portfolios' risk exposure, we apply the Fama & French three-factor model, the Carhart four-factor model and the Fama & French five-factor model. Our analysis is separated into two parts. In the first part, we examine the overall European market using the Asset4 Europe index, screening portfolios based on both ESG and ESGC scores. We find a neutral relationship between high- and low ESG(C) rated stocks in the overall European market. In the second part of the analysis, we divide our sample into 11 industries, analyzing the ESG components separately. Our results show that in specific industries and depending on the ESG criterion, investors pay a price for being socially responsible. However, investors investing based on the social component in the Financials industry can earn an abnormal return of 0.63% monthly. In the Health Care-, Energy-, Utilities- and Real Estate industry, investors can invest socially responsibly without sacrificing return.

Sammendrag

Denne masteroppgaven undersøker forholdet mellom bedrifters samfunnsansvar og deres finansielle prestasjon i det Europeiske aksjemarkedet. Dette er gjort ved å beregne alphaer av en long-short zero investment strategi, der vi går long i aksjer med høy ESG score og short i aksjer med lav ESG score. For å redegjøre for forskjeller i porteføljenes risikoeksponering, benytter vi oss av Fama & French tre-faktormodell, Carhart fire-faktormodell og Fama & French fem-faktormodell. Vår analyse er todelt. I den første delen analyserer vi hele Europamarkedet ved å bruke Asset4 Europa indeksen og screener porteføljer basert på ESG og ESGC score. Vi finner et nøytralt forhold mellom høyt og lavt ESG(C) rangerte aksjer i Europamarkedet. I del to av analysen deler vi opp datasettet i 11 industrier og analyserer ESG komponentene hver for seg. Resultatene våre viser at i visse industrier og avhengig av ESG kritere, betaler investorer en pris for å investere sosialt ansvarlig. Imidlertid kan investorer som investerer basert på social-komponenten i finanssektoren tjene månedlig abnormal avkastning på 0.63%. I helse-, energi-, forsynings- og eiendomssektoren kan investorer investere sosialt ansvarlig uten å måtte ofre avkastning.

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Abbreviations

AuM - Assets under Management

CFP - Corporate Financial Performance

CMA - Conservative-Minus-Aggressive

CSR - Corporate social responsibility

E - Environmental pillar (part of the ESG and ESGC)

ESG – Environmental, Social and Governance

ESGC – Environmental, Social and Governance Combined

G - Governance pillar (Part of the ESG and ESGC)

GMB – Good-Minus-Bad (High-rated ESG minus low-rated ESG)

HML – High-Minus-Low

MktRf - Market Risk Premium

MPA - Matched Pair Analysis

r - Expected rate of return

Rf - Risk-free rate

RI - Responsible investing

ROA - Return on assets

ROE - Return on equity

Rm-Rf -Market risk premium

RMW - Robust-Minus-Weak

S - Social pillar (Part of the ESG and ESGC)

SMB – Small-Minus-Big

SRI - Socially Responsible Investments

WML – Winners-Minus-Losers

β - Factor`s coefficient (sensitivity)

1. Introduction

Over the past years, companies reporting a green profile have increased considerably. There seems to be a growing agreement that sustainability is essential in a time of climate change, and some even call green finance the new mainstream (KPMG, 2019). Through global certifications, both industry-specific and non-industry-specific firms seek the credibility of being responsible companies.

Social Responsible Investing (SRI) includes strategies using criteria linked to Environmental (E), Social (S) or Corporate Governance (G) (ESG) when investing, in addition to financial profit. For instance, negative screening can be used to sort out investment objects with low ESG performance, resulting in a portfolio without companies in the gambling-, tobacco- or alcohol sector. SRI-strategies also include strategies aiming to serve the investor's personal preferences, using individual criteria. By the ESG criteria, SRI is closely related to Corporate Social Responsibility (CSR), and the two concepts encourage each other (Gajdosova, 2011).

In 2019, one out of three dollars under professional management in the US was managed according to sustainable investing strategies (US SIF, 2021). In Europe, the share of SRI is even greater. The European Fund and Asset Management Association (EFAMA) reported that as much as 45% of the total assets under management in Europe were invested in some sort of ESG selection Strategy (International Investment, 2020). However, despite a positive trend in the money distributed to SRI, researchers disagree about the relationship between CSR and Corporate Financial Performance (CFP). Both stocks and funds have been analyzed but with different results. Furthermore, there has been a minimum focus on industry differences, leaving a void in the literature. For that reason, this thesis focuses on the relationship between CSR and CFP on an industry level. Moreover, to add a more detailed perspective, we will also break down the ESG to each of its components within the industries. By analyzing our data on industry level, while separating the ESG components, we aim to enlighten part of the literature that lacks research.

The relationship between CSR and CFP will be analyzed through a long-short zero investment strategy, investigating whether abnormal earnings can be achieved when buying a portfolio with a high ESG-rating and selling a portfolio with a low ESG rating. In addition, the thesis will focus on the European market. The reason for this is that previous research has primarily focused on the American market. Also, the increased focus on socially responsible

investing, as mentioned above, makes the European market relevant. As ESG-integration is one of the most used SRI methods (Global Sustainable Investment Alliance, 2018), we will use the ESG-rating to measure CSR. We deploy three factor models to analyze the risk-adjusted performance: Fama & French three-factor model, Carhart four-factor model, and Fama & French five-factor model. This thesis aims to answer the following question:

"Is there a positive relationship between CSR and CFP, and can investors achieve abnormal returns in any industry by investing based on either the E, S or G criteria?"

We have used the Refinitiv Eikon (Refinitiv) database, earlier Thomson Reuters Eikon, and the Kenneth R. French library online to answer our research question. The sample period is January 2009 to December 2019, representing an overall bull market period. As this thesis contributes to the literature of the European financial market, the Asset4 Europe index from Refinitiv has been used, containing 1142 companies with ESG-rating. From Refinitiv, we retrieved ESG scores, ESG combined scores (ESGC), scores on the components E, S and G, in addition to market capital and closing price. The ESGC score represents a company's performance on the ESG pillars but also accounts for global media sources' controversies (Refinitiv, 2021a).

After retrieving the data, we constructed portfolios within the overall European market screened by companies' ESG and ESGC scores. We used different cut-off rates and constructed both value-weighted portfolios and equally weighted portfolios. Further, in the industry analysis, we used the same method as in the overall market, but with different cut-off rates. The industry-level analysis consists of a breakdown of each component of ESG (E, S, and G), and the Global Industry Classification Standard (GICS) has been used as an industry classifier.

In the overall analysis of the European market, we found a significant outperformance by the low ESG rated companies of 0.61% monthly. When screening by the companies' ESGC scores, the outperformance of low-rated companies was 0.77%. However, the result was only apparent when using a 10% cut-off rate on the portfolios. When applying a 25% cut-off rate on the portfolios, the results showed no significant difference between high and low-rated

portfolios. Therefore, our results were not robust over different cut-off rates, and we concluded with a non-existent relationship between corporate social responsibility and financial performance in the overall European market. Socially responsible investors can, based on these results, invest in the European market without sacrificing return.

When analyzing the industries and the ESG components separately, several significant differences between high and low-rated companies were identified. In the IT-, Industrials-, Consumer Discretionary-, Consumer Staples- and Communication Services industry, we experienced significant negative alphas. In these industries, low-rated companies outperformed high-rated companies in one or more screening criteria. Depending on the screening criteria, investors pay a price for investing socially responsible in these industries. The financials industry was the only industry generating significant positive alphas. Here, socially responsible investors investing based on the social criteria can achieve an abnormal return of 0.63% monthly. In the Health Care-, Energy-, Utilities-, and Real Estate industry, we identify a neutral relationship between CSR and CFP. Investors can invest socially responsibly in these industries without having to sacrifice return. Across the industries, screening portfolios by the social and the governance criteria proved to generate more significant alphas than screening by the environmental criteria.

The thesis will be structured as follows: Chapter two provides an overview of existing literature on the relationship between CSR and CFP and empirical findings from research done on both SRI funds and stocks. Chapter three presents research questions and hypotheses. Chapter four provides the data used in this thesis. This includes descriptions of how our sample was retrieved and reviews on the ESG scores and how they are measured. Chapter five describes the method we have used, including model specifications for the factor models and the statistical tests we have run to meet the OLS requirements. Chapter six presents the results from our analyzes, and chapter seven discusses these results. Lastly, chapter eight contains a conclusion of the thesis.

2. Literature Review

The purpose of this thesis is to update and add empirical findings regarding the relationship between ESG-rating and stock return. The literature review will be the foundation, hence providing information on earlier methods used, results, and discussions. Using the overall European market as a benchmark, we aim to provide insight into each industry in the European Market. Further, as there is little research on the relationship between the ESG components and stock return within each sector, we seek to fill a gap within the existing literature.

The main terms used in this thesis are defined as follows: Corporate Social Responsibility (CSR) is the responsibility of each business to impact people, the environment, communities and societies (Government, 2016). Socially Responsible Investment (SRI) is a strategy considering not only the financial returns but also the impact on environmental, ethical, or social change (Corporate Finance Institute, 2021a). SRIs can be implemented both on a personal and corporate level, while CSR only refers to companies. SRI can be implemented on an individual level by using, for instance, ESG criteria to screen the market, which is a common strategy for a socially responsible investor (SRI). On a company level, the investor is the company; hence, SRI implementation involves taking social responsibility into account when investing in addition to financial performance. The last central terminology is Corporate Financial Performance (CFP), which refers to the company's overall standing in categories such as assets, liabilities, equities, revenue and more (Corporate Finance Institute, 2021b). CFP can be measured through various methods, such as stock return and different measurements of accounting performance.

2.1 Theoretical background

2.1.1 Three different views on the relationship between CSR and CFP

The literature discussing the effect of socially responsible investing on financial performance is ambiguous. There are mainly three different views on this relationship. The first view states that CSR has a positive effect on CFP. Freeman (1984) supports this view in his Stakeholder-theory argument. He argues that every individual with a stake in a company has

the right to take part in both the decision-making and the company's actions. The "available fund hypothesis" also states a positive relationship between CSR and CFP. The hypothesis claims that high corporate financial performance yields slack resources enabling firms to invest in socially responsible activities (Auer & Schuhmacher, 2016).

The second view is that SRI harms CFP. Friedman (1970) states that there are costs attached to being socially responsible. He believes that these costs outweigh the benefits of being socially responsible, reducing the shareholders' wealth. The "Managerial Opportunism Hypothesis" also states a negative relationship between CSR and CFP. This hypothesis states that managers tend to maximize private gains in prosperous times and placate weak financial performance by increasing the shareholder's welfare through social activities (Posner & Schmidt, 1992). Also, by following Markowitz's (1952) argument about diversification in portfolios, financial theorists argue that ethical investing underperforms in the long term because ethical portfolios are subsets of the market portfolio and lack sufficient diversification.

A third perspective on the CSR-CFP relationship is that there is no such relationship. One can argue that SRI neither adds nor destroys portfolio value because corporate social responsibility is unpriced. This argument comes from the standard framework of finance, which says that factors that are not proxies for risk do not affect expected returns, and socially responsible investors do not reduce the relative cost of capital to socially responsible companies by favoring their stocks (Hamilton, Jo, & Statman, 1993).

2.1.2 The Efficient-market hypothesis

A market in which prices always fully reflect available information is called "efficient" (Fama, 1970). The Efficient-market hypothesis (EMH) was first introduced by Bachelier (1900). He proved that the theoretical assumption, implying that stock prices could be sufficiently forecasted through a detailed analysis of previous price fluctuations, had little empirical support when examined statistically. Although EMH is one of the most researched financial theories, there has been little consensus among financial economists about the validity of the EMH (Sewell, 2012). The economic theory defines three forms of market efficiency: the weak, the semistrong and the strong forms of the hypothesis (Bodie, Kane & Marcus, 2018; Copeland, Weston & Shastri, 2004). What distinguishes these three forms is the level of information about the stock that is available to investors. The weak-form

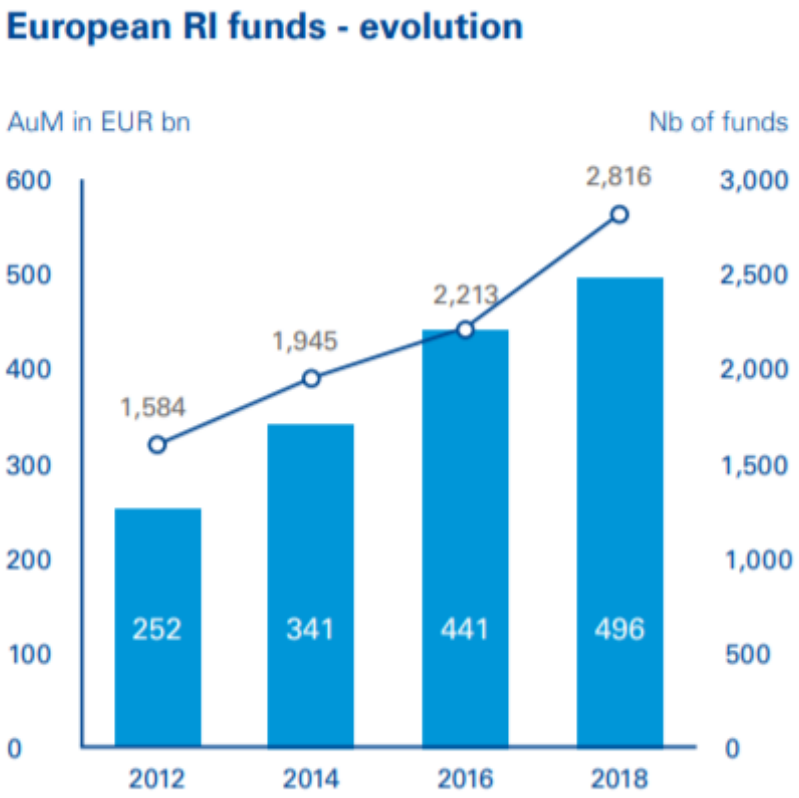
hypothesis asserts that the stock prices already reflect all available information concerning market trading data. The semistrong form of the hypothesis claims that all available information regarding the firms' prospects is already reflected in the stock price. Lastly, the strong form of the hypothesis states that all information, including information only available to insiders, is already reflected in the stock prices. The latter form of the hypothesis implies that no investor can consistently beat the market (Bodie et al., 2018; Copeland et al., 2004).

The relevance of the EMH to our thesis is related to abnormal return and if investors can achieve alpha by implementing ESG-based strategies into their investments. In an efficient market, investors should not be able to earn consistent alpha when investing in the stock market. Thus, if the theory holds, generating alpha by investing based on ESG information should not be possible.

2.3 Empirical evidence

Socially Responsible Investments (SRIs) have experienced a tremendous development throughout the last decade (Halbritter & Dorfleitner, 2015). In 2019, one out of three dollars managed under professional management in the US was managed according to sustainable investing strategies (US SIF, 2021). In Europe, the share of SRI is even greater. The European Fund and Asset Management Association (EFAMA) reported that as much as 45% of the total assets under management in Europe were invested in some sort of ESG selection Strategy (International Investment, 2020). According to KPMG (2019), the number of responsible investment funds has increased by almost 78% from 2012 to 2018 in Europe. This reveals the importance of SRIs for both researchers and investors.

Figure 1. 1 European responsible investment funds development



(Source: KPMG, 2019)

Even though corporate financial performance (CFP) is investors' focus, firms are increasingly encouraged to consider non-monetary goals (Halbritter & Dorfleitner, 2015). Therefore, a question about the link between SRI and CFP arises. However, despite years of research, empirical evidence so far has been divided. In the following, research on funds and stocks is presented.

2.3.1 SRI funds

Kreander, Gray, Power and Sinclair (2005) studied a sample of 80 European funds, containing 40 ethical and 40 non-ethical funds. The authors used a matched pair analysis (MPA) method and matched funds on size, age, country, and investment universe. The authors used the Treynor ratio, the Sharpe ratio, Jensen's alpha, and applied a two-model factor by Henriksson and Merton (1981), to measure the risk-adjusted return. Kreander et al. (2005) found no significant difference in risk-adjusted performance e between ethical and

non-ethical funds. However, the authors did identify a significant difference in the systematic risk and concluded that ethical funds had a lower risk than non-ethical.

In 2008, Renneboog, Horst & Zhang studied SRI's performance relative to conventional Asian, European, and North American funds. The authors applied the Capital Asset Pricing Model (CAPM), the Fama-French-Carhart (FFC) four-factor model, in addition to an FFC model extended by an ethics factor. Further, they tested for several different factors intending to explain the performance variances between ethical and non-ethical funds. To avoid survivorship bias, the authors included dead funds.

As Renneboog et al.'s (2008) work were based on a larger sample than earlier studies, the study became one of the most cited studies in modern literature. The authors proved a significant underperformance of SRI in France, Ireland, Sweden, and Japan. However, the study did not verify any differences between SRI and conventional funds in other countries.

Leite & Cortez (2014) analyzed SRI funds' performance domiciled in the U.K. and European markets and compared the results against characteristics-matched conventional funds using the MPA. The authors primarily applied the FFC four-factor model, extended with a local factor to account for potential home biases. The study did not find significant differences in CFP between SRI and conventional funds. Further, the authors found no evidence that the SRI approach affected this result regarding a screening strategy. Also, the difference in factor exposure was insignificant. However, the authors found that the screening strategy affected the factor exposure.

Friede, Bush and Bassen (2015) published an overview of academic research on the relationship between ESG-criteria and the author's definition of CFP. The authors claim to have created the most comprehensive overview of scholarly research on this topic, as the paper combines the findings of about 2 200 individual studies. Friede et al. included both vote-count studies and aggregated the results of economic review studies (meta-analyses). The authors reported that 90 percent of the studies found non-negative ESG-CFP relation and that the majority found a positive relationship. However, while the positive relationship between ESG and CFP is documented across various approaches, regions, and asset classes, the relationship is not apparent on a portfolio level. According to the authors, the positive relationship between ESG focus and financial performance is not transparent when funds are studied.

2.3.2 SRI stocks

The findings from research done on SRI stocks performance differ from the SRI fund findings. A meta-analysis of 52 studies done by Orlitzky, Schmidt and Ryes (2003) showed a positive correlation between CSP and CFP. Orlitzky et al. (2003) analyzed a sample size of 33.878 observations between the 1970s and late 1990s. In addition to measuring stock performance, the analysis also measured accounting performance in terms of return on assets (ROA) and return on equity (ROE).

Kempf and Osthoff (2007) measured the effect of socially responsible investing on portfolio performance by analyzing stocks on the S&P 500 and DS 400 index from 1992-2004. Moreover, they investigated whether abnormal returns can be achieved by taking different socially responsible screening criteria into account. These screening criteria included positive screens on community, diversity, employee relations, environment, human rights and product, as well as a combination of all of the screens. In addition, the researchers included a negative screen by excluding companies involved in controversial businesses. The result showed that the performance of the socially responsible portfolios was never significantly negative. In contrast, the portfolios with low social responsibility suffered a performance loss on some of the screens.

Statman and Glushkov (2009) showed that stocks with high scores on sustainability provided a better risk-adjusted return than companies with low scores. They analyzed the risk-adjusted returns by applying the CAPM model, Fama & French three-factor model, and Carhart four-factor model. The portfolios they compared were screened based on the different criteria: community, employee relations, diversity, environment, products, human rights and governance. One key observation Statman & Glushkov made in their analysis was that the advantage of investing in companies with high social responsibility was mainly offset by the disadvantage of excluding stocks of shunned companies, also called “sin stocks.”

A more recent study by Auer & Schuhmacher (2016) analyzed companies in the Asia-Pacific region, the United States and Europe. Instead of using an alpha-based performance evaluation, Auer & Schuhmacher (2016) applied the Sharpe Ratio to compare the portfolios. The researchers also analyzed the E, S and G criteria separately, and they were the first to subdivide their stock sample into different industries. The results showed that regardless of geographic region, industry, or ESG criterion, active selection of high-or low-rated stocks did

not provide superior risk-adjusted performance compared to passive stock market investments. However, they found that in Europe, in specific industries and depending on the ESG criterion, investors ended up with significantly lower risk-adjusted performance than passive benchmarks.

3. Research question and hypothesis

In the following chapter, research questions, hypotheses and supplementing questions will be presented. The research question and hypotheses are based on theoretical background and empirical research.

3.1 Research question

Is there a positive relationship between CSR and CFP, and can investors achieve abnormal returns in any industry by investing based on either the E, S or G criteria?

The research question reflects the structure of this thesis. With a divided research question, we also divide our analysis in two. The first part of the question refers to the overall market and therefore requires a broad perspective analysis. In the first part, we include all the companies listed on the index, independently of the industry. Furthermore, we apply different cut-off rates and screen portfolios using both the ESG and ESGC criteria to achieve a robust result. The second part of the research question, which will be our main focus when presenting the results, requires a narrower perspective. Hence, we break down the ESG-criteria to each of its components and analyze them individually. By doing this, we seek to focus on each of the industries' relation to the separated ESG components.

For both parts of our research question, it is necessary to specify what kind of relationship we refer to. As the literature review exemplifies, both CSR and CFP can be monitored through different units of measurement. Stock return is one measure used broadly to monitor CFP. Furthermore, because many investors seek to maximize their stock return, we find this to be an appropriate and valuable way to measure CFP. For that reason, we use stock return as a measure of CFP in our thesis. As for CSR, we use the ESG criteria to measure each company's corporate social responsibility performance. ESG is one of the most used screening criteria implemented by investors (Global Sustainable Investment Alliance, 2018), making it a suitable unit of measurement, in our opinion.

3.2 Supplementing questions

Is any of the ESG pillars more important in explaining financial performance across the industries than the others?

With this question, we aim to investigate if any of the three screening criteria (environmental scores, social scores or governance scores) to a greater extent generates more significant alphas than the others.

3.3. Hypotheses

Hypothesis 1:

High ESG-rated stocks will not provide better risk-adjusted returns than low ESG-rated stocks in the European market.

The empirical research presented in this thesis is divergent regarding the relationship between ESG-rated stock and risk-adjusted return. Friede et al. (2015) reported that 90 percent of all the studies found a non-negative relationship between CSR and CFP and added that most of the 2,200 studies reported a positive CSR-CFP relationship. However, all the studies included in their literature review failed to prove a CSR-CFP relationship on a portfolio level (Friede et al., 2015). On the other hand, Statman and Glushkov (2009) found that stocks with high performance on sustainability performed better in risk-adjusted returns than low-performing stocks. Because of the different findings within the literature, we find it hard to predict any result. However, we lean towards finding a non-positive relationship between CSR and CFP. We justify this choice by the implication of the efficient-market hypothesis. If the EMH holds and the right performance attribution framework is used, investors should not be able to earn abnormal returns by using ESG information in their investment decisions (Kempf & Osthoff, 2007).

Hypothesis 2:

None of the industries will show better risk-adjusted returns for high ESG-rated companies when analyzing the ESG-components separately.

Since there is limited research done on industry-level in the European market, the outcome of this analysis is hard to predict. The only study we have found on an industry level that analyses the ESG components separately is the mentioned study by Auer & Schuhmacher (2016). Based on this research, we might find underperformance by high-rated portfolios in some industries, depending on the ESG criteria. However, we do not expect outperformance by high-rated portfolios.

Hypothesis 3:

None of the ESG components will be more important in explaining financial performance than the others.

We do not find any research suggesting that the ESG pillars are being prioritized differently by companies. Consequently, we do not expect to find that one of the ESG components is more important than the others in explaining financial performance. We justify hypothesis 3 with the implication of the efficient-market hypothesis as well. Since information about companies' implementation of the ESG components is available to all investors, none of the components should be more important in explaining financial performance.

4. Data

In the following chapter, we will present the process of collecting the data used in our thesis. This involves what data sources have been used and the data retrieved from them. Further, the sample selection and screening process will be explained in detail and the variables and risk factors used in this thesis. Lastly, we present our concerns about the dataset.

4.1 Data sources

The data used in this thesis is collected from Refinitiv Datastream and Kenneth R. French's data library. Refinitiv is a historical financial database with over 35 million individual instruments or indicators across all major asset classes, and it features 65 years of data across 175 countries (Refinitiv, 2021b). Data retrieved from Refinitiv includes the name of the companies, market capital, industry GICS code and monthly adjusted close price. In addition, it also contains yearly ESG- and ESGC scores, and annual E-, S- and G scores for each company.

The Kenneth R. French Library has been used to retrieve the Fama & French three-factor model, the Fama & French five-factor model, and the Carhart four-factor model. Monthly observations of the variables have been used for all of the three models. Kenneth R.French`s Library offers observations from several continents, and this thesis has used European observations.

4.2 Refinitiv scores overview

The ESG and ESGC scores provided by Refintiv were launched in May 2017, replacing the widely used Asset4 database (Reuters, 2017). Despite the launch in 2017, Refinitiv has calculated the score for companies back to the fiscal year of 2002 (Reuters, 2017), giving companies close to 20 years of rating history. Refinitiv has stated that they only use publicly available information to preserve objectivity (Douglas, Van Holt & Whelan, 2017), making it a reliable database in our opinion. Moreover, as most investors only have access to this level of information, and Refinitiv is one of the cheapest providers, we consider Refinitiv's scores

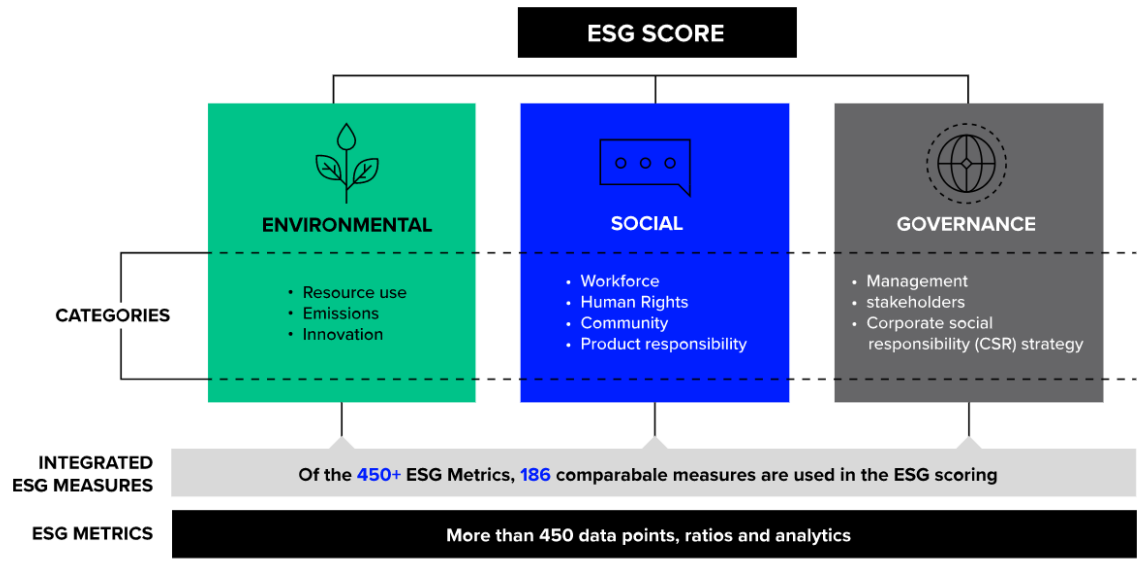
representative of the common investor. Another reason for using the scores provided by Refinitiv is that it is the agency with the highest number of indicators evaluated (Davies Polk & Wardwell LLP, 2017).

4.2.1 ESG score

ESG investing is investing in financial factors but also considering environmental, social and governance factors in the decision-making process (The Global Compact, 2004; MSCI, 2019). ESG as a term emerged in 2005 and is based on the concept of corporate social responsibility (CSR), responsible investing (RI) and socially responsible investing (SRI). For that reason, incorporating ESG in the investment strategy is a matter of return in addition to moral and ethical criteria (Kell, 2018).

Refinitiv captures and calculates over 500 company-level measures, of which a subset of 186 power the overall company assessment and scoring process (Refinitiv, 2021a). The 186 are grouped into ten categories reformulating the three pillar scores and the final ESG score. The ESG score reflects the companies' ESG performance, commitment, and effectiveness based on the publicly available information (Refinitiv, 2021a).

Figure 2. 1 The categories reformulating the three ESG pillars



(Source: Refinitiv, 2021a)

4.2.2. ESG score calculation methodology

Refinitiv calculates the ESG scores using a percentile rank scoring methodology (Refinitiv, 2021a). This percentile ranking is based on a company's ESG performance relative to other companies. The score is based on how many companies are worse than the current one, how many companies have the same value, and how many companies have a value at all. In addition, the underlying data points that the score relies on takes into account industry group relevance in the calculation of the score. The scores range from 0-100 and are calculated as follows:

$$\frac{\#\ of\ companies\ with\ a\ worse\ value + \frac{\#\ of\ companies\ with\ the\ same\ value\ included\ the\ current\ one}{2}}{\#\ of\ companies\ with\ a\ value}$$

Table 1. 1 Category weights for calculating ESG score

Pillar	**Category**	**Category Weights**	**Sum of Category Weights**
Environmental	Emissions	15 %	44 %
Environmental	Resource Use	15 %	
Environmental	Innovation	13%	
Social	Community	9%	31%
Social	Human Rights	5%	
Social	Product Responsibility	4%	
Social	Workforce	13%	
Corporate Governance	Shareholders	5%	25%
Corporate Governance	CSR Strategy	3%	
Corporate Governance	Management	17%	

(Source: Refinitiv 2021a)

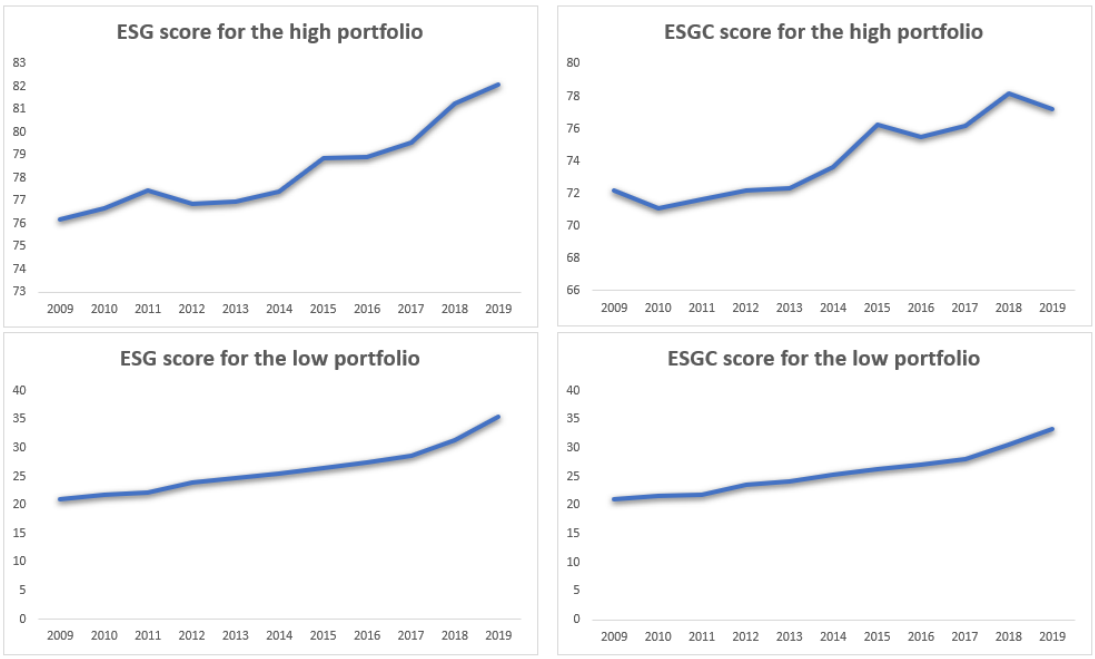
4.2.3 ESG Combined score

The ESG Combined (ESGC) score gives a measure of a company's performance on the ESG pillars but also accounts for ESG controversies captured from global media sources. The primary purpose of the ESGC score is to discount the ESG performance score based on negative media stories (Refintiv, 2021a). Refinitiv calculates the score based on 23 controversial topics, and if, during a year, a scandal occurs, the company involved is penalized and the overall ESGC score is affected. If the scandal is an ongoing one and affects the company in the continuing years in terms of, for example, lawsuits, ongoing legislation disputes, or fines, this will also be reflected in the score. If a company has been involved in ESG controversies, the ESGC score will be the weighted average of the two-component scores (ESG and ESGC) per fiscal year, with recent controversies reflected in the latest complete period. On the other hand, if a company has not been involved in any controversies, the ESG and ESGC score of the company will be identical (Refintiv, 2021a).

4.2.4 Development in ESG and ESGC scores

The ESG- and ESGC scores of our analyzed companies have had an overall positive trend from 2009 to 2019. The graphs in figure 3.1 show the development for high- and low-rated portfolios in our overall European market analysis, screened by ESG- and ESGC scores. The overall increase in the scores over the analyzed period is 35.27%. The low-rated portfolios have had the most significant increase in the scores, where the average growth has been 67.7%. For the high-rated portfolios, the scores have increased by an average of 7.3%.

Figure 3. 1 ESG and ESGC development



(Source: Own illustration)

4.3 Sample selection

To answer the research question of this thesis, we have examined a strategy of buying companies with high ESG scores and selling companies with low ESG scores (long-short-strategy). Further, the thesis investigates the relationship between each ESG component and the companies' stock return within each industry. The analysis has been performed on the European market, both on an overall and industry-level. The companies we have analyzed have been collected the Asset4 Europe list provided by Refinitiv. This list contains all the ESG-rated companies in Europe, including small, mid, and large capital firms. At the time of retrieval, the list included 1142 companies.

The period we analyze is January 2009 to December 2019. Since we wanted our analysis to include as many observations as possible, we deemed it necessary to have research spanning a decade. The reason not to extend this period is the number of ESG-rated companies, as we found them to be too few in 2008. The financial crisis in 2008 contributed to an increasing focus on companies' ethical behavior, accountability, risk handling, ethical behavior, and ability to manage different stakeholders (Galbreath, 2012). Both institutional and private

investors incorporated ESG, leading to increasing awareness around ESG. We found this trend to be positive from 2009 up to 2018, as the number of companies included in our analysis increased by more than 47% during this period. However, for some reason, we also found a decrease of almost 5% in the number of ESG-rated companies on the Asset4 Europe index from 2018 to 2019.

4.3.1 Screening

This section describes the screening process, meaning how we have cleaned the data before the portfolio construction. As this thesis performs an industry analysis, we require that all companies have an industry code. To divide the data into subgroups while keeping the subgroups at a large enough size for statistical reasons, the Global Industry Classification Standard (GICS) Europe classification has been chosen in this thesis. GICS was developed by S&P 500 Dow Jones and MSCI in 1999 to offer an investment tool providing width, depth, and evolution of industry sectors (MSCI, 2021). GICS is a four-tired, hierarchical sector classification, referred to as industries in this thesis. The industries in GICS Europe - used in this thesis - are Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Financials, Information Technology, Real Estate, Communication Services, and Utilities. A description of the industries can be found in the Appendix (C). The companies missing GICS were not included in our data sample.

ESG- and ESGC scores and the scores for the individual components are given in both yearly and monthly data in Refinitiv. Still, this thesis only uses annual observations. After observing that ESG-rating rarely changes within a year, we assess the inaccuracy potential as low when using yearly rating. Further, we observed that if a company misses a rating one month, it often retrieves its rating the following month, with the same rating as earlier. For that reason, a yearly rating reduces the error of missing values. Companies missing ESG-rating in January are excluded from the data sample.

After cleaning the data sample, the highest number of companies was 1014 in 2018. Table 2.1 shows the average number of companies within each industry as well as the average environmental, social and governance scores. See Appendix (A) for a complete list of the companies within each year.

Table 2. 1 Average environmental-, social- and governance scores for each industry

Industries	Number of Companies	Environmental Score	Social Score	Governance Score
Energy	49	50.61	55.45	53.11
Industrials	168	59.62	58.18	58.15
Consumer Staples	52	57.47	59.71	54.68
Financials	150	43.11	51.32	53.48
Materials	81	59.62	58.18	58.15
Consumer Discretionary	101	50.74	55.86	50.02
Health Care	47	42.00	56.40	49.15
Information Technology	46	42.42	54.37	51.29
Real Estate	50	52.30	51.12	44.19
Communication Services	64	47.56	56.79	51.52
Utilities	38	64.87	62.65	56.14

4.3.2 Portfolio construction

The process of constructing portfolios included multiple stages. We constructed portfolios from the entire dataset to investigate the relationship between ESG and risk-adjusted stock return in the overall market. The portfolio performance was measured twelve times during 12 calendar months, using returns calculated by the stocks closing price on the 19th of each month. For a company to be picked for a portfolio, we required it to have observation of

return in January. However, to avoid survivorship bias, we included companies that go bankrupt, or for some other reason, no longer had market capital observations. We assumed that the value of the company's investment is reallocated to the other companies in the already existing portfolio. In summary, companies could leave the portfolio but not join the portfolio after January.

We screened portfolios both by the companies' ESG scores and their ESG Combined scores, using a cut-off rate on the portfolios of 25%. The 25% of the companies from our dataset with the highest scores represent the long position, and the 25% with the lowest scores represent the short position. We then calculated both value-weighted and equally weighted returns for the portfolios in both positions (long and short). The process was then repeated with a cut-off rate on the portfolios of 10%. A description of the screening process for the overall Eurpean analysis is shown in table 3.1.

Table 3. 1 Portfolio construction for the analysis on the overall European market

Long position:	**Short position:**
Portfolio 1	Portfolio 2
25% of companies with highest ESG rating	25% of companies with the lowest ESG rating
Value weighted portfolios	Value weighted portfolios

Long position:	**Short position:**
Portfolio 5	Portfolio 6
25% of companies with highest ESGC rating	25% of companies with the lowest ESGC rating
Value weighted portfolios	Value weighted portfolios

Long position:	**Short position:**
Portfolio 3	Portfolio 4
25% of companies with highest ESG rating	25% of companies with the lowest ESG rating
Equally weighted portfolios	Equally weighted portfolios

Long position:	**Short position:**
Portfolio 7	Portfolio 8
25% of companies with highest ESGC rating	25% of companies with the lowest ESGC rating
Equally weighted portfolios	Equally weighted portfolios

Long position:	**Short position:**
Portfolio 9	Portfolio 10
10% of companies with highest ESG rating	10% of companies with the lowest ESG rating
Value weighted portfolios	Value weighted portfolios

Long position:	**Short position:**
Portfolio 13	Portfolio 14
10% of companies with highest ESGC rating	10% of companies with the lowest ESGC rating
Value weighted portfolios	Value weighted portfolios

Long position:	**Short position:**
Portfolio 11	Portfolio 12
10% of companies with highest ESG rating	10% of companies with the lowest ESG rating
Equally weighted portfolios	Equally weighted portfolios

Long position:	**Short position:**
Portfolio 15	Portfolio 16
10% of companies with highest ESGC rating	10% of companies with the lowest ESGC rating
Equally weighted portfolios	Equally weighted portfolios

This thesis also aims to break down the ESG rating and analyze companies on an industry level. For that purpose, we constructed different portfolios in each industry after screening

both high- and low-rated portfolios based on the three ESG criteria. Because we want to measure both value-weighted and equally weighted returns on the portfolios, we ended up with 12 portfolios in each industry, with a cut-off rate of 40%. The reasoning behind the 40% rate is that some of the industries did not contain a large enough number of companies for us to use a lower cut-off rate. A description of the screening process for the industry analysis is shown in table 3.2.

Table 3. 2 Portfolio construction for the industry analysis

Long position:	**Short position:**
Portfolio 1	Portfolio 2
40% of companies with the highest environmental score	40% of companies with the lowest environmental score
Value weighted portfolios	Value weighted portfolios

Long position:	**Short position:**
Portfolio 3	Portfolio 4
40% of companies with the highest social score	40% of companies with the lowest social score
Value weighted portfolios	Value weighted portfolios

Long position:	**Short position:**
Portfolio 5	Portfolio 6
40% of companies with the highest governance score	40% of companies with the lowest governance score
Value weighted portfolios	Value weighted portfolios

Long position:	**Short position:**
Portfolio 7	Portfolio 8
40% of companies with the highest environmental score	40% of companies with the lowest environmental score
Equally weighted portfolios	Equally weighted portfolios

Long position:	**Short position:**
Portfolio 9	Portfolio 10
40% of companies with the highest social score	40% of companies with the lowest social score
Equally weighted portfolios	Equally weighted portfolios

Long position:	**Short position:**
Portfolio 11	Portfolio 12
40% of companies with the highest governance score	40% of companies with the lowest governance score
Equally weighted portfolios	Equally weighted portfolios

The portfolio construction process for the industry analysis left us with 132 portfolios. Adding the 16 portfolios from the overall analysis, we constructed a total of 148 portfolios. Each of them has been rebalanced in January each year by the companies' scores on the respective ESG criteria. Transaction costs regarding the rebalancing process have not been considered in this thesis.

4.4 The variables

The dependent variable in our analyses is the monthly return from our long-short zero investment strategy, meaning we go long in the high-rated portfolio and short in the low-rated

portfolio. We have used the portfolio's excessive return, given by the monthly return deducted by the risk-free rate collected from Kenneth R. French's data library, represented by the US monthly treasury bill (French, 2021). The returns were calculated using stock prices adjusted for subsequent capital actions, retrieved from Refinitiv. Because the risk factors we have used are calculated by simple returns (French, 2021), the same return formula when calculating returns has been applied.

$$Return = (R_t - R_{t-1})/R_{t-1}$$

Table 4. 1 Descriptive statistics of returns for high and low ESG-rated companies

Descriptive statistics	Obs	Mean	Std. Dev.	Min	Max
Return from high ESG-rated companies (equally weighted)	131	0.83%	4.68%	-16.17%	20.57%
Return from low ESG-rated companies (equally weighted)	131	0.99%	4.46%	-14.55%	24.89%
Return from high ESG-rated companies (value-weighted)	131	0.94%	3.72%	-12.08%	13.38%
Return from low ESG-rated companies (value weighted)	131	1.16%	3.48%	-9.06%	19.16%

Table 4.1 summarizes descriptive statistics of the average return from our portfolios used in the overall analysis on the European market screened by ESG scores. The average return from the portfolios is slightly higher for the low-rated portfolios, and the volatility in the portfolio returns is higher for the equally weighted portfolios.

4.5 Risk factors

Three factor models have been used to adjust the risk exposure in our portfolios: Fama & French three-factor model, Carhart four-factor model and Fama & French five-factor model. The Fama & French five-factor model includes factors used in both the five-factor model and the three-factor model. The Kenneth R. French Data Library provides these. The five factors are the *market risk premium* (*Rm-Rf), Small minus Big (SMB), High minus Low (HML), Robust minus Weak (RMW) and Conservative minus Aggressive (CMA)* (French, 2021). In

addition to the five mentioned, we also added the *Winners minus Losers (WML)* factor used in the Carhart model. Each model will be explained in detail in chapter 5.

4.6 Concerns about the dataset

One concern about this dataset is the dependency on the Refinitiv ESG-framework and the methodology used in performance analysis. Doyle (2018) argues for inconsistency between ESG-rating agencies by pointing out that companies do not necessarily get comparable scores. The inconsistency comes from the lack of uniform criteria, scales, and targets (Doyle, 2018). For that reason, the portfolio composition may vary, depending on which agency is used. One way to achieve a more robust result would be to use an average score of the different agencies.

Another limitation of this dataset is the transaction costs. This thesis is relying on a one-year rebalancing portfolio, which would lead to considerable transaction costs. The potential abnormal earnings, represented by a positive alpha, should therefore be reduced with the cost of applying the strategy in terms of transaction costs. However, this thesis will not take this into account.

Lastly, the period analyzed in this thesis, 2009-2019, represents a bull market. Thus, the relationship between ESG and risk-adjusted-performance may not be representable for other states of the market.

5.0 Methodology

This chapter forms the basis of the empirical analysis. By applying a long-short strategy, we go long in portfolios consisting of companies with high ESG-rating and short in portfolios consisting of companies with low ESG-rating. We measure risk-adjusted return by applying three different factor models. The factor models used in this thesis are the Fama & French three-factor model, the Fama & French five-factor model, and the Carhart four-factor model. To measure the portfolios' performance, we apply time-series regressions and interpret monthly alphas for our strategy. A positive alpha indicates abnormal return for high-rated stocks, and a negative alpha indicates abnormal return for low-rated stocks.

5.1 Model Specifications

Factor models are based on an intuition that risky assets are given a surcharge, as they are more exposed to systematic risk factors (Ang, 2014). Fama and French (2004) argue that the size of the company (SML) and the relationship between equity and market value (HML), in addition to the market factor, are non-diversifiable risk factors in the stock market. The Fama and French models seek to explain the variation of return on the listed companies (Womack & Zhang, 2003). Using the historical risk factors affecting the return, the model measures the risk of returns in a dataset. The model's implementation simplifies the cleaning process, as we do not need to divide our data into companies- or industry-specific risk factors.

Using well-known and globally accepted models makes our findings easier to understand for others. However, it is necessary to interpret the models correctly. As we investigate the difference between a long-short portfolio, the degree of explanations will likely be lower than ordinary portfolios with a long or short position. Furthermore, with a non-significant estimation, we cannot reject the null hypothesis of zero differences between the two portfolios in the exposure of the specific risk factor in a long-short portfolio.

5.2. The Models

In the following, the factor models used in this thesis will be presented.

5.2.1 Fama & French three-factor model

Fama and French's three-factor model was developed in 1993 to extend the Capital Assets Pricing Model (CAPM) (Fama & French, 1993). The model aims to describe the stock returns through three factors: Market risk premium, Small-minus-Big, and High-minus-Low. The market risk premium-factor is the difference between the expected return of the market and the risk-free rate. Small-minus-Big is the outperformance of small-cap companies relative to large-cap companies. High-minus-Low represents the outperformance of high book-to-market value companies versus low book-to-market value companies.

$$GMB_t = \alpha + \beta_{rm}(Rm_t - Rf_t) + \beta_{SMB}(SMB_t) + \beta_{HML}(HML_t) + u_t$$

Where:

$GMB_t = Excess\ return\ on\ good\ minus\ bad\ portfolios\ at\ time\ t$

$\alpha = Abnormal\ return$

$\beta_{rm} = Exposure\ to\ market\ factor$

$(Rm_t - Rf_t) = Excess\ return\ in\ the\ market\ at\ time\ t$

$\beta_{SMB} = Exposure\ to\ the\ size\ factor$

$SMB_t = Size\ factor\ at\ time\ t$

$\beta_{HML} = Exposure\ to\ the\ value\ factor$

$HML_t = Value\ factor\ at\ time\ t$

$u_t = Error\ term\ at\ time\ t$

5.2.2 The Carhart four-factor model

In 1995, Mark Carhart presented the momentum factor, an additional factor to Fama and French`s three-factor. The momentum factor is a one-year return momentum versus contrarian stocks (Carhart, 2012), accounting for the persistence involving a long position in earlier winners and a short position in previous losers. Using data unbiased for survivorship, more variation in returns is described when adding the momentum factor (Carhart, 2012).

$$GMB_t = \alpha + \beta_{rm}(Rm_t - Rf_t) + \beta_{SMB}(SMB_t) + \beta_{HML}(HML_t) + \beta_{WML}(WML_t) + u_t$$

Where:

$\beta_{WML} = Exposure\ to\ the\ momentum\ factor$

$WML_t = Momentum\ factor\ at\ time\ t$

5.2.3 Fama & French five-factor model

After research showed evidence that the three-factor model was incomplete, Fama and French extended the model (Fama & French, 2015). Novy-Marx (2013) and Titman, Wei, and Xie (2004), among others, argued that the model was incomplete because of the lack of variation in average return related to profitability and investment. Motivated by this, Fama and French added two additional factors: The profitability factor (RMW) and the investment factor (CMA) (Fama & French, 2015). RMW represents the difference between the returns on diversified portfolios of stock with robust and weak profitability. CMA is the difference between the returns on diversified portfolios of stocks of low and high investment firms, called conservative and aggressive.

$$GMB_t = \alpha + \beta_{rm}(Rm_t - Rf_t) + \beta_{SMB}(SMB_t) + \beta_{HML}(HML_t) + \beta_{CMA}(CMA_T) + \beta_{RMW}(RMW_t) + u_t$$

Where:

$\beta_{CMA} = Exposure\ to\ the\ investment\ factor$

$CMA_T = Investment\ factor\ at\ time\ t$

$\beta_{RMW} = Exposure\ to\ the\ profitability\ factor$

$RMW_t = Profitability\ factor\ at\ time\ t$

5.3 Model testing

To trust the regressions used in interpreting the results that our models provide, some assumptions of the data set need to be verified. These assumptions are no autocorrelation and homoscedasticity. In addition, we need to make sure that our data set is stationary since we are using time series analysis (Studenmund, 2014). If these assumptions are not met, the data needs to be transformed not to have spurious results.

5.3.1 Autocorrelation

For testing autocorrelation in our data, we have used both the Durbin-Watson test for autocorrelation, as well as the Breusch-Godfrey test. Since the Durbin-Watson test gave us unidentifiable results in some cases, the Breusch-Godfrey test was used to get a more robust check for autocorrelation. While a small number of our datasets showed weak negative autocorrelation, none of the datasets had to be transformed due to significant autocorrelation.

5.3.2 Heteroscedasticity

To test our data for possible heteroscedasticity, we used White's test. The test showed that several of our datasets struggled with heteroscedasticity. In these cases, we ran new regressions with robust standard errors. A list of the regressions where robust estimation was used can be found in the Appendix (B).

5.3.3 Stationarity

To check for stationarity in our datasets, we performed the Augmented Dickey-Fuller unit root test. The test showed that all our datasets were stationary and could therefore be used in the regressions.

6. 0 Results

In this section, the relationship between companies' ESG-rating and their financial performance is investigated. Our analysis is separated into two parts. In the first part, companies representing the overall European market are examined. This is done by screening companies into portfolios both by their ESG- and ESGC scores. The portfolios are first screened by the companies' ESG scores and the return is measured both equally weighted and value-weighted. The portfolios compared consist of 25% of the companies with the highest ESG scores and 25% of the companies with the lowest ESG scores. To achieve a more robust result, we use 10% cut-off rates on the portfolios as well. We compare the return from the portfolios using a long-short zero investment strategy, meaning we go long in the portfolio consisting of companies with the highest ESG scores and short in the portfolios consisting of companies with the lowest ESG scores. The same procedure is done when portfolios are screened by their ESGC scores. To adjust for risk exposure in the portfolios, three different factor models have been used. The abnormal return is represented by the alpha, which is presented in the tables. We want to see if the alphas are significant in several factor models, indicating a robust difference in the return between the portfolios. In addition to interpreting the alphas from the regressions, we will also interpret the risk factors and their importance.

In the second part of the analysis, we divide the companies into 11 different industries. Within these industries, portfolios are screened by the company's environmental scores, social scores and governance scores. The same method is applied for comparing the portfolio's performance as in the first analysis. By performing industry analyses, we can see if some industries drive the results from our first analysis. In addition, by applying these measurements, it is possible to assess if investors can achieve abnormal returns by screening on either the environmental criteria, social criteria or governance criteria within a specific industry in the European market, based on historical numbers. The cut-off rate used in the industry analysis is 40%. This is because the number of companies within each industry varies greatly, and some industries do not contain enough companies to apply a lower cut-off rate. The primary attention when presenting the results will be on the industry analysis.

In the European overall market analysis, we will devote more space to discussing the risk factors and their importance. In the industry analysis, the main focus will be on the alphas, and the risk factors will be discussed at the end.

6.1 Analysis of the European market

Table 5. 1 Results from the analysis on the European market using ESG scores (25% cut-off rate)

European market ESG:						
Cut-off rate: 25%						
	Value-weighted			Equally weighted		
	(1)	(2)	(3)	(1)	(2)	(3)
MktRF	0.1378*	0.1604**	0.1631**	0.0097	0.0167	0.0209
SMB	-0.2687**	-0.2532*	-0.328**	-0.3856***	-0.3807***	-0.3956***
HML	-0.1102	-0.0442	-0.4604**	0.0289	0.0494	-0.0573
WML		0.1056			0.0328	
RMW			-0.5051*			-0.1169
CMA			0.2517			0.1223
α	-0.32	-0.39	-0.14	-0.1	-0.12	-0.05
N	131	131	131	131	131	131
R2	9 %	11 %	14 %	18 %	18 %	19 %

This table shows the output from the regressions using the Fama & French three-factor model (1), the Carhart four-factor model (2) and the Fama & French five-factor model (3). The left side of the table presents the results from the value-weighted portfolios, while the right side of the table presents the results from the equally weighted portfolios. The portfolios are screened by companies' ESG scores, and the cut-off rate on the portfolios is 25%.

Table 5. 2 Results from the analysis on the European market using ESGC scores (25% cut-off rate)

European market ESGC:						
Cut-off rate: 25%						
	Value-weighted			Equally weighted		
	(1)	(2)	(3)	(1)	(2)	(3)
MktRF	0.1289*	0.1412*	0.1560**	0.0158	0.0242	0.0316
SMB	-0.231	-0.2225	-0.2857*	-0.3326***	-0.3269***	-0.3308***
HML	-0.1398	-0.1038	-0.5047***	-0.0219	0.0024	-0.1091
WML		0.0576			0.0389	
RMW			-0.5206*			-0.0899
CMA			0.2643			0.1632
α	-0.08	-0.11	0.1	0.01	-0.02	0.04
N	131	131	131	131	131	131
R2	7 %	7 %	11 %	14 %	15 %	15 %

This table shows the output from the regressions using the Fama & French three-factor model (1), the Carhart four-factor model (2) and the Fama & French five-factor model (3). The left side of the table presents the results from the value-weighted portfolios, while the right side of the table presents the results from the equally weighted portfolios. The portfolios are screened by companies' ESGC scores, and the cut-off rate on the portfolios is 25%.

Table 5. 3 Results from the analysis on the European market using ESG scores (10% cut-off rate)

European market ESG:						
Cut-off rate: 10%						
	Value-weighted			Equally weighted		
	(1)	(2)	(3)	(1)	(2)	(3)
MktRF	0.1449***	0.1163**	0.1013*	-0.0024	0.0005	0.004
SMB	-0.2821**	-0.3018**	-0.3521**	-0.5655***	-0.5635***	-0.5933***
HML	-0.0474	-0.1312	-0.0497	0.0223	0.0307	-0.0718
WML		-0.1340*			0.0135	
RMW			-0.2754			-0.1687
CMA			-0.4228*			0.0851
α	-0.67**	-0.60**	-0.55**	-0.16	-0.17	-0.08
N	131	131	131	131	131	131
R2	10 %	13 %	13 %	18 %	18 %	19 %

This table shows the output from the regressions using the Fama & French three-factor model (1), the Carhart four-factor model (2) and the Fama & French five-factor model (3). The left side of the table presents the results from the value-weighted portfolios, while the right side of the table presents the results from the equally weighted portfolios. The portfolios are screened by companies' ESG scores, and the cut-off rate on the portfolios is 10%.

Table 5. 4 Results from the analysis on the European market using ESGC scores (10% cut-off rate)

European market ESGC:						
Cut-off rate: 10%						
	Value-weighted			Equally weighted		
	(1)	(2)	(3)	(1)	(2)	(3)
MktRF	0.0874*	0.0737	0.0624	0.0354	0.0387	0.0295
SMB	-0.2759	-0.2854**	-0.2807**	-0.4581	-0.4557***	-0.4806***
HML	-0.0712	-0.1113	0.0547	-0.1392	-0.1292	-0.1614
WML		-0.0642			0.0159	
RMW			0.0643			-0.1037
CMA			-0.2361			-0.0407
α	-0.78***	-0.74***	-0.78***	-0.06	-0.07	0
N	131	131	131	131	131	131
R2	7 %	8 %	8 %	13 %	13 %	13 %

This table shows the output from the regressions using the Fama & French three-factor model (1), the Carhart four-factor model (2) and the Fama & French five-factor model (3). The left side of the table presents the results from the value-weighted portfolios, while the right side of the table presents the results from the equally weighted portfolios. The portfolios are screened by companies' ESGC scores, and the cut-off rate on the portfolios is 10%.

Table 5.1 and Table 5.2 show the results from our analysis on the overall European market when using a 25% cut-off rate on the portfolios. We can see that the strategy generates an average alpha of -0.18% when the portfolios are screened by companies' ESG scores. When we screen the portfolios by ESGC scores, this generates an average alpha of -0.01%. Both results indicate an outperformance by low-rated portfolios over high-rated portfolios. However, the alphas are not significant in either of the models. This means that we cannot claim any significant difference in the high and the low portfolios of the European market regarding risk-adjusted return when using a 25% cut-off rate.

When using a 10% cut-off rate (table 5.3 and table 5.4), we see a different result. The alphas in the value-weighted portfolios, both when screening by ESG- and ESGC scores, are significant both at 5% level and at 1% level, in all three models. All the alphas are negative, indicating an outperformance by low-rated portfolios over high-rated portfolios. When screening by ESG score, the low-rated portfolios outperform the high by an average of 0.61%

monthly. When screening by ESGC scores, the outperformance by the low-rated portfolios has a monthly average of 0.77%. The fact that the significant alphas only appear in the value-weighted portfolios implies that the outperformance by the low-rated ESG stocks is particularly present for companies with a higher market capitalization. This is because companies with higher market cap are given bigger weights in the value-weighted portfolios. Considering that our results are not consistent over different cut-off rates, we cannot conclude that there is an existing relationship between CSR and CFP. Our first hypothesis, stating that high ESG rated stocks will not provide better risk-adjusted return than low ESG-rated stocks in the European market, is therefore not rejected.

The portfolio's exposure to the risk factors is also presented in the table 5.1-5.4. Since we are analyzing differences in two portfolios, a significant risk factor means a significant difference in the exposure to this risk factor between the high and the low portfolio. Using a 25% cut-off rate, the market risk premium (MktRF) is significant for all three models, both when screening by ESG and ESGC score. The risk factor is significant in all the value-weighted portfolios, and the exposure is positive. This indicates that the portfolios consisting of high-rated ESG stocks have higher volatility in terms of market risk than the low-rated portfolio. The significant betas appear only in the value-weighted portfolios, indicating that the higher volatility is especially present for bigger companies. When using a 10% cut-off rate, the significant differences disappear for the portfolios screened by ESGC scores.

The SMB factor (small-minus-big) is also significant across all three models using a 25% cut-off rate. This accounts when screening portfolios both by ESG- and ESGC score. When screening by ESG score, it is significant in all three models, both for equally weighted and value-weighted portfolios. However, it is significant only for the equally weighted portfolio when screening by ESGC score. The negative exposure to the SMB factor indicates that the low-rated portfolios have higher exposure to small-cap companies than the high-rated portfolios. Using a 10% cut-off rate, the differences between portfolios screened by ESGC scores change slightly. Here, we find the exposure no longer significant across all three models, neither in the equally nor the value-weighted portfolios.

The HML factor (high-minus-low) is significant for the value-weighted portfolios when screening by ESG- and ESGC scores. The exposure to this factor is negative in both cases. This indicates that the low-rated companies have higher exposure to value stocks (stocks with

a high book-to-price ratio) than high-rated companies. When using a 10% cut-off rate, the significant difference between high- and low-rated portfolios disappear.

The RMW factor (robust minus weak) is significant in the Fama & French five-factor model for the value-weighted portfolio. This is the case for screening by both ESG- and ESGC scores. The exposure is negative, which indicates that the portfolios containing companies with high ESG scores comprise more companies with weak profitability than robust profitability. Also, here, the difference between the portfolios disappears when using a 10% cut-off rate.

The WML (winners minus loosers) factor is significant for the value-weighted portfolios when screening by ESG score, but it is only significant when using a 10% cut-off rate. The CMA (conservatively minus aggressively) is not significant in either of the models.

6.2 Industry analysis

Table 6. 1 Results from the industry analysis (40% cut-off rate)

Industry:	**Value-Weighted Portfolios**								
	(1)			(2)			(3)		
	E	S	G	E	S	G	E	S	G
Utilities	0.47	0.48	0.62*	0.29	0.36	0.48	0.04	0.04	0.41
Real Estate	0.07	0.01	-0.23	-0.02	0.02	-0.22	0.15	0.06	-0.07
Materials	-0.15	-0.17	-0.67***	-0.17	-0.28	-0.8	-0.22	-0.24	-0.64**
IT	-0.86	0.18	0.15	-0.99*	0.11	0.22	-1.1*	0.11	-0.11
Industrials	-0.22	-0.16	-0.32**	-0.19	-0.08	-0.26*	-0.31	-0.11	-0.34**
Health Care	0.03	-0.07	-0.6	0.01	-0.06	-0.54	0.09	-0.02	-0.67
Financials	0.28	0.53*	-0.37	0.43	0.73**	-0.48	0.39	0.5	-0.1
Consumer Staples	-0.7**	-0.57**	-0.18	-0.71**	-0.63**	-0.11	-0.69**	-0.53*	-0.06
Communication Services	-0.45	-0.92***	-0.85**	-0.41	-0.86**	-0.73*	-0.51	-0.77*	-0.79*
Energy	-0.59	-0.19	-0.2	-0.73	-0.17	-0.19	-0.54	-0.18	-0.2
Consumer Discretionary	-0.11	-0.21	-0.73**	-0.15	-0.27	-0.75**	-0.13	-0.09	-0.80**
	Equally-Weighted Portfolios								
	(1)			(2)			(3)		
	E	S	G	E	S	G	E	S	G
Utilities	0.16	0.16	-0.22	0.13	0.18	-0.21	0.23	-0.02	-0.17
Real Estate	0.16	0.3	0.32	0.01	0.27	0.49	0.31	0.46*	0.42
Materials	-0.18	0.09	-0.35*	-0.27	0.02	-0.35*	-0.26	0.06	-0.27
IT	0.05	0.26	0.17	-0.02	0.15	0.19	0.04	0.39	-0.09
Industrials	0.17	-0.15	-0.09	-0.15	-0.13	-0.13	-0.21	-0.19	-0.08
Health Care	-0.02	0.01	0.01	-0.12	-0.06	0.06	-0.02	0.12	-0.01
Financials	-0.01	0.08	0.21	0.05	0.19	0.28	0.08	0.13	0.3
Consumer Staples	-0.22	-0.37	-0.48**	-0.25	-0.39	-0.44**	-0.08	-0.23	-0.38*
Communication Services	-0.22	-0.42*	-0.83***	-0.33	-0.52**	-0.86***	-0.2	-0.38	-0.82**
Energy	0.08	0.22	0.29	0.06	0.21	0.36	0.29	0.28	0.43
Consumer Discretionary	-0.02	0.01	-0.13	-0.03	0.07	0.04	-0.02	0.2	-0.05

This table presents the alphas from the industry analysis using the Fama & French three-factor model (1), the Carhart four-factor model (2) and the Fama & French five-factor model (3). The upper half of the table shows the results of the value-weighted portfolios, while the lower half shows the results of the equally weighted portfolios. The portfolios are screened by companies' environmental-, social- and governance scores, and the cut-off rates on the portfolios are 40%.

An important implication of the industry analysis is that the portfolios are no longer well diversified, as it was in our first analysis. The effect of this is that there are more idiosyncratic risk attached to our portfolios. This again can explain that the magnitude of significant alphas is higher in the industry analysis than the overall analysis.

Table 6.1 shows that the strategy applied in our analysis generates several significant alphas from various industries. Across all models, we find 36 significant alphas, where 32 of these alphas are negative. A clear negative relation between ESG rating and stock return in the industry analysis is therefore visible. We find that eight of the significant alphas are significant in all the three models we apply, five alphas are significant in two models, and two alphas are significant in one of the models.

We find no significant differences in return between high ESG-rated stocks and low ESG-rated stocks in some of the industries. This is the case for the Health Care- and the Energy industry, where none of the alphas are significant. In Utilities and Real Estate, we only find one significant alpha, and these alphas only appear in one of the models. Hence, no systematic trend is detected in the mentioned industries.

In the Materials industry, we observe a pattern of significant alphas. When we screen portfolios by the companies' governance score, both the value-weighted and the equally weighted portfolios show significant negative alphas. These negative alphas appear for models 1 and 3 for the value-weighted portfolios and models 1 and 2 for the equally weighted portfolios. In this industry, companies with low governance ratings outperform the high governance-rated companies by an average of 0.5% each month.

In the IT industry, we also observe a pattern of significant alphas. When we screen the portfolios by their environmental scores, the equally weighted portfolios produce significant negative alphas when applying models 2 and 3. The alphas' size is relatively large, showing that companies with a low rating on the environmental component outperform the highly rated companies with a monthly average of 1%.

In the Financials industry, we find the only positive alphas consistent over more than one model. By screening the portfolios by their social scores, the value-weighted portfolios produce significant alphas in models 1 and 2. The monthly average of outperformance by the high-rated companies is 0.63%. Interestingly, we observe an overweight of positive alphas in the Financials industry, where 14 out of 18 alphas in this industry come out positive.

However, as mentioned, only the alphas in the portfolios screened by the social component are significant. The result from this industry provides a basis for rejecting our second hypothesis stating that none of the industries will show better risk-adjusted return for high ESG rated companies when analyzing the ESG components separately. Our results show that high social-rated stocks provide better risk-adjusted returns than low social-rated stocks in the Financials industry.

In the Industrials industry, we observe a systematic trend when the portfolios are screened by their governance score. By using value-weighted portfolios, low governance-rated companies outperform high-rated with a monthly average of 0.31%. The alphas are significant in all of the three models. The same trend applies to the Consumer Discretionary industry, as we observed for the Industrials Industry. The value-weighted portfolios screened by the companies governance score produce significant negative alphas in all three models. Here, the monthly outperformance by low governance-rated companies is, on average, 0.76%.

In the Consumer Staples industry, we observe three significant alphas across all three models. The alphas appear in all three screening criteria. When we screen the portfolios by the company's environmental scores, the value-weighted portfolios produce significant alphas in all three models. The same applies when we screen by the companies social scores. When screening by the governance score, the equally weighted portfolios are significant in all models. The three screening methods lead to outperformance by the low-rated portfolios of 0.7% (environmental), 0.58% (social) and 0.43% (governance). A majority of the alphas are significant on a five percent level.

A systematic trend is also to be found in the last industry, Communication Services. When we screen portfolios by the company's social scores, we find significant negative alphas for both the equally weighted and the value-weighted portfolios. This result is present for all three models when using value-weighted portfolios, and it is present for model 1 and model 2 when using equally weighted portfolios. The monthly outperformance by the low social-rated portfolios over the high-rated portfolios is on an average of 0.66%. When screening the portfolios by companies` governance scores, this creates an even more significant outperformance by the low-rated companies with a monthly average of 0.84%. These alphas are significant both when using equally weighted and value-weighted portfolios, and they are consistent over all three models.

Table 7. 1 The industries' exposure to the risk factors

	Value weighted portfolios			Equally weighted portfolios		
	E	S	G	E	S	G
MktRF	Utilities, Health Care, IT, Consumer Staples	IT, Industrials	IT, Industrials, Health Care	Communication services, Utilities		IT
SMB	IT	Materials, IT, Communication Services, Utilities, Consumer Staples	Utilities, Materials, IT, Financials, Consumer Staples, Real Estate	Real estate, Communication Services, Consumer Staples, Consumer Discretionary, Energy	Real Estate, Materials, IT, Industrials, Communication Services, Energy, Consumer Discretionary, Consumer Staples	IT, Industrials, Communication Services, Energy, Financials
HML	Materials, Health Care, Financials, Consumer Discretionary	Health Care, Financials, Communication Services,	Real Estate, Industrials, Financials, Consumer Staples	Financials, Communication Services	Financials, Communication Services, Energy	Utilities, Real Estate, IT
WML	Utilities, Financials	Materials, Industrials, Financials	Utilities, Materials, Industrials, Consumer Staples	Materials, Health Care, Financials, Communication Services, Financials	Communication Services, Real Estate	
RMW		Utilities	Real Estate	Consumer Staples	Utilities, Real Estate, Consumer Staples	
CMA	Materials, IT		Utilities, Health Care	Health Care, Financials, Communication Services	Financials, Communication Services	Utilities, Financials, Consumer Discretionary

The risk factors for the industry analysis are shown in table 7.1. In the overall analysis, we experienced more significant exposure to the risk factors in the value-weighted portfolios. As for the industry analysis, the exposure to the risk factors is more even distributed. When looking at the MktRF factor, more significant exposure in the industries can be detected when using value-weighted portfolios. This indicates that the difference in exposure to this factor between high- and low-rated companies is more considerable for larger companies. For the SMB, RMW, and CMA factors, we found more significant exposure within the industries for the equally weighted portfolios. This implies that the difference in exposure to these factors is greater for smaller companies. For the HML and WML factors, the number of industries with significant exposure to these risk factors is approximately the same when changing the weights.

7.0 Discussion

7.1 European analysis

The results from our analysis on the overall European market showed that the low ESG-rated companies outperform high-rated companies by 0.61% monthly. When using companies' ESGC scores, which considers recent controversies, the outperformance of the low-rated companies was 0.77% monthly. However, the outperformance is only apparent when using a 10% cut-off rate on the portfolios. By using a 25% cut-off rate, none of the alphas are significant. This indicates that the result of this analysis is not robust over different cut-off rates.

The different results across the two different cut-off rates show some interesting insight: the difference in return for the high-rated and low-rated portfolios is more prominent when analyzing the extremes in our sample. When using a higher cut-off rate and thereby including more companies, this difference is no longer significant. Since our result is not robust over the different cut-off rates, we cannot conclude with a significant difference between high- and low ESG-rated companies in the European market. That being said, investors using the same investment strategy should be aware of the implication of our results: screening portfolios using a lower cut-off rate can create a negative risk-adjusted return and thereby reducing the value of the investment.

The results from our analysis when using a 10% cut-off rate can be explained by Friedman's (1970) argument that costs outweigh the benefits of being socially responsible, reducing the shareholders' wealth. By looking at the portfolio's exposure to the RMW factor, we saw that the high ESG-rated portfolios comprise more companies with weak profitability than robust profitability. This result also supports Friedman's argument, indicating that the high ESG-rated companies do not have more robust profitability than low-rated.

7.2 Industry analysis

In the industry analysis, we found that four out of eleven industries show a neutral relationship between CSR and CFP. This applies to Health Care, Energy, Utilities and Real Estate. Within these industries, our results show that investors can invest socially responsibly

without having to sacrifice return. The neutral relationship in these industries is in line with the third perspective mentioned in chapter 2.1, claiming that CSR is unpriced.

In the Financials industry, we observed significant positive alphas for the social screen. A clear positive trend is apparent when looking at both significant and insignificant alphas: 14 out of 18 alphas in the Financials came out positive. The results from this industry show that investors can screen portfolios based on social scores and achieve a monthly abnormal return of 0.63%. This positive relationship between CSR and CFP aligns with Freeman's (1984) stakeholder-theory argument presented in chapter 2.1 of this thesis. The reason behind this result when using a social screening would be interesting to find out. A possible explanation could be the increased demand from external shareholders for companies within the financial sector to increase transparency in their risk management and communities requiring engagement and increased transparency (Ernst & Young LLP, 2019). It is conceivable that this could lead to higher returns for companies that meet this demand and thereby have high scores on the social component.

The IT industry was one out of two industries where we found a significant difference in portfolios screened by environmental scores. Here, investors cannot invest socially responsibly by screening portfolios by companies' environmental scores without sacrificing return, following our strategy. The IT industry showed the most considerable outperformance, where the low-rated companies outperformed the high-rated companies by 1% monthly. This result indicates that the IT industry might be lagging behind other industries when it comes to the environmental component. A report from KPMG (2020) shows that the awareness and appreciation for ESG issues are not yet fully translated into business practices for technology companies. This could explain why we see such a considerable underperformance by high environmental-rated companies, implying that environmental-related factors are not considered risk factors for investors investing in this industry.

In the Industrials-, Consumer Discretionary- and Materials industry, we found trends of significant negative alphas within one screening criteria. In these industries, we saw a trend of negative alphas when screening portfolios by companies' governance scores. Thus, our results show that investors cannot invest socially responsible by screening portfolios by companies' governance scores in these three industries without sacrificing return.

In the last two industries, Consumer Staples and Communication Services, we found significant negative alphas for several screening criteria. In Communication Services, we found that investors cannot invest socially responsibly by screening portfolios by the companies' social scores or their governance scores without sacrificing return. Consumer Staples stands out in terms of being the only industry where all three screening criteria showed outperformance by low-rated companies. Here, investors cannot invest by screening portfolios either by the E, S or G criteria without sacrificing return. This clear outperformance by low-rated companies could be explained by looking at the underlying companies within the Consumer Staples industry. The low-rated portfolios from our data sample contain several companies that are involved in the alcohol-, sugar- and tobacco industry, which by definition of many investors would be considered as "sin stocks". As Statman & Glushkov (2009) found in their research, shunning "sin stocks" from portfolios may cause a financial disadvantage relative to conventional portfolios. This indicates that the outperformance by the low-rated portfolios in the Consumer Staples industry may be driven by the "sin stocks".

In comparison to previously mentioned research, our results show some similarities. Auer & Schuhmacher's (2016) findings from Europe showed that investors should avoid some combinations between ESG-criteria and industry not to cause financial disadvantages. Our results support this, as six industries showed outperformance by low ESG-rated stocks in one or more screening strategies. Auer & Schuhmacher (2016) did not find any outperformance by high-rated portfolios in any of the industries or by any of the screening criteria in Europe. Thus, our results also differ from theirs, since we found outperformance by high rated companies within the Financials industry. However, the researchers did use a slightly different strategy by comparing portfolios to a passive benchmark instead of applying a long-short strategy.

When reviewing the results from the different screenings criteria across all the industries, we see most cases of outperformance between high- and low-rated portfolios when using a governance screen. Five of the industries show outperformance when screening by governance scores. When using a social screen, we find outperformance in three industries and we see outperformance in two of the industries when using the environmental screen. Hence, the social-, and especially the governance screen, creates more abnormal returns

across the industries than the environmental screen. This result provides a basis for rejecting our third hypothesis, stating that none of the ESG components will be more important in explaining financial returns than the others. Our results suggest that the social- and governance components are more important in explaining stock returns than the environmental component when comparing the three screening criteria. A possible explanation for this might be that investors have started to incorporate the environmental factor in their risk assessment and that the social- and governance factors are assessed as less important. NN Investment Partners (2019) reports from a survey of professional investors in Europe that 66% of the investors believe that environmental factors have the most potential to drive returns, while only 40% see potential in governance factors and 15% in social factors. This could contribute to explaining the differences in the screens that our results show us.

8.0 Conclusion

Our first hypothesis, stating that high ESG-rated companies do not provide better risk-adjusted returns than low ESG-rated stocks, could not be rejected. When using a 10% cut-off rate on the analyzed portfolios, our results showed a negative relationship between ESG scores and stock performance. However, the results were not robust over different cut-off rates, and we concluded with a non-existent relationship between corporate social responsibility and financial performance. For investors who would like to invest socially responsibly in the European market, our findings imply that they can do so without sacrificing return.

Our second hypothesis, stating that none of the industries will show better risk-adjusted return for high ESG-rated companies when analyzing the ESG components separately, is rejected. The results from the analysis on the Financials industry showed that high social-rated companies outperformed low-rated ones. Investors can invest socially responsibly based on the social-component in the Financials industry and earn a monthly abnormal return of 0.63%.

Our third hypothesis, claiming that none of the ESG components will be more important in explaining financial returns than the others, is rejected. Our results showed that the social, and especially the governance component, are more important in generating abnormal return than the environmental component. This could indicate that investors have started to incorporate the environmental factor in their risk assessment and that the social- and governance factors are deemed less prominent.

In our introduction, we raised the following question: "Is there a positive relationship between CSR and CFP, and can investors achieve abnormal returns in any industries by investing based on either the E, S or G criteria?". Our answer to the first part of this question is that we find no relationship between CSR and CFP. As for the second part of the question, results show that in specific industries and depending on the ESG criterion, investors pay a price for being socially responsible. However, investors investing socially responsibly based on the social component in the Financials industry can earn an abnormal return of 0.63% monthly.

In terms of future research, one could consider using other ESG-score providers to see if this generates different results. As mentioned, a way to achieve a more robust result would be to

use an average score of the various agencies since there is an inconsistency between the different providers of ESG scores (Doyle, 2018). Also, analyzing the relationship between CSR and CFP within industries in other parts of the world could give interesting insight. As of today, there is not much research that investigates this relationship in the Asian market, making it an interesting area to analyze.

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APPENDIX

A – List of Asset4 Europe constituents after the data cleaning process

Industry / Year	**Number of companies after screening**	**Industry / Year**	**Number of companies after screening**	**Industry / Year**	**Number of companies after screening**	**Industry / Year**	**Number of companies after screening**
Energy		Industrials		Consumer Staples		Financials	
2009	42	2009	138	2009	40	2009	130
2010	45	2010	146	2010	43	2010	136
2011	46	2011	150	2011	47	2011	139
2012	47	2012	153	2012	50	2012	140
2013	48	2013	155	2013	52	2013	141
2014	48	2014	161	2014	53	2014	143
2015	51	2015	174	2015	54	2015	149
2016	51	2016	181	2016	54	2016	160
2017	54	2017	196	2017	58	2017	172
2018	55	2018	199	2018	63	2018	175
2019	55	2019	196	2019	59	2019	164
Total	**542**		**1849**		**573**		**1649**
Materials		Consumer Discretionary		Health Care		Information Technology	
2009	62	2009	79	2009	37	2009	34
2010	67	2010	82	2010	40	2010	35
2011	72	2011	87	2011	41	2011	41
2012	80	2012	88	2012	41	2012	42
2013	81	2013	90	2013	41	2013	42
2014	84	2014	94	2014	41	2014	43
2015	85	2015	109	2015	45	2015	47
2016	89	2016	114	2016	52	2016	51
2017	91	2017	121	2017	54	2017	60
2018	92	2018	127	2018	62	2018	60
2019	83	2019	124	2019	67	2019	53
Total	**886**		**1115**		**521**		**508**
Real Estate		Communication Services		Utilities		**GRAND TOTAL**	
2009	36	2009	58	2009	33	**2009**	**689**
2010	38	2010	58	2010	34	**2010**	**724**
2011	44	2011	60	2011	35	**2011**	**762**
2012	47	2012	61	2012	37	**2012**	**786**
2013	47	2013	62	2013	37	**2013**	**796**
2014	48	2014	62	2014	38	**2014**	**815**
2015	56	2015	63	2015	40	**2015**	**873**
2016	57	2016	66	2016	40	**2016**	**915**
2017	61	2017	73	2017	44	**2017**	**984**
2018	62	2018	76	2018	43	**2018**	**1014**
2019	58	2019	70	2019	35	**2019**	**964**

Total	**554**		**709**		**416**	**Grand Total**	**9322**

B - Regressions that struggled with heteroscedasticity

White's test for heteroscedasticity showed that these regressions struggled with heteroscedasticity. Therefore, robust standard error estimation has been used. The following table shows the regressions that had to be transformed.

Fama & French three factor model:	**Carhart four-factor model:**	**Fama & French five factor model:**
Overall market – screened by ESG score (value weighted)	Overall market – screened by ESG score (value weighted)	Overall market – screened by ESG score (value weighted)
Overall market – screened by ESG score (equally weighted)	Overall market – screened by ESG score (equally weighted)	Overall market – screened by ESG score (equally weighted)
Overall market – screened by ESGC score (value weighted)	Overall market – screened by ESGC score (value weighted)	Overall market – screened by ESGC score (value weighted)
Overall market – screened by ESGC score (equally weighted)	Overall market – screened by ESGC score (equally weighted)	Overall market – screened by ESGC score (equally weighted)
Materials – screened by environmental score (value weighted)	Materials – screened by environmental score (value weighted)	Materials – screened by environmental score (value weighted)
Materials – screened by environmental score (equally weighted)	Materials – screened by environmental score (equally weighted)	Materials – screened by environmental score (equally weighted)
Materials – screened by governance score (value weighted)	Real estate – screened by environmental score (value weighted)	Materials – screened by social score (equally weighted)
Materials – screened by governance score (equally weighted)	Real Estate – screened by environmental score (equally weighted)	Materials – screened by governance score (equally weighted)
Real estate – screened by environmental score (value weighted)	Real Estate – screened by social score (value weighted)	Real estate – screened by environmental score (value weighted)
Real Estate – screened by environmental score (equally weighted)	Real Estate – screened by social score (equally weighted)	Real Estate – screened by environmental score (equally weighted)
Real Estate – screened by social score (value weighted)	Real Estate – screened by governance score (value weighted)	Real Estate – screened by social score (value weighted)
Real Estate – screened by social score (equally weighted)	Real Estate – screened by governance score (equally weighted)	Real Estate – screened by social score (equally weighted)
Real Estate – screened by governance score (value weighted)	Information Technology – screened by environmental score (value weighted)	Real Estate – screened by governance score (value weighted)
Real Estate – screened by governance score (equally weighted)	Information Technology – screened by environmental score (equally weighted)	Real Estate – screened by governance score (equally weighted)
Information Technology – screened by environmental score (value weighted)	Information Technology – screened by social score (value weighted)	Information Technology – screened by social score (value weighted)
Information Technology – screened by social score (value weighted)	Information Technology – screened by social score (equally weighted)	Information Technology – screened by social score (equally weighted)
Information Technology – screened by social score (equally weighted)	Consumer Staples – screened by environmental score (value weighted)	Industrials – screened by governance score (value weighted)
Industrials – screened by environmental score (value weighted)	Consumer Discretionary – screened by environmental score (equally weighted)	Health Care – screened by environmental score (value weighted)
Industrials – screened by governance score (value weighted)	Consumer Discretionary – screened by social score (value weighted)	Health Care – screened by environmental score (equally weighted)
Health Care – screened by environmental score (equally weighted)	Consumer Discretionary – screened by governance score (value weighted)	Consumer Discretionary – screened by environmental score (value weighted)

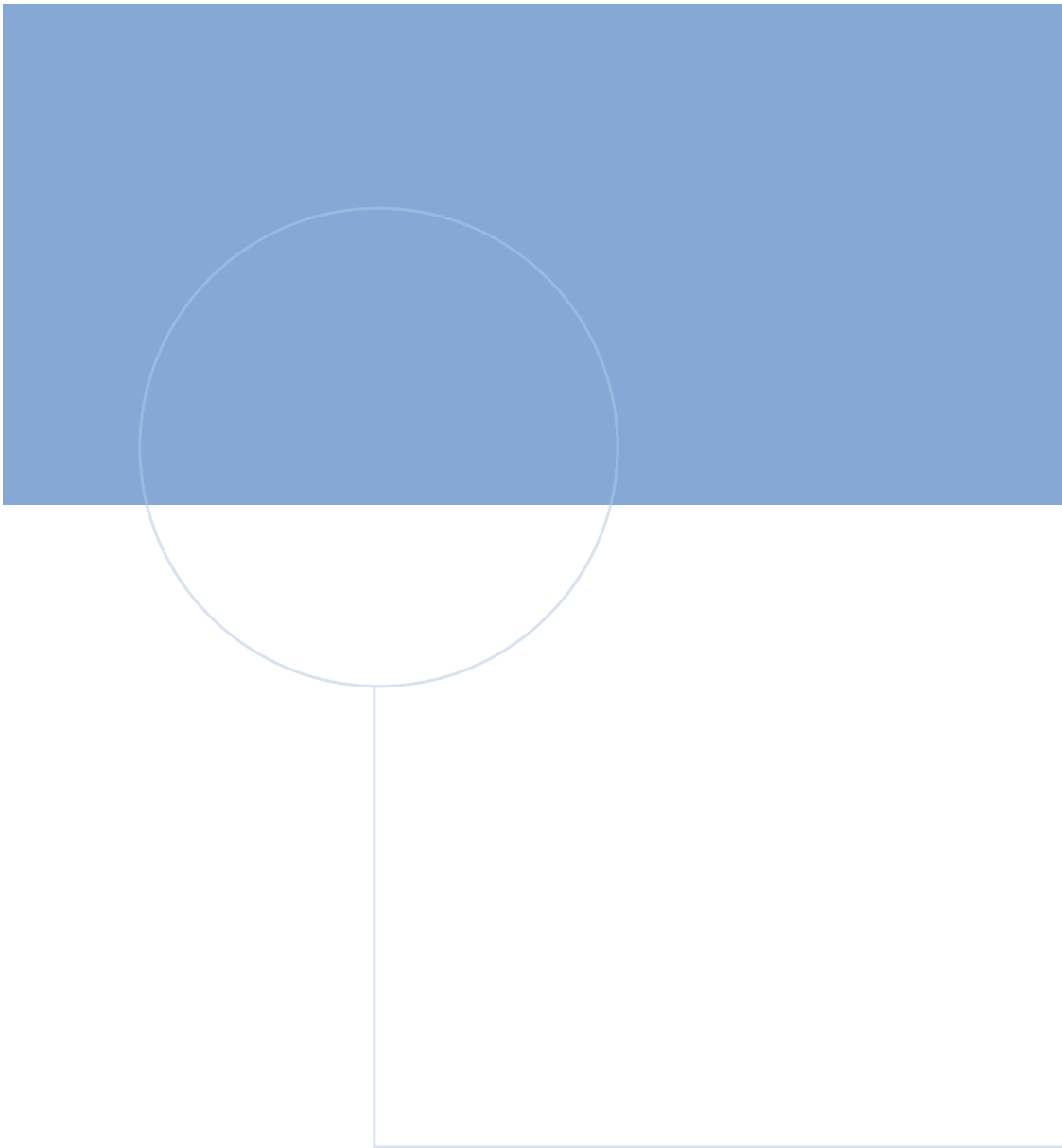
Consumer Staples – screened by environmental score (equally weighted)	Consumer Discretionary – screened by governance score (equally weighted)	Consumer Discretionary – screened by governance score (value weighted)
Consumer Staples – screened by social score (value weighted)	Communication Services – screened by environmental score (equally weighted)	Consumer Discretionary – screened by governance score (equally weighted)
Consumer Staples – screened by social score (equally weighted)	Communication Services – screened by social score (equally weighted)	Communication Services – screened by environmental score (equally weighted)
Consumer Discretionary – screened by governance score (value weighted)	Communication Services – screened by governance score (equally weighted)	Communication Services – screened by social score (equally weighted)
Consumer Discretionary – screened by governance score (equally weighted)	Utilities – screened by environmental score (equally weighted)	Communication Services – screened by governance score (equally weighted)
Communication Services – screened by environmental score (equally weighted)	Utilities – screened by social score (value weighted)	Financials – screened by governance score (value weighted)
Communication Services – screened by social score (equally weighted)	Utilities – screened by social score (equally weighted)	Utilities – screened by environmental score (equally weighted)
Communication Services – screened by governance score (equally weighted)	Utilities – screened by governance score (value weighted)	Utilities – screened by social score (value weighted)
Financials – screened by social score (value weighted)		Utilities – screened by social score (equally weighted)
Utilities – screened by social score (equally weighted)		Utilities – screened by governance score (value weighted)

C – Industry classification

Industry	Sub-industries	
Energy Sector	• Exploration & Production • Refining & Marketing	• Storage & Transportation of Oil & Gas and Coal & Consumable fuels • Oil & Gas Equipment and Services
Materials Sector	• Chemicals • Construction Materials • Glass • Paper • Minerals and Mining Companies	• Forest Products and related Packaging Products • Metals • Producers of Steel
Industrials Sector	• Aerospace & Defense • Building Products • Electrical Equipment and machinery • Construction & Engineering Services	• Commercial & Professional Services including printing, environmental and facilities services, office services & supplies, security & alarm services, human resource & employment services, research & consulting services, transportation services.
Consumer Discretionary Sector	• Automotive • Household durable goods • Leisure equipment and textiles & apparel • Hotels	• Restaurants • Leisure Facilities • Media production and Services • Consumer Retailing and Services
Consumer Staples Sector	• Food • Beverages • Tobacco • Non-durable households	• Personal products • Food & Drug retailing Companies • Hypermarkets • Consumer Super Centers
Health Care Sector	• Research, Development, Production and Marketing of Pharmaceuticals and biotechnology products.	• Health Care Providers & Services • Manufacturing and Distribution of Health Care Equipment & Supplies and Health

		Care Technology Companies
Financials Sector	• Banking • Thrifts & Mortgage Finance • Specialized Finance • Consumer Finance • Asset Management Custody Banks	• Investment Banking • Brokerage • Insurance Financial Exchanges & Data and Mortgage REITs.
Information Technology Sector	• Software & Technology Services	• Manufacters and distributors of Technology Hardware & Equipment such as communications equipment, cellular phones, computers & Peripherals, Electronic Equipment and related instruments, semiconductors
Communication Services Sector	• Telecom • Media & Entertainment • Interactive Gaming Products	• Content and Information Creation Distribution through Proprietary Platforms
Utilities Sector	• Electric • Gas • Water	• Power producers & Energy Trading Renewable Sources
Real Estate Sector	• Real Estate Development and Operations	• Real Estates related services Equity Real Estate Investment Trusts (REITs)

(Source: MSCI, 2020)



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