ERASMUS UNIVERSITY ROTTERDAM

ERASMUS SCHOOL OF ECONOMICS

BSc Economie en Bedrijfseconomie

Bachelor Specialization Financial Economics

THESIS:

Can sustainable investments yield better financial stock returns:

Evidence from the Stoxx Europe 600

Author: Storm Muller

Student number: 543801

Thesis supervisor: Dr. Tim Eisert

Second assessor:

Date final version: 19-07-2022

Preface & acknowledgements

First, I want to thank my supervisor, Dr. Tim Eisert, who has guided me through the process of my thesis. He always managed to find time for me and to provide valuable feedback on my writing and the conceptual part of my thesis.

Abstract

This paper examines the effects of environmental, social, and governance (ESG) scores on stocks that are listed on the STOXX Europe 600 index from January 2009 to December 2020. These effects are examined by a cross-sectional analysis, in which the individual ESG pillars are analyzed and controlled for by industry. Next, a time-series analysis is undertaken, in which ESG scores are categorized into high and low portfolios with a view to analyzing the differences in excess returns and alpha generation. The relationship between ESG factors and the financial performance of a company is a controversial topic. More than 2,000 articles have been published on this subject since 1970 (Friede, Busch, & Bassen, 2015). The vast majority of previous studies demonstrate a positive relationship between ESG and financial returns. However, while I found mixed results, most evidence is in favor of a negative significant result. According to Kaiser (2020), European companies return a negative significant alpha due to the higher adoption rate of ESG criteria among European investors.

Keywords: ESG, sustainable investing, Stoxx 600 Europe, cross-sectional analysis, time-series analysis, and Fama-French three factors

Table of Contents

List of tables

List of Appendix tables

Acronyms

CAPM	Capital Asset Pricing Model
CSR	Corporate Social Responsibility
EMH	Efficient Market Hypothesis
ESG factors	Environmental Social Governmental factors
EU	European Union
GHG	Greenhouse Gas
GSIA	Global Sustainable Investment Alliance
ICB	Industry Classification Benchmark
ISIN	International Securities Identification Number
SRI	Socially Responsible Investment
FF3	Fama and French (1993)
FMB	Fama and MacBeth (1973)

1. Introduction

Today's society and economy experience significant pressure from overarching problems such as climate change and growing population. There has been a shift in values in relation to how businesses are managed – from an exclusive focus on making profit towards social and sustainable organizational governance. Attention is being focused on issues relating to business as usual and corporate governance, and organizations are having to respond to many different stakeholders on their core competences and practices. This has given rise to an increased social awareness and a number of regulatory initiatives that have stimulated socially responsible investment (SRI). It is anticipated that SRI will continue the rapid growth it has displayed to date (el Ghoul, Guedhami, Kwok, & Mishra, 2011; Renneboog, ter Horst, & Zhang, 2008a). With regard to stimulating SRI, a score was required to quantify the efforts a company has made to comply with the new investment standards. The environmental, social, and governance (ESG) score was introduced for this purpose. ESG is a term used to describe the three-pillar approach to measuring the sustainability and ethical impact of an investment. Appendix 1 presents a comprehensive overview of the construction of the individual pillars.

The environmental pillar focuses on resource use, emissions, and innovation. In 2015, the Paris Agreement was signed by 197 countries to address climate change, setting certain goals to be realized. Its goal is to limit global warming to well below 2°C, compared to pre-industrial levels in 1990 (United Nations Framework Convention on Climate Change (UNFCCC), n.d.). Furthermore, the social pillar considers the impact of a company's behavior on social issues. These can include employment equality, gender diversity, employee health and safety, training and development, human rights and privacy issues. This pillar assesses how a company treats its employees, customers and other stakeholders (Sisto, 2020). It is an important aspect because it has a major impact on a company's reputation. For example, if a company is known for treating its employees poorly, it may have difficulty attracting and retaining top talent. If a company is known for poor customer service, it may lose customers. Moreover, if a company has a negative impact on society, it may face a public backlash and lose the support of key stakeholders (S&P Global, 2020). Finally, the governance pillar refers to how a company operates internally and determines the corporate behavior within a company. Other governance issues that can be taken into account when evaluating a company include employee and executive compensation, board and company diversity, tax strategy, accounting standards, bribery and corruption, and shareholder rights (Sisto, 2020). In general, a legal and stable political infrastructure will increase willingness to invest in a particular country/industry and subsequently increases the

demand for such a stock. Next, the agency theory suggests that firms that practice good corporate governance have the interests of shareholders and employees better aligned and thus generate higher shareholder value (Bhagat & Bolton, 2008).

The field of SRI persuades investors to align ethical and financial concerns that impact companies' ESG performance (de Colle & York, 2009; Renneboog et al., 2008a). In fact, most institutional and private investors apply negative screening to companies that fall outside the realm of SRI. The availability of ESG data, although not universal, allows both individual and institutional investors to incorporate ESG into their investment strategies

It is clear that SRI is a growing trend, and it is important to understand its potential impacts. ESG investing can potentially have positive impacts on companies, including improved financial performance and reduced environmental and social risks. On the other hand, ESG investing can also have negative impacts, such as increased costs and decreased flexibility. Therefore it is important to understand both the potential positive and negative impacts of ESG investing in order to make informed investment decisions. Consequently, the research question of this thesis has been formulated as follows:

Do high-rated ESG companies yield better financial returns than low-rated ESG companies?

Environmental, social and governance factors have become increasingly important for financial institutions in recent decades, due to the rising global pressure in relation to governance. Therefore, ESG factors are incorporated in sustainable investment strategies (Kempf & Osthoff, 2007). According to the Global Sustainable Investing Alliance (GSIA), sustainable investment strategies were used to manage $30.683 trillion in assets in 2018 (GSIA, 2019). This represents a 34% increase on 2016. With $14.075 trillion and $11.995 trillion under management in 2018, respectively, Europe and the United States are primarily to blame for this significant increase in properly managed assets (GSIA, 2019). While much research on ESG effects has been done in relation to the global market and the United States, much less research has been done on these effects in relation to Europe. However, after the US, Europe is the main global player in terms of sustainable investments, and it is therefore interesting to investigate whether an ESG effect exists within Europe. To do so, this study examines the European Stoxx 600 share index.

First, this study conducted a cross-sectional analysis to evaluate whether there is a positive relationship between ESG and financial stock returns at the individual firm level. This was done by examining the Fama-MacBeth (1973) methodology. In addition, a time-series analysis was conducted to create long and short portfolios with cut-offs at the 70th and 30th percentiles, based on ESG scores. The returns of these portfolios were compared to the

three component model developed by Fama and French in 1993. The return spreads between these portfolios were then examined using the three-factor model and a variety of summary statistics. This made it possible to examine whether this long-short portfolio outperforms the benchmark by generating a significant and positive alpha – thus making ESG a serious factor to be reckoned with.

To answer the research question, a number of hypotheses were formulated to examine the effect of ESG scores on financial stock returns.

Hypothesis 1: ESG scores have a positive effect on the returns of the corresponding company.

Hypothesis 2: ESG effects are present when controlling for industries.

Hypothesis 3: A long-minus-short ESG investment strategy outperforms the Fama and French three-factor model.

The first section of this study examines ESG ratings and their relation to the financial stock returns of individual companies. This examination was tested for the general ESG score and for the individual pillar. Such an analysis, accounting for individual pillars, was carried out by Halbritter and Dorfleitner (2015), who identified a relationship between ESG scores and financial stock returns. However, while these authors concentrate exclusively on the United States, this study attempts to identify the ESG effect for European companies. Nagy, Kassam, and Lee (2016) and Verheyden, Eccles, and Feiner (2016) studied the ESG effect with a time-series analysis with ESG portfolios. In order to make my study more robust, in addition to the Fama and MacBeth (1973) method, a cross-sectional analysis was also carried out according to the fixed and random effects model. Subsequently, a Hausman test was conducted, which indicated that the fixed effects model is better suited. Next, time effects were taken into account. Ultimately, the results of the fixed effects model can be compared to the Fama and MacBeth model. This approach was used to verify findings and to increase the validity and reliability of this study. Nagy et al. (2016) and Verheyden et al. (2016) performed a time-series analysis of only five and eight years, respectively. In order to more thoroughly determine whether an ESG effect exists over time, my study concentrates on a broader and more up-to-date time-series sample covering 2009 to 2020 (12 years). Pollard, Sherwood, and Klobus (2018) recommended that future studies should investigate the implications of ESG integration within specific industries. Therefore, in this study – in addition to control variables such as beta, market value and book-to-market value – the ESG effect was controlled for different industries.

Based on the knowledge gaps referred to above, this study is guided by the abovementioned hypotheses. To test for robustness with current research, the primary point of departure of the formulated hypotheses is that higher ESG scores result in better financial returns. This was done on the basis of cross-sectional analysis. Moreover, this study also controlled for industries because the impact of ESG ratings and financial returns might differ by industry. Finally a time-series analysis was undertaken with ESG portfolios.

The cross-sectional analysis yielded mixed results. Table 2 presents the Fama and MacBeth regression. The results indicate that there is negative significant effect for the ESG score. When evaluating the individual pillars, the environmental and governance pillar indicate a negative significant effect, while the social pillar indicates a positive significant effect. Table 3 presents the fixed effects model. The results reveal an insignificant positive effect for the ESG score. When evaluating the individual pillars, the environmental pillar reveals a positive significant result, the social pillar a positive insignificant result, and the governance pillar a negative significant result. Even though these results are on a monthly basis, on a yearly basis the results are economically still almost negligible. Table 4 indicates that there are no consistent ESG effects within industries. In addition, I performed a time-series analysis. Table 5 indicates a positive significant alpha for the bottom ESG portfolio and an almost negligible insignificant alpha for the top ESG portfolio. A long-minus-short strategy would even result in a substantial negative significant alpha. Table 6 indicates that size has a significant impact on these results. In summary, there is no real consistency for an ESG effect, but most evidence is in favor of a negative ESG effect.

This paper is structured as follows. Chapter 2 presents the literature review, which provides a brief overview the ESG pillar and discusses potential positive and negative ESG effects. Chapter 3 explains the data and methodology that are used to test the hypotheses and subsequently assists in answering the research question. Chapter 4 presents the results in detail, Chapter 5 presents the conclusion and certain limitations of this research including recommendations for future research, Chapter 6 contains the references and appendix.

2. Literature review

2.1 Start of ESG investing

Corporate social responsibility (CSR) is a business approach that contributes to sustainable development by delivering economic, social and environmental benefits for all stakeholders. In recent years, a great interest has arisen among investors in companies that adhere to certain environmental, social, and governance standards. As a result, various rating agencies have created a number of objective techniques to measure CSR policies using ESG factors. The relationship between ESG factors and the financial performance of a company is a controversial topic. Since 1970, more than 2,000 articles have been published on this subject (Friede et al., 2015). According to Eccles, Kastrapeli, and Potter (2017), 21% of institutional investors have completely integrated ESG into their investments strategies, while 47% of institutional investors use either a positive or negative screening in relation to ESG. The question that arises is whether the increasing importance placed on ESG by institutional and individual investors also yields better financial stock returns; moreover, whether SRI yields an alpha in comparison to conventional investing that does not take ESG into account. The literature reveals that there is a potential for ESG to become a risk factor and that SRI actually outperforms a general benchmark. Most studies demonstrate either a positive or neutral relationship between ESG and financial returns. Very few cases demonstrate a negative relationship.

2.2 Environmental Pillar

The first pillar of ESG is the environmental pillar. This pillar analyzes the level of emissions, resource efficiency, and innovative measures taken by a company. The ESG acts as a measure of climate change with an environmental score. This score reflects, to some extent, the company's contribution to climate change. Scientists agree on including climate change factors in their financial calculations, and there are concerns that companies from non-environmental sectors are required to invest more to repair environmental damage caused by their activities. As a result, fossil fuel-dependent companies have become less attractive to investors (Stern, 2007). In general, eco-efficient companies perform better than eco-inefficient companies with regard to their economic value relative to the waste they create. Eco-efficient companies tend to manage their resources better, which gives them a competitive advantage (Derwall, Guenster, Bauer, & Koedijk, 2005). In order to achieve eco-efficiency, a company needs to make substantial investments, not all of which can be passed on to consumers, which negatively affect profitability (Albertini, 2013). A higher ESG

score does not generally lead to better financial performance. As reported in the press, higher emissions pose transitory, regulatory, and commodity risks (Bolton & Kacperczyk, 2020; Bolton & Kacperczyk, 2021). A case could be made that sustainable investments ultimately lead to positive externalities, if companies are able to make those substantial investments (Albertini, 2013; Derwall et al., 2005). Thus, the relationship between environmental scores and returns observed in this study may be in both positive and negative.

2.3 Social Pillar

The social pillar of ESG analyzes how a company functions in terms of its workforce, human rights, and community and product responsibility. The personnel component assesses the extent to which safe and satisfying jobs are created. Of all the ESG pillars, the relationship between social scores and financial performance is the least significant (Friede et al., 2015). Companies that scored higher on social capital performed significantly better during the 2008 financial crisis (Lins, Servaes, & Tamayo, 2017). There is an indication that investing in social capital pays off and can be considered as an "insurance policy" in times of need. Strong human capital is an important resource for firms to gain a competitive advantage in the long run. This competitive advantage ultimately translates into improved financial performance. However, it takes time to achieve this benefit, and the effect cannot therefore be measured in the short run. Financial compensation is necessary for the skills and knowledge of high-quality human capital. This results in higher labor costs, which can lower a company's profitability and thus its valuation (Crook, Todd, Combs, Woehr, & Ketchen, 2011). In terms of the signalling theory, the attractiveness of a company as an employer improves when it communicates positive social signals; moreover, such a company is in a better position to attract highly qualified talent. This, in turn, translates into a competitive advantage over companies that are less able to do so (Carlini, Grace, France, & lo Iacono, 2019). Significant investments are also required to achieve this competitive advantage. In general, human capital lowers business risk in times of crisis, which leads to better financial business results (Lins et al., 2017; Turban & Greening, 1997). The conflicting views on investing in human capital in relation to financial performance may make it more difficult for this research to identify a convincing one-way relationship

2.4 Governance Pillar

The governance pillar refers to how a company is managed, its CSR strategy, and its shareholder structure. Although many positive governance-related results have been

identified, it is not clear whether good governance leads to better performance or vice versa (Love, 2011). A stable political and legal infrastructure usually leads to greater willingness on the part of investors to invest in the country concerned, thereby increasing demand for shares and increasing returns. Improved governance reduces transaction and intermediation costs for investors, which reduces initial investment costs (Hooper, Sim, & Uppal, 2009). In terms of the agency theory, at the company level, companies with good corporate governance align the interests of shareholders and employees more effectively, thus generating higher shareholder value. There is a positive relationship between corporate financial performance and various governance measures, in terms of which corporate financial performance translates into higher profitability (Bhagat & Bolton, 2008). In general, a company with good corporate governance outperforms its competitors by means of better management and efficient capital allocation, which leads to reduced waste of resources, less asset stripping, and fewer other ways of destroying value. In addition, more external financing is available as such companies are more favorable lenders; this leads to a lower cost of capital, which subsequently increases the valuation of these companies (Love, 2011). In general, good governance lowers costs, which ultimately leads to higher profitability for a company and hence higher returns for investors in the long run. The literature identifies primarily economic evidence for a positive relationship between governance and financial performance.

2.5 Positive ESG effect

The literature provides evidence relating to the positive impact of ESG efforts and CSR strategies on company performance – for example, financial performance, employee commitment, innovation, and corporate reputation. This supports the view that an ESG rating is positively correlated with a company's financial performance (Clark, Feiner, & Viehs, 2014; Kleine, Krautbauer, & Weller, 2013). In general, positive ESG effects outperformed the MSCI World Index from 2008 to 2016. This was demonstrated both in tilt-based and momentum-based strategy studies with ESG integration (Nagy et al., 2016) also confirmed in a peer-reviewed paper analysis (Bender, Hammond, & Mok, 2014). Stocks with a high ESG rating could be considered safer than stocks with a low ESG rating and could serve as an insurance policy for a company's reputation. This was confirmed in a study on the social and environmental scandals of BP, Rabobank, and Hennes & Mauritz (Godfrey, Merrill, & Hansen, 2009). Therefore, SRI reduces risk: fewer scandals are likely to occur, these businesses are more prepared for new regulations, and they generally fare better in adverse circumstances (Dunn, Fitzgibbons, & Pomorski, 2018; Sassen, Hinze, & Hardeck, 2016). Nofsinger and Varma (2014) examined the performance of US conventional and SRI funds

between 2000 and 2011. They examined two economic conditions within this time frame: a crisis period and a non-crisis period. These authors demonstrated that SRI funds perform better than traditional funds during financial crises. The positive screening of SRI funds in terms of ESG is assumed to be the cause of this asymmetric pattern. According to Gibson, Krueger, and Mitali (2020), sustainable institutional investors outperform the market. However, this premium is not driven by the underlying fundamentals, but by a growing demand on the part of investors for sustainable assets. Thus, the authors argue that stocks with a high ESG score are less risky, leading to market outperformance through demand-driven price pressure. Kaiser (2020) arrives at similar results in relation to increasing client demand and long-term return potential. This can cause demand-driven price pressure within responsible investment strategies, which can lead to higher returns for companies with a higher ESG score. Companies with a high ESG score are generally more innovative, more competitive, and more resource-efficient, and find it easier to attract and retain human capital. This was confirmed by an analysis of the three building blocks (cash flows, idiosyncratic risk, and systematic risk) of the discounted cash flow (DCF) model, which linked SRI to the financial performance of a company (Giese, Lee, Melas, Nagy, & Nishikawa, 2019). In the DCF model, this increases the numerator (cash flows) and thus increases the profitability and valuation of a company. As mentioned above, responsible companies are less risky. Lower risk and better resilience to negative events lead to lower variability in a company's cash flows (Ashwin Kumar et al., 2016; Khan, Serafeim, & Yoon, 2016). There is a range of diverse economic reasons and business cases in favor of responsible investing. The risks are lower, leading to better risk-adjusted returns (Ashwin Kumar et al., 2016; Dunn et al., 2018; Sassen et al., 2016). Companies with a higher ESG score have a competitive advantage and better business performance and can manage their stakeholders more effectively; this, in turn, leads to higher profitability and higher cash flows and increases the valuation of these companies (Giese et al., 2019; Whelan, Atz, & Clark, 2021).

2.6 Negative ESG effect

There are also arguments in favor of a negative relationship between ESG factors and the financial performance of a company. Incurring additional costs to achieve a high ESG score does not always lead to a higher-than-average stock performance (Guerard, 1997). In general, companies with a high ESG score are less risky than companies with a lower ESG score. Revelli and Viviani (2013) argue that according to the modern portfolio theory, a theory developed in 1952 by Markowitz, it is possible to construct a portfolio of assets that will maximize return for a given level of risk. The reason that investors require a higher return

is to compensate them for taking on the additional risk. In addition, higher-risk investments may actually be more likely to experience negative outcomes, meaning that investors may require a higher return to offset the increased likelihood of losses. Revelli and Viviani (2013) support the modern portfolio theory and introduce a second argument for a negative relation between ESG and financial stock returns, namely the monitoring theory. The monitoring theory relates to the extra costs for ESG research that investors have to incur when monitoring these responsible investments. A great deal of research has been done on the effect of ESG on corporate performance. According to the neoclassical approach, SRI entails additional costs (Palmer, Oates, & Portney, 1995). These additional costs do not add direct value for companies, and there is no significant relationship between ESG/CSR activities and above-average stock performance (Guerard, 1997; Landi & Sciarelli, 2019). The ESG outcome effects have been demonstrated to be inconclusive and economically insignificant (Hoepner & McMillan, 2009; Revelli & Viviani, 2013; van Beurden & Gössling, 2008). Hong and Kacperczyk (2009) analyzed the so-called "sin stocks" at the company level. These are companies that are involved in activities that are considered immoral – for example, the production of alcohol and tobacco, gambling, and the manufacture of weapons. While their research does not focus directly on ESG scores, such sin stocks are not generally those companies with the highest ESG scores; moreover, they are also more likely to experience negative screening by institutional investors. Their study examines the effect of excluding sin stocks – that is, negative screening. It turns out that sin stocks tend to outperform other stocks. Hong and Kacperczyk (2009) argue that responsible investing has financial costs. According to Arbel, Carvell, and Strebel (1983), stocks that are heavily held by institutions typically perform worse than their overlooked peers. These investors have a less diversified portfolio and potentially miss out on higher returns. Neglected stocks (such as sin stocks) are traded below their intrinsic value on the stock exchange (Merton, 1987). These stocks are less popular with investors, which results in low demand. Since these stocks have depressed values compared to their fundamental value, this should lead to higher returns. Institutional investors are increasingly taking ESG scores into account. Funds make use of positive or negative screening methods: they either include high ESG-rated companies or exclude low-rated ESG companies. This reduces the demand among institutional investors for companies that do not perform well in terms of ESG scores. Moreover, there are certain shares that are not covered by ESG rating agencies. Therefore, a lack of analyst coverage frequently arises within companies that are not extensively covered by institutional investors. However, stocks with low analyst coverage tend to perform better (Fabozzi, Ma, & Oliphant, 2008). Pedersen, Fitzgibbons, and Pomorski (2021) made use of a similar model. By incorporating ESG in the investment portfolio, investors

have to deviate from an optimal asset allocation. This reduces diversification and leads to lower risk-adjusted returns. According to advocates of the efficient market hypothesis (EMH), reducing the investment universe results in fewer optimal portfolios, which automatically means lower returns and increased risks. Research has also been carried out into the generalizability criteria of ESG factors, demonstrating that ESG factors lack homogeneity in rating methods. Since different rating agencies do not arrive at the same ESG ratings, this can harm the potential of ESG factors as a risk premium (Berg, Koelbel, & Rigobon, 2019). In addition, several studies have indicated that the availability of ESG data and the definition and exact nature of the individual pillars differ. There is no uniform quantification of ESG data yet, which means that the conclusions drawn about ESG effects are unreliable (Breedt, Ciliberti, Gualdi, & Seager, 2019; Orlitzky, 2011; Reynolds, 2014). This literature review has revealed that there are economic arguments for a positive ESG effect, as well as economic arguments for a negative ESG effect. Moreover, SRI leads to the exclusion of certain companies and thus to less diversification. A less diversified portfolio means investors face higher risks and miss out on potential returns, which in turn negatively affects risk-adjusted performance (Pedersen et al., 2021). The so-called sin stocks can also provide more information about the relation between stock returns and ESG score. Sin stocks generally achieve low ESG scores and are therefore often excluded by institutional investors. They receive low coverage by analysts and this leads to an information deficit premium, which in turn results in higher returns (Arbel et al., 1983; Hong & Kacperczyk, 2009).

2.7 Industry classifications

As mentioned earlier, stocks that are primarily held by institutional investors achieve lower returns than stocks for which there is little demand from institutional investors. It has been observed that the unpopular sin stocks tend to achieve higher returns. Galbreath (2013) has demonstrated that certain sectors receive more attention from institutional investors, whereas others receive less. In an earlier study, Epstein and Schnietz (2002) demonstrated that industry matters. Their study revealed that after the World Trade Organisation (WTO) negotiations in Seattle in 1999, Fortune 500 companies involved in logging, toys, oil, clothing, and mining (high-impact industries) saw their stock prices fall faster than other industries in the Fortune 500. This was because of the perception that these types of industries are more harmful to workers or the environment.

In another study, Jackson and Apostolakou (2009) identified the opposite effect. In a study on SRI among 274 companies in 16 Western European countries, high-impact industries scored better on various SRI activities than medium- and low-impact industries. Knudsen

(2011) conducted research into factors leading to the delisting of companies from the UN Global Compact. Knudsen (2011) found that certain sector characteristics can determine the likelihood of a delisting. Companies in the oil and gas industry (high-impact industries) are less likely to be delisted. High-impact industries are said to be subject to higher coercive and prescriptive pressures relating to environmental, social, or governance issues (Quack, 2007). In addition, these industries may face more direct mimetic pressure (pressure to conform to the behaviors, attitudes, and values of others in a group) than other industries to follow competitors (Bansal, 2005).

3. Methodology and data

In this study, the ESG scores were collected from Thomas Reuters (ASSET4), which can be found within the Refinitiv Eikon database. Several data agencies, such as Refinitiv, Morningstar, Bloomberg, and KLD, provide ESG scores. Bloomberg is limited as it has a smaller time-series sample available for ESG scores. KLD is limited as it only has data available on US stocks (Halbritter & Dorfleitner, 2015). However, I focus on publicly listed companies on the European market. Refinitiv Eikon is best suited to this study as it is available from 2002 and 80% of the global market capitalization is covered. In addition to the general ESG scores, the individual pillars are also examined. These pillars can be subdivided into ten sub-pillars (Appendix 1). The ESG score ranges between 0 and 100. Table 1 presents the average ESG scores, financial returns, and standard deviation by industry. The STOXX 600 Europe index, which comprises the 600 largest companies listed in Europe, is the foundation for the sample selection in this study. Appendix 2 emphasizes the growing trend of sustainable investing. The average ESG score has increased from 2009 to 2020 with 24.3%. Appendix 3 presents the broad summary statistics of the separate industries. Thereafter, Appendix 2 and 3 were combined and merged into Table 1. The technology industry exhibits the lowest average ESG score, but has the highest financial stock return. The energy industry exhibits the highest average ESG score, but has the lowest average financial stock returns, with the exception of telecommunications.

Table 1: Industry summary statistics

INDUSTRY	OBS	ESG SCORE	STD DEV ESG	AVERAGE RETURN	AVERAGE STD DEV
TECHNOLOGY	2,777	52.38	19.14	1.736	9.354
TELECOMMUNICATIONS	2,377	68.92	16.53	0.074	7.052
HEALTH CARE	5,749	61.28	18.61	1.246	7.748
REAL ESTATE	3,289	58.48	20.32	0.797	7.319
CONSUMER DISCRETIONARY	9,239	61.89	19.45	1.101	9.504
CONSUMER STAPLES	4,994	65.70	16.92	0.819	6.782
INDUSTRIALS	13,771	59.15	18.34	1.022	8.350
BASIC MATERIALS	5,375	66.14	17.10	0.898	8.803

ENERGY	1,753	75.37	10.42	0.289	8.620
UTILITIES	3,297	68.30	12.71	0.300	7.103

Table 1 above presents an overview of the number of monthly observations, the average ESG scores, the average standard deviation of the ESG scores, the average financial stock return per industry, and the corresponding average standard deviation. These outcomes are the averages taken from January 2009 to December 2020. The average financial stock return and standard deviation are the monthly averages in percentages (%).

In addition to the ESG scores, a number of other variables were retrieved from the Refinitiv Eikon database, namely adjusted closing price, historical beta, market value, and book-to-market values. The adjusted closing price was adjusted for stock splits and dividends. The logarithm of the returns was used because it assumes constant compounding of the returns and is therefore slightly more accurate. Finally, the returns were calculated with the following formula:

$$Return\ (t)\ =\ ln[(Closing\ price\ (t))\ /\ (Closing\ price\ (t\ -\ 1))]$$

As indicated earlier, in this study I have controlled for industries. Although the Industry Classification Benchmark (ICB) consists of 11 industries, the "financial" industry is excluded in most studies. Financial firms by nature have a very high book-to-market ratio, because they use high leverage, which causes distress (Fama & French, 1993). Consequently, financial firms were excluded from this study. In addition, a number of companies were excluded whose ESG scores or book-to-market ratios were missing. Companies with a negative book-to-market ratio were removed as well. This is because the natural logarithm of the market value and book-to-market ratio are regarded as control variables, and a negative value of the natural logarithm is undefined. Ultimately, 458 active companies remained. The study examined the period from January 2009 to December 2020 on the basis of monthly data.

In order to test the hypotheses formulated in this study, various different methods were used. For the cross-sectional analysis, a panel dataset was used to test the effect of ESG on the financial returns of individual stocks. Next, a time-series regression was used, where three ESG quintile portfolios were formed to test whether the top ESG portfolio can outperform the risk factors of the Fama and French three-factor (FF3) model. The aim of these methods was to test the effect of ESG scores on financial returns in various ways.

The cross-sectional analysis of individual stocks was undertaken with the use of the Fama and MacBeth (1973) methodology. The Fama–MacBeth (1973) regression is a two-step

procedure: the first step involves estimation of N cross-sectional regressions, while the second step involves T time-series averages of the coefficients of the N cross-sectional regressions. In addition to the relationship between the returns and ESG scores, several control variables, such as the historical beta, market value, and book-to-market value, were examined. To check the robustness of the potential ESG effect on financial returns, this study controlled for industries. By following the Fama and MacBeth (1973) methodology it was possible to identify the direct relationship between the ESG score of an individual company and its corresponding financial stock return (Halbritter & Dorfleitner, 2015). Ultimately, the following regression equations were formulated, used for Table 2, 3, and 4:

$$ln(Ret)_{i,t} = \alpha_{i,t} + \beta_{i,t}Beta_t + \beta_{i,2}ln(MV)_{t-1} + \beta_{i,3}ln(B/M)_{t-1} + \beta_{i,4}ESG_{t-1} + \varepsilon_{i,t} \quad (1)$$

$$ln(Ret)_{i,t} = \alpha_{i,t} + \beta_{i,t}Beta_t + \beta_{i,2}ln(MV)_{t-1} + \beta_{i,3}ln(B/M)_{t-1} + \beta_{i,4}E\_score_{t-1} + \beta_{i,5}S\_score_{t-1} + \beta_{i,6}G\_score_{t-1} + \varepsilon_{i,t} \quad (2)$$

The models were also corrected with the Newey–West standard error. A rule of thumb for the number of lags (m) is the following: m= T^(¼) (*Econometric Analysis*, 7th edition, section 20.5.2, p. 960). A total of 144 monthly observations resulted in a lag of 4. The control variables (except beta) were lagged by one month, and the market value and book-to-market value were normalized by using the natural logarithm.

After the panel data analysis, a time-series analysis was performed. Three ESG quintile portfolios were constructed in the time-series data. Most studies that have attempted to identify a time-series ESG risk premium adopt a long-minus-short investment strategy and compare this portfolio to the FF3 risk factors to establish whether any outperformance and alpha generation can be observed. The same approach was adopted in order to test Hypothesis 3. Like the factor construction methodology of Fama and French (2015), this study also used 30th and 70th percentile portfolios. The long portfolio contained all the stocks with high ESG scores above the 70th percentile. The short portfolio contained all the stocks with low ESG scores below the 30th percentile. Next, the time-series average excess returns were taken for each portfolio, and the long-minus-short portfolio subsequently indicated a return spread over time. I constructed equal-weighted portfolios – equal-weighted means that each stock in the portfolio is given the same weight (1/n). A value-weighted portfolio might be less diversified than an equal-weighted portfolio because it places more emphasis on the larger companies in the index, especially since I use the Stoxx 600 which is made up of the 600 largest European companies. Equal-weighting may lead to a more diversified portfolio, which can be beneficial in terms of risk and return. The disadvantage of an equal-weighted portfolio is that the size factor and beta are likely to have a greater

influence, as this portfolio is dominated by small caps. But as mentioned before, the Stoxx 600 consists mainly of large caps, so the effect of dominating small caps should be limited. Therefore I have chosen to use equal-weighted portfolios in this study.

Once the three quintile portfolios had been compiled, a number of statistics were examined. For example, it was tested whether the ESG quintile portfolios yielded any statistically significant results. This process made it possible to identify a potential relationship between stock returns and ESG scores. The returns were compared with the three risk factors of the FF3 model – market risk, size, and value factor – resulting in the following formula, used in Table 5 and 6:

$$R_{i,t} - Rf_{i,t} = \alpha_{i,t} + \beta_1(Rm_{i,t} - Rf_{i,t}) + \beta_2 SMB_{i,t} + \beta_3 HML_{i,t} + \varepsilon_{i,t} \quad (3)$$

Reference has already been made to the generation of an alpha. Jensen's alpha (α) – a measure of a portfolio's risk-adjusted performance – was examined by evaluating the regression intercepts. It is calculated using a portfolio's beta and the expected return of the market. It is the outperformance that is achieved compared to a benchmark, usually a stock index (Jensen, 1968).

4. Results

4.1 Cross-sectional analysis

With a view to testing the formulated hypotheses, multiple regression analyses on the potential ESG effect were undertaken, both at the individual stock level and the portfolio level.

Presented in Table 2, regressions 1, 3, and 5 attempted to identify the relationship between the individual ESG pillars and the financial stock returns. Regressions 2, 4, and 6 attempted to identify the relationship in the case of the general ESG score. Regressions 1 and 2 examined only the direct relationship between ESG scores and the financial stock returns. Both regressions identified a negative significant relation. In regressions 3 and 4, two control variables were added, namely the natural logarithm of market value and book-to-market value. When controlling for size and value the relationship between ESG and financial stock returns decreased substantially and became less significant. Finally, a third control variable, beta, was added in regressions 5 and 6. When controlling for these three factors, a significant (under 5% significance level) small negative relationship was ultimately identified for ESG and financial stock returns. With regard to the individual pillars, the environmental and governance pillars exhibited a small significant negative relationship, but the social pillar exhibited a small significant positive result. Ultimately, the final two regressions yielded statistically significant results for both individual pillars and the general ESG score. The question then arose as to whether these findings were also economically significant. Regression 6 states that when an ESG score increases by one unit, the financial stock return decreases by 0.0056% per month (0.07% on a yearly basis). These results are not that economically relevant.

Table 2: Fama and MacBeth (1973) regression

	Reg1	Reg2	Reg3	Reg4	Reg5	Reg6
cons	2.2986***	2.3035***	4.9770***	4.9261***	4.2468***	4.1852***
	(0.417)	(0.422)	(0.813)	(0.823)	(0.466)	(0.466)
beta					0.2190	0.2057

					(0.415)	(0.414)
Ln(MV)			-0.4119***	-0.4121***	-0.3604***	-0.3578***
			(0.064)	(0.066)	(0.048)	(0.049)
ln_(B/M)			0.0422	0.0198	-0.0662	-0.0851
			(0.159)	(0.159)	(0.114)	(0.115)
ESG		-0.0208***		-0.0053*		-0.0056**
		(0.004)		(0.003)		(0.003)
E	-0.0102***		-0.0057**		-0.0054**	
	(0.003)		(0.002)		(0.002)	
S	-0.0031		0.0046*		0.0045*	
	(0.003)		(0.003)		(0.002)	
G	-0.0079***		-0.0052***		-0.0058***	
	(0.002)		(0.002)		(0.002)	
r2	.023	.013	.059	.051	.108	.100
r2_a	.015	.010	.045	.043	.093	.090
N	52621	52621	52621	52621	52621	52621

*Table 2 above presents the Fama and MacBeth (1973) monthly financial returns (%). The panel dataset contains 458 companies over a period from January 2009 to December 2020. I used the historical beta (beta), the natural logarithm of the market value (Ln(MV) and book-to-market value (Ln(B/M) as control variables. The first row (cons) presents the average intercept. Finally, Newey-West standard errors were used with four lags. Appendix 1 shows how the average ESG score is constructed by taking the individual pillar weights. The standard errors are in parentheses. *p<0.10, p**<0.05, p***<0.01*

The Fama and MacBeth (1973) methodology has been widely used to examine ESG effects. However, since a triangulation research method would increase the reliability and validity of

this study, a fixed effects and a random effects model were tested for the ESG scores and abovementioned control variables. Next, a Hausman test was undertaken to establish which model was more suitable for this study. The null hypotheses stated that the random effects model was more appropriate. However, the null hypothesis was rejected (under a 1% significance level). Therefore the fixed effects model was used as a second method for the cross-sectional analysis. Since I used a panel dataset, the fixed effects model was controlled for time-effects (by using monthly dummies). The results are presented in Table 3.

A comparison of the fixed effects model (FE) and the Fama and MacBeth (1973) model revealed that both models exhibited a negative statistically significant coefficient for the governance pillar. Interpreting the environmental pillar becomes difficult as the FMB model exhibited a negative sign, while the FE model exhibited a positive sign (both statistically significant). Both models demonstrated positive relationship between the social pillar and financial returns. However, these results were no longer statistically significant for the FE model. Both models consistently exhibit a significant negative effect for the governance pillar. When examining the relationship between the general ESG score and financial stock returns, in contrast to the FMB model, the FE-model exhibited a positive and statistically insignificant coefficient. Therefore the economic relevance is debatable, because the regression coefficients are rather small, not always statistically significant, and the sign of the regression coefficients did not always match. Subsequently, when evaluating Hypothesis 1 – *ESG scores have a positive effect on the returns of the corresponding company* – the null hypothesis cannot be rejected, meaning that there is no clear relationship between ESG and financial return. When evaluating the FMB model only, the null hypothesis would be rejected and a negative relationship between ESG and financial returns would be confirmed. However, when evaluating the FE model the null hypothesis cannot be rejected. Due to the inconsistent results of the FMB model vis-à-vis the FE model, ultimately the null hypothesis cannot be rejected and it is confirmed that there is no conclusive relationship between ESG and financial stock returns.

Table 3: Fixed effects regression model

	Reg1	**Reg2**	**Reg3**	**Reg4**	**Reg5**	**Reg6**
_cons	-5.7091***	-5.6116***	3.9333**	3.7698**	3.7093**	3.5380*
	(0.765)	(0.760)	(1.816)	(1.820)	(1.875)	(1.877)

beta					0.1263	0.1320
					(0.156)	(0.158)
Ln(MV)			-1.2616***	-1.2231***	-1.2512***	-1.2123***
			(0.225)	(0.228)	(0.226)	(0.229)
Ln(B/M)			1.5009***	1.4996***	1.4950***	1.4937***
			(0.257)	(0.254)	(0.258)	(0.255)
ESG		-0.0105*		0.0065		0.0067
		(0.006)		(0.007)		(0.007)
E	0.0078		0.0136**		0.0138**	
	(0.005)		(0.006)		(0.006)	
S	-0.0045		0.0076		0.0076	
	(0.004)		(0.006)		(0.006)	
G	-0.0129***		-0.0131***		-0.0130***	
	(0.003)		(0.004)		(0.004)	
r2	.274	.273	.285	.284	.285	.284
r2_a	.272	.271	.283	.282	.2825	.282
N	52621	52621	52621	52621	52621	52621

*Table 3 above presents the fixed effects monthly financial returns (%). The panel dataset contains 458 companies over a period from January 2009 to December 2020. I used the historical beta (beta), the natural logarithm of the market value (Ln(MV) and book-to-market value (Ln(B/M) as control variables. The first row (cons) presents the average intercept. Finally, the fixed effect model made use of company clustered standard errors. Appendix 1 shows how the average ESG score is constructed by taking the individual pillar weights. The standard errors are in parentheses. *p<0.10, p**<0.05, p***<0.01*

To further improve reliability and validity, the cross-sectional analysis was controlled by industry. The Fama and MacBeth (1973) regression has frequently been used in peer studies. Therefore, the same FMB model as in Table 2 was used, but this time controlled by industry. The results are presented in Table 4.

Table 4: Fama and MacBeth (1973) regression model by industry

	Constant	Beta	Ln(MV)	Ln(B/M)	ESG	E	S	G
Technology	3.0438*	0.4028	-0.1382	0.1762		-0.0230*	0.0369*	-0.0221*
	(1.719)	(0.644)	(0.262)	(0.291)		(0.014)	(0.020)	(0.012)
	2.7191*	0.3258	-0.0998	0.1663	-0.0076			
	(1.536)	(0.526)	(0.206)	(0.255)	(0.012)			
Telecommunications	2.2694	-0.0385	0.0381	0.3721*		-0.0088	-0.0086	-0.0165**
	(1.727)	(0.594)	(0.238)	(0.203)		(0.011)	(0.011)	(0.008)
	2.0187	-0.0686	0.0495	0.4466**	-0.0296**			
	(1.666)	(0.584)	(0.218)	(0.187)	(0.015)			
Health Care	4.3948***	0.3971	-0.3766***	-0.0521		0.0004	0.0047	-0.0085
	(0.854)	(0.408)	(0.118)	(0.143)		(0.007)	(0.008)	(0.006)
	4.7183***	0.1738	-0.3502***	0.0003	-0.0058			
	(0.906)	(0.388)	(0.121)	(0.132)	(0.010)			
Real Estate	5.9794***	0.2024	-0.6588***	0.6124		-0.0075	0.0008	0.0051
	(1.515)	(0.603)	(0.184)	(0.398)		(0.005)	(0.005)	(0.005)
	5.7026***	-0.0621	-0.6001***	0.5756	-0.0022			
	(1.489)	(0.587)	(0.184)	(0.390)	(0.005)			
Consumer Discretionary	4.0362***	0.2471	-0.3398***	-0.0540		-0.0015	0.0059	-0.0081
	(0.960)	(0.483)	(0.107)	(0.127)		(0.005)	(0.006)	(0.005)
	3.8146***	0.2806	-0.3293***	-0.0797	-0.0015			
	(1.014)	(0.473)	(0.107)	(0.129)	(0.006)			

Consumer Staples	2.7271***	0.1338	-0.1825*	-0.2076		-0.0095	0.0035	-0.0017
	(0.782)	(0.675)	(0.104)	(0.227)		(0.007)	(0.007)	(0.004)
	3.0155***	0.1398	-0.2095*	-0.2033	-0.0079			
	(0.781)	(0.685)	(0.111)	(0.217)	(0.007)			
Industrials	4.5450***	0.0728	-0.3659***	0.0858		-0.0021	0.0002	-0.0056**
	(0.697)	(0.415)	(0.072)	(0.160)		(0.003)	(0.004)	(0.003)
	4.3502***	0.0605	-0.3503***	0.0883	-0.0063*			
	(0.683)	(0.413)	(0.070)	(0.160)	(0.003)			
Basic Materials	3.7714***	-0.0052	-0.3349**	-0.1145		-0.0003	-0.0070	0.0075
	(1.022)	(0.518)	(0.148)	(0.290)		(0.007)	(0.007)	(0.006)
	3.4459***	0.0174	-0.2950**	-0.1197	-0.0024			
	(0.918)	(0.496)	(0.127)	(0.300)	(0.007)			
Energy	2.3419	0.2472	-0.0994	0.0369		0.0150	-0.0303*	-0.0022
	(1.717)	(0.756)	(0.242)	(0.557)		(0.002)	(0.002)	(0.001)
	3.3324**	0.2531	-0.1725	-0.0495	-0.0215			
	(1.322)	(0.806)	(0.218)	(0.481)	(0.022)			
Utilities	3.0543***	-1.0515	-0.2839**	0.3568		0.0007	0.0101	0.0011
	(0.934)	(0.718)	(0.123)	(0.219)		(0.007)	(0.010)	(0.007)
	2.2785**	-1.3124*	-0.2226*	0.4467**	0.0172			
	(0.924)	(0.730)	(0.116)	(0.222)	(0.012)			

*Table 4 above presents the Fama and MacBeth (1973) monthly financial returns (%), controlled by 10 industries. The panel dataset contains 458 companies over a period from January 2009 to December 2020. I used the historical beta (beta), the natural logarithm of the market value (Ln(MV) and book-to-market value (Ln(B/M) as control variables. The first row (cons) presents the average intercept. Finally, Newey-West standard errors were used with four lags. Appendix 1 shows how the average ESG score is constructed by taking the individual pillar weights. The standard errors are in parentheses. *p<0.10, p**<0.05, p***<0.01*

When controlling by industry, beta, and the natural logarithm of market value and book-to-market value, almost no significant relationship could be found between ESG scores and financial stock returns. Only telecommunications and industrials exhibited a significant negative relationship between ESG and financial returns, under a 5% and 10% significance level, respectively. The utilities industry alone exhibited a positive coefficient for the ESG score; however, this result was not statistically significant. For most industries, the environmental and governance pillar exhibited a negative relationship. However, the social pillar exhibited a positive relationship in most cases. These results, apart from a few exceptions, are statistically insignificant. Out of the ten controlled industries, nine industries exhibited a negative ESG coefficient. Under a 1% significance level, no industry exhibited any statistically significant relationship. Subsequently, when evaluating Hypothesis 2 – *ESG effects are present when controlling for industries* – it is not possible to reject the null hypothesis, which means that that there is no relationship between ESG and financial returns by industry.

4.2 Time-series analysis

The previous section thoroughly examined the cross-sectional analysis. This section examines the time-series analysis. This analysis no longer focuses on the individual companies, because three quintile portfolios were created. Quintile 1 contains the average returns of the lowest 30th percentile regarding ESG scores. Quintile 3 contains the average returns of the highest 70th percentile regarding ESG scores. Quintile 2 contains all the average returns between these top and bottom quintiles. The risk-free rate was subtracted from the average returns in order to identify potential excess returns. Finally, a long-minus-short portfolio was generated, where I created a portfolio that went long in the top ESG portfolio and short in the bottom ESG portfolio. This portfolio was compared to the FF3 model. The FF3 model has a higher explanatory power than the capital asset pricing model (CAPM). Despite the fact that the five-factor model is regarded as superior, the FF3 model was used for this study, because it is the most frequently used and widely known asset pricing model (Rehnby, 2014). The results of this analysis are presented in Table 5.

An examination of the short portfolio reveals, contrary to Hypothesis 3, that the portfolio with low ESG scores consistently and significantly outperformed the FF3 factors. This portfolio generated an alpha of 0.60% per month. By contrast, the long portfolio did not consistently and significantly outperform the FF3 factors. It even exhibited a slightly significant underperformance against the size factor. In addition, it exhibited an almost negligible and insignificant alpha of 0.02% per month. Finally, the long-minus-short strategy exhibited a

statistically and economically significant alpha of -0.62% per month. For this long-minus-short strategy, the largest influence on the negative alpha is caused by the underperformance against the size factor, which states that small companies outperform large companies (based on market value).

Table 5: Time-series regression per ESG portfolio

	Reg1	**Reg2**	**Reg3**	**Reg4**
MktRF	0.7390***	0.7091***	0.7147***	-0.0243
	(0.043)	(0.040)	(0.038)	(0.0242)
SMB	0.3691***	0.1019	-0.1753*	-0.5444***
	(0.106)	(0.100)	(0.095)	(0.0599)
HML	-0.1769**	-0.0012	0.0590	0.2361***
	(0.083)	(0.078)	(0.074)	(0.0466)
Alpha	0.5958***	0.2582	0.0202	-0.6177***
	(0.200)	(0.189)	(0.179)	(0.1130)
N	143	143	143	143

*Table 5 presents the equal-weighted portfolio monthly excess returns (%), benchmarked against the FF3 model, from January 2009 to December 2020. Three ESG portfolios were constructed by taking the 30th and 70th percentiles as cut-offs, resulting in a low-ranked ESG portfolio (Reg1), and a high-ranked ESG portfolio (Reg3). Moreover, a long-minus-short portfolio was constructed; high-ranked ESG portfolio - low-ranked ESG portfolio (Reg4). Alpha presents the average intercept and the ESG portfolio was benchmarked against the market risk factor (MktRF), the size factor (SMB), and the value factor (HML). Finally, Newey-West standard errors were used with four lags. The standard errors are in parentheses. *p<0.10, p**<0.05, p***<0.01*

In addition to the statistical relevance of the observed alpha generation for the low-quintile portfolio and long-minus-short portfolio, its economic significance is relevant as well. For example, according to the results of Table 5, investing in a low-ranked ESG portfolio yields a statistically significant and substantial alpha of 0.60% per month. On a yearly basis, investing in a low-ranked ESG portfolio outperforms when benchmarked against the FF3 model by 7.15%. The same applies to the long-minus-short portfolio. Such an investment strategy would result in a statistically significant alpha of -0.62%. On a yearly basis, such an investment strategy results in an underperformance of -7.41% when benchmarked against the FF3 model. When evaluating Hypothesis 3, a long-minus-short ESG investment strategy outperforms the FF3 model, the null hypothesis that states that there is no relationship between ESG portfolios and excess financial returns can be rejected. Hypothesis 3 suggests an outperformance of the long-minus-short investment strategy, but the results indicate that there is a statistically significant underperformance of this investment strategy against the FF3 model, resulting in a negative relationship between ESG scores and financial returns. Table 5 indicates that size effect typically accounts for a major portion of the return spreads. This demonstrates that large-cap companies are heavily weighted in the ESG spread portfolios. In addition, the market risk component seems to account for a considerable amount of the financial returns for both portfolios.

Again, in order to improve reliability and validity, a second time-series was performed. Since it was observed that for the long-minus-short strategy, the largest and most significant underperformance was explained by the size factor, a double-sorted portfolio was constructed, controlling for size (market value). The results are presented in Table 6. Regression 1 indicates the excess returns for the bottom ESG scores for small companies, while regression 6 indicates the excess returns for the top ESG scores for large companies.

Table 6: Time-series regression with double-sorted ESG portfolios

	Reg1	**Reg2**	**Reg3**	**Reg4**	**Reg5**	**Reg6**
MktRF	0.7570***	0.6756***	0.7728***	0.6508***	0.8460***	0.6780***
	(0.049)	(0.068)	(0.054)	(0.044)	(0.058)	(0.054)
SMB	0.4778***	-0.0193	0.3379**	-0.1161	0.1520	-0.2712*
	(0.133)	(0.136)	(0.163)	(0.136)	(0.174)	(0.146)

HML	-0.1583	-0.2495*	0.0814	-0.0767	0.2994*	-0.0011
	(0.133)	(0.143)	(0.141)	(0.103)	(0.174)	(0.088)
Alpha	0.7388***	0.0763	0.5540**	-0.0247	0.5094*	-0.1638
	(0.208)	(0.240)	(0.224)	(0.180)	(0.274)	(0.177)

*Table 6 presents the equal-weighted double-sorted portfolio monthly excess returns (%), benchmarked against the FF3 model, from January 2009 to December 2020. Six ESG portfolios were constructed by taking the 30th and 70th percentiles as cut-offs, and controlling for market value by creating portfolios with either small companies or large companies. Reg1 presents the low-ranked ESG portfolio for small companies, Reg6 presents the high-ranked ESG portfolio for large companies. Alpha presents the average intercept and the ESG portfolio was benchmarked against the market risk factor (MktRF), the size factor (SMB), and the value factor (HML). Finally, Newey-West standard errors were used with four lags. The standard errors are in parentheses. *p<0.10, p**<0.05, p***<0.01*

Presented in Table 6, regression 1 exhibits the highest and most significant alpha (0.74% per month). On a yearly basis, this portfolio outperforms the FF3 factors by 8.87%. This result is statistically and economically significant, as it indicates an extreme outperformance against the compared benchmark. Regression 6 shows that a portfolio with high-ranked ESG scores and high market value returns to an underperformance against the FF3 factors. However, this result is insignificant. In addition, from regressions 1, 3, and 5 it is clear that regardless of the ESG portfolio, the portfolio with small companies always returns a significant and positive alpha. Size is therefore a dominant factor. However, for these portfolios including small companies, the bottom ESG portfolio does in fact show the most significant and highest alpha.

According to Breedt et al., 2018, among others, other well-known equity characteristics, such as market risk, size, and value, have already accounted for any benefits from including an ESG risk premium in a portfolio. According to Chatterji, Levine, and Toffel (2009) and Delmas, Etzion, and Nairn-Birch (2013), it is more challenging to incorporate objective ESG elements into portfolios because of the complexity of computing them. The results of this study are consistent with the outcomes of the abovementioned studies.

Finally, Kaiser (2020) supports these findings of a negative significant alpha for European companies. A higher adoption rate for European companies demonstrates that European investors invest primarily in sustainable companies and less in conventional companies. This decreases the returns for sustainable companies and increases the returns for conventional companies (Pástor, Stambaugh, & Taylor, 2021).

5. Conclusion and recommendations

5.1 Conclusion

The ultimate goal of this study was to establish whether sustainable investments can yield better financial returns. The results and conclusion are based on data collected from the Stoxx Europe 600 index.

The results of this study – presented in Chapter 4 – assist in testing the three formulated hypotheses, which function as a guideline throughout this study. The first hypothesis tested whether there is a positive relation between the ESG score and financial stock returns. When evaluating the FMB model only, evidence was found of a negative relationship between ESG and financial returns for individual companies. However, when evaluating the FE-model, the null hypothesis could not be rejected. This means that there is no clear evidence for a relationship between ESG scores and financial stock returns – due to the inconsistent results of the FMB model compared to the FE model. The second hypothesis tested whether there is a relationship between ESG and financial returns within an industry. The results exhibit no evidence to reject this hypothesis, which means that there is no significant presence of a relationship between ESG and financial returns within an industry. Based on the cross-sectional analysis undertaken in this study, it can be concluded that there is neither a statistical nor an economic relationship between ESG and financial stock returns for individual companies.

In addition, a time-series analysis was performed to test the last hypothesis of this study. Previously, the relation between ESG and financial returns was based on an individual stock level. For the time-series analysis, the relation between ESG and financial returns was based on a portfolio level. Three quintile portfolios consisting of all the companies used in the sample data were constructed, with 30^{th} and 70^{th} percentile cut-offs regarding the ESG scores. In addition to the three quintile portfolios, a fourth portfolio was constructed in which an investor goes long in the top ESG portfolio and short in the bottom ESG portfolio – a long-minus-short investment strategy. The third and last hypothesis of our study states that this long-minus-short portfolio outperforms the FF3 model and ultimately generates a significant alpha. The results presented in Table 5 reveal significant evidence of an underperformance vis-à-vis the FF3 model, and these results are economically relevant. According to the results a long-minus-short portfolio generates an alpha of -0.62% per month, resulting in an underperformance of -7.41% on a yearly basis, which is a substantial underperformance. Most of this underperformance is caused by the size effect (SMB), and this demonstrates that large-cap companies are heavily weighted in the ESG spread portfolios.

Therefore a double-sorted portfolio was constructed, controlling for size (market value) and resulting in “small” and “large” portfolios. Table 6 indicates that regardless of the ESG score, a “small” portfolio always returns a significant and positive alpha. Size is therefore a dominant factor; however, within these “small” portfolios, the bottom ESG portfolio does actually present the most significant and highest alpha. Based on the time-series analysis, evidence was found to support the last hypothesis. The only exception is that while the hypothesis suggests an overperformance, the results present evidence of an substantial underperformance.

Therefore, in line with the triangulation research method to increase the reliability and validity of the study, multiple methods have been used to ultimately answer the research question of this study, namely:

Do high-rated ESG companies yield better financial returns than low-rated ESG companies?

Most of the evidence mentioned above indicates that the research question cannot be confirmed, and there is even some evidence that the contrary is true, meaning a negative relationship between ESG scores and financial returns. However, economics is a complicated field, especially with a rising topic as ESG. Therefore one cannot explicitly answer this question with a simple “No”. The cross-sectional analysis did reveal some evidence in this regard, but it was not consistent and not economically relevant, thus indicating a more neutral point of view. The time-series analysis did provide negative evidence for the relation between ESG and financial returns; and therefore this analysis indicates a more negative point of view on ESG. According to Kaiser (2020), this significant alpha can be explained by the high adoption rate of ESG criteria among European investors. This will decrease the returns of sustainable companies and increase the returns of conventional stocks (Pástor et al., 2021).

Briefly put, most investors believe that sustainable investing is likely to outperform the more conventional companies. However, I have demonstrated that sustainable investing still has a long way to go and does not automatically lead to higher financial returns. The literature demonstrates that companies with high ESG scores have an “insurance premium” and are less risky, and that the expected financial returns will therefore be lower. Moreover, excluding stocks (negative or positive screening) decreases the diversification of an investor’s portfolio and can subsequently lower the expected financial returns. Lastly, it seems that European companies are more likely to experience a negative relationship, due to the high adoption rate of ESG criteria within Europe

5.2 Recommendations

As previously mentioned, ESG can be used as an insurance premium because such companies are less risky. There is evidence that socially responsible companies perform better during periods of crisis. Future research could use a longer time period to control for crisis and non-crisis periods to clarify if this insurance premium could result in a significantly more positive relation between ESG scores and financial returns during a crisis period. As I only used a sample dataset from 2009 to 2020, which could explain why I identified a negative relation between ESG portfolios and financial excess returns (Lins et al., 2017; Nofsinger & Varma, 2014).

In this study the ESG scores were collected from the Thomson Reuters database (ASSET4). In future studies, data could be collected from different rating agencies to test whether these different rating agencies arrive at the same conclusions. To improve sustainable investing, a universal measure should be created to correctly compare ESG scores for different companies. If the results indicate that different rating agencies provide significantly different outcomes, the awareness and importance of a universal ESG measure can be accelerated (Berg et al., 2019).

Furthermore, this study used the FF3 model as a benchmark for the ESG portfolios. Future research could make use of various other asset pricing models, such as the Carhart four-factor model, the HXZ four-factor model, and the Fama–French five-factor model. A GRS test could then identify which asset pricing model is most suitable (Fama and French, 2015; Rehnby, 2014).

Furthermore, I used the data of the Stoxx Europe 600 companies. Due to the lack of data and the fact that financial firms were excluded, a total of 458 companies were analyzed. Moreover, the Stoxx 600 consists of the 600 largest European companies. The results indicate that the “small” companies were the main drivers of alpha generation. More robust results could be obtained by using a larger and more diversified dataset. Future research could focus on including small-, mid-, and large-cap companies and different regions besides Europe (Pollard et al., 2018).

6. References

Albertini, E. (2013). Does environmental management improve financial performance? A meta-analytical review. *Organization & Environment*, *26*(4), 431–457. https://doi.org/10.1177/1086026613510301

Arbel, A., Carvell, S., & Strebel, P. (1983). Giraffes, institutions and neglected firms. *Financial Analysts Journal*, *39*(3), 57–63. https://doi.org/10.2469/faj.v39.n3.57

Ashwin Kumar, N. C., Smith, C., Badis, L., Wang, N., Ambrosy, P., & Tavares, R. (2016). ESG factors and risk-adjusted performance: A new quantitative model. *Journal of Sustainable Finance & Investment*, *6*(4), 292–300. https://doi.org/10.1080/20430795.2016.1234909

Bansal, P. (2005). Evolving sustainably: A longitudinal study of corporate sustainable development. *Strategic Management Journal*, *26*(3), 197–218. https://doi.org/10.1002/smj.441

Bender, J., Hammond, P. B., & Mok, W. (2014). Can alpha be captured by risk premia? *The Journal of Portfolio Management*, *40*(2), 18–29. https://doi.org/10.3905/jpm.2014.40.2.018

Berg, F., Koelbel, J. F., & Rigobon, R. (2019). *Aggregate confusion: The divergence of ESG ratings.* Cambridge, MA, USA: MIT Sloan School of Management.

Bhagat, S., & Bolton, B. (2008). Corporate governance and firm performance. *Journal of Corporate Finance*, *14*(3), 257–273. https://doi.org/10.1016/j.jcorpfin.2008.03.006

Bolton, P., & Kacperczyk, M. T. (2020, April 1). *Carbon premium around the world*. *CEPR* Discussion Paper No. DP14567. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3594188

Bolton, P., & Kacperczyk, M. T. (2021). Do investors care about carbon risk? *Journal of Financial Economics*, *142*(2), 517–549. https://doi.org/10.1016/j.jfineco.2021.05.008

Breedt, A., Ciliberti, S., Gualdi, S., & Seager, P. (2019). Is ESG an equity factor or just an investment guide? *The Journal of Investing*, *28*(2), 32–42. https://doi.org/10.3905/joi.2019.28.2.032

Carlini, J., Grace, D., France, C., & lo Iacono, J. (2019). The corporate social responsibility (CSR) employer brand process: Integrative review and comprehensive model. *Journal of Marketing Management*, *35*(1–2), 182–205. https://doi.org/10.1080/0267257x.2019.1569549

Chatterji, A. K., Levine, D. I., & Toffel, M. W. (2009). How well do social ratings actually measure corporate social responsibility? *Journal of Economics & Management Strategy*, *18*(1), 125–169. https://doi.org/10.1111/j.1530-9134.2009.00210.x

Clark, G. L., Feiner, A., & Viehs, M. (2015, March). From the stockholder to the stakeholder: How sustainability can drive financial outperformance. *London, UK: Arabesque Partners/Oxford, UK: University of Oxford.* Retrieved from https://arabesque.com/research/From_the_stockholder_to_the_stakeholder_web.pdf

Crook, T. R., Todd, S. Y., Combs, J. G., Woehr, D. J., & Ketchen, D. J. (2011). Does human capital matter? A meta-analysis of the relationship between human capital and firm performance. *Journal of Applied Psychology*, *96*(3), 443–456. https://doi.org/10.1037/a0022147

de Colle, S., & York, J. G. (2009). Why wine is not glue? The unresolved problem of negative screening in socially responsible investing. *Journal of Business Ethics*, *85*(Suppl. 1), 83–95. https://doi.org/10.1007/s10551-008-9949-z

Delmas, M. A., Etzion, D., & Nairn-Birch, N. (2013). Triangulating environmental performance: What do corporate social responsibility ratings really capture? *Academy of Management Perspectives*, *27*(3), 255–267. https://doi.org/10.5465/amp.2012.0123

Derwall, J., Guenster, N., Bauer, R., & Koedijk, K. (2005). The eco-efficiency premium puzzle. *Financial Analysts Journal*, *61*(2), 51–63. https://doi.org/10.2469/faj.v61.n2.2716

Dunn, J., Fitzgibbons, S., & Pomorski, L. (2018). Assessing risk through environmental, social and governance exposures. *Journal of Investment Management*, *16*(1), 4–17.

Eccles, R. G., Kastrapeli, M. D., & Potter, S. J. (2017). How to integrate ESG into investment decision-making: Results of a global survey of institutional investors. *Journal of Applied Corporate Finance*, *29*(4), 125–133. https://doi.org/10.1111/jacf.12267

el Ghoul, S., Guedhami, O., Kwok, C. C., & Mishra, D. R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance*, *35*(9), 2388–2406. https://doi.org/10.1016/j.jbankfin.2011.02.007

Epstein, M. J., & Schnietz, K. E. (2002). Measuring the cost of environmental and labor protests to globalization: An event study of the failed 1999 Seattle WTO talks. *The International Trade Journal*, *16*(2), 129–160. https://doi.org/10.1080/08853900252901396

Fabozzi, F. J., Ma, K., & Oliphant, B. J. (2008). Sin stock returns. *The Journal of Portfolio Management*, *35*(1), 82–94. https://doi.org/10.3905/jpm.2008.35.1.82

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, *33*(1), 3–56. https://doi.org/10.1016/0304-405x(93)90023-5

Fama, E. F., & French, K. R. (2015). A five-factor asset pricing model. *Journal of Financial Economics*, *116*(1), 1–22. https://doi.org/10.1016/j.jfineco.2014.10.010

Fama, E. F., & MacBeth, J. D. (1973). Risk, return, and equilibrium: Empirical tests. *Journal of political economy*, *81*(3), 607-636. https://doi.org/10.1086/260061

Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, *5*(4), 210–233. https://doi.org/10.1080/20430795.2015.1118917

Galbreath, J. (2013). ESG in focus: The Australian evidence. *Journal of Business Ethics*, *118*(3), 529–541. https://doi.org/10.1007/s10551-012-1607-9

Gibson, R., Krueger, P., & Mitali, S. F. (2020). The sustainability footprint of institutional investors: ESG driven price pressure and performance. *Swiss Finance Institute Research Paper No. 17–05*. *European Corporate Governance Institute (ECGI) – Finance Working Paper No. 571/2018.* Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2918926

Giese, G., Lee, L. E., Melas, D., Nagy, Z., & Nishikawa, L. (2019). Foundations of ESG investing: How ESG affects equity valuation, risk, and performance. *The Journal of Portfolio Management*, *45*(5), 69–83. https://doi.org/10.3905/jpm.2019.45.5.069

Global Sustainable Investment Alliance. (2019, April). *Global sustainable investment review 2018*. Retrieved from https://apo.org.au/sites/default/files/resource-files/2019-04/apo-nid228331.pdf

Godfrey, P. C., Merrill, C. B., & Hansen, J. M. (2009). The relationship between corporate social responsibility and shareholder value: an empirical test of the risk management hypothesis. *Strategic Management Journal*, *30*(4), 425–445. https://doi.org/10.1002/smj.750

GSIA, (2019). 2018 Global Sustainable Investment Review. [online] Gsi-alliance.org. Available at: http://www.gsi-alliance.org/wp-content/uploads/2019/06/GSIR_Review2018F.pdf)

Guerard, J. B. (1997). Is there a cost to being socially responsible in investing? *Journal of Forecasting*, *16*(7), 475–490. https://doi.org/10.1002/(SICI)1099-131X(199712)16:7%3C475::AID-FOR668%3E3.0.CO;2-X

Halbritter, G., & Dorfleitner, G. (2015). The wages of social responsibility — where are they? A critical review of ESG investing. *Review of Financial Economics*, *26*(4), 25–35. https://doi.org/10.1016/j.rfe.2015.03.004

Hoepner, A. G. F., & McMillan, D. G. (2009). Research on “responsible investment”: An influential literature analysis comprising a rating, characterisation, categorisation and investigation. *SSRN Electronic Journal*. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1454793

Hong, H., & Kacperczyk, M. (2009). The price of sin: The effects of social norms on markets. *Journal of Financial Economics*, *93*(1), 15–36. https://doi.org/10.1016/j.jfineco.2008.09.001

Hooper, V., Sim, A. B., & Uppal, A. (2009). Governance and stock market performance. *Economic Systems*, *33*(2), 93–116. https://doi.org/10.1016/j.ecosys.2009.03.001

Jackson, G., & Apostolakou, A. (2009). Corporate social responsibility in Western Europe: An institutional mirror or substitute? *Journal of Business Ethics*, *94*(3), 371–394. https://doi.org/10.1007/s10551-009-0269-8

Jensen, M. C. (1968). The performance of mutual funds in the period 1945–1964. *The Journal of Finance*, *23*(2), 389–416. https://doi.org/10.1111/j.1540-6261.1968.tb00815.x

Kaiser, L. (2020). ESG integration: Value, growth and momentum. *Journal of Asset Management*, *21*(1), 32–51. https://doi.org/10.1057/s41260-019-00148-y

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

Khan, M., Serafeim, G., & Yoon, A. (2016). Corporate sustainability: First evidence on materiality. *The Accounting Review*, *91*(6), 1697–1724. https://doi.org/10.2308/accr-51383

Kleine, J., Krautbauer, M., & Weller, T. (2013, February). *Nachhaltige Investments aus dem Blick der Wissenschaft: Leistungsversprechen und Realität*. Munich, Germany: Steinbeis Research Center for Financial Services. Retrieved from http://paylab.de/images/pdf-

documents/Studie_Nachhaltige%20Investments%20aus%20dem%20Blick%20der%20Wissenschaft%20Leistungsversprechen%20und%20Realitt.pdf

Knudsen, J. S. (2011). Company delistings from the UN Global Compact: Limited business demand or domestic governance failure?. *Journal of Business Ethics*, *103*(3), 331-349. https://doi.org/10.1007/s10551-011-0875

Landi, G., & Sciarelli, M. (2019). Towards a more ethical market: The impact of ESG rating on corporate financial performance. *Social Responsibility Journal*, *15*(1), 11–27. https://doi.org/10.1108/srj-11-2017-0254

Lins, K. V., Servaes, H., & Tamayo, A. (2017). Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis. *The Journal of Finance*, *72*(4), 1785–1824. https://doi.org/10.1111/jofi.12505

Love, I. (2011). Corporate governance and performance around the world: What we know and what we don't. *The World Bank Research Observer*, *26*(1), 42–70. https://doi.org/10.1093/wbro/lkp030

Merton, R. C. (1987, July). A simple model of capital market equilibrium with incomplete information. *Journal of Finance*. Retrieved from https://dspace.mit.edu/bitstream/handle/1721.1/2166/SWP-1869-18148074.pdf

Nagy, Z., Kassam, A., & Lee, L. E. (2016). Can ESG add alpha? An analysis of ESG tilt and momentum strategies. *The Journal of Investing*, *25*(2), 113–124. https://doi.org/10.3905/joi.2016.25.2.113

Newey, W. K., & West, K. D. (1987). Hypothesis testing with efficient method of moments estimation. *International Economic Review*, 777-787. https://doi.org/10.2307/2526578

Nofsinger, J., & Varma, A. (2014). Socially responsible funds and market crises. *Journal of banking & finance*, *48*, 180-193. https://doi.org/10.1016/j.jbankfin.2013.12.016

Orlitzky, M. (2011). Institutional logics in the study of organizations: The social construction of the relationship between corporate social and financial performance. *Business Ethics Quarterly*, *21*(3), 409–444. https://doi.org/10.5840/beq201121325

Palmer, K., Oates, W. E., & Portney, P. R. (1995). Tightening environmental standards: The benefit-cost or the no-cost paradigm? *Journal of Economic Perspectives*, *9*(4), 119–132. https://doi.org/10.1257/jep.9.4.119

Pástor, U., Stambaugh, R. F., & Taylor, L. A. (2021). Sustainable investing in equilibrium. *Journal of Financial Economics*, *142*(2), 550–571. https://doi.org/10.1016/j.jfineco.2020.12.011

Pedersen, L. H., Fitzgibbons, S., & Pomorski, L. (2021). Responsible investing: The ESG-efficient frontier. *Journal of Financial Economics*, *142*(2), 572–597. https://doi.org/10.1016/j.jfineco.2020.11.001

Pollard, J. L., Sherwood, M. W., & Klobus, R. G. (2018). Establishing ESG as risk premia. *Journal of Investment Management, 16*(1), 1–12. Retrieved from https://www.researchgate.net/profile/Julia-Pollard-2/publication/327548430_Establishing_ESG_as_Risk_Premia/links/5ceda190299bf109da771d06/Establishing-ESG-as-Risk-Premia.pdf

Quack, S. (2007, May). *Cross-border interaction in multi-level governance: The case of professional associations as standard setters*. Paper presented at the Workshop on Multi-level Governance, Centre for the Study of Globalization and Regionalization, Warwick, UK. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.630.1683&rep=rep1&type=pdf

Rehnby, N. (2014). *Does the Fama-French three-factor model and Carhart four-factor model explain portfolio returns better than CAPM? A study performed on the Swedish stock market* (Thesis, Karlstad Business School, Karlstad, Sweden). Retrieved from https://www.diva-portal.org/smash/get/diva2:944713/FULLTEXT04.pdf

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

Revelli, C., & Viviani, J. L. (2013). The Link Between SRI and Financial Performance: Effects and Moderators. *Management International*, *17*(2), 105–122. https://doi.org/10.7202/1015403ar

Reynolds, F. (2014, November 16). Mainstream slow to accept benefits of responsible investment. *Financial Times*. Retrieved from https://www.ft.com/content/a8e2d2c6-69b8-11e4-8f4f-00144feabdc0

Sassen, R., Hinze, A. K., & Hardeck, I. (2016). Impact of ESG factors on firm risk in Europe. *Journal of Business Economics*, *86*(8), 867–904. https://doi.org/10.1007/s11573-016-0819-3

Sisto, A. L. (2020, April 3). *What is ESG and its three pillars?* Tern PLC. Retrieved from https://www.ternplc.com/blog/what-is-esg-and-its-three-pillars

S&P GLOBAL. (2020, February 24). What is the “S” in ESG? Retrieved from https://www.spglobal.com/en/research-insights/articles/what-is-the-s-in-esg

Stern, N. (2007). *Stern review: The economics of climate change*. Cambirdge, UK: Cambridge University Press. https://www.osti.gov/etdeweb/biblio/20838308

Turban, D. B., & Greening, D. W. (1997). Corporate social performance and organizational attractiveness to prospective employees. *Academy of Management Journal*, *40*(3), 658–672. https://doi.org/10.5465/257057

United Nations Framework Convention on Climate Change (UNFCCC). (n.d.). The Paris Agreement. Retrieved from https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

van Beurden, P., & Gössling, T. (2008). The worth of values: A literature review on the relation between corporate social and financial performance. *Journal of Business Ethics*, *82*(2), 407–424. https://doi.org/10.1007/s10551-008-9894-x

van Duuren, E., Plantinga, A., & Scholtens, B. (2015). ESG integration and the investment management process: Fundamental investing reinvented. *Journal of Business Ethics*, *138*(3), 525–533. https://doi.org/10.1007/s10551-015-2610-8

Verheyden, T., Eccles, R. G., & Feiner, A. (2016). ESG for all? The impact of ESG screening on return, risk, and diversification. *Journal of Applied Corporate Finance*, *28*(2), 47–55. https://doi.org/10.1111/jacf.12174

Whelan, T., Atz, U., & Clark, C. (2021). *ESG and financial performance, Uncovering the relationship by aggregating evidence from 1,000 plus studies published between 2015–2020*. New York, NY, USA: NYU Stern, Center for Sustainable Business. Retrieved from https://www.stern.nyu.edu/sites/default/files/assets/documents/NYU-RAM_ESG-Paper_2021.pdf

Appendix

Appendix 1: ESG score construction

ESG score construction

Pillar	Category	Indicators in rating	Weights	Pillar Weights
Environment	Resource use	19	11%	
	Emissions	22	12%	34%
	Innovation	20	11%	
Social	Workforce	29	16%	
	Human Rights	8	4.50%	35.50%
	Community	14	8%	
	Product Responsibility	12	7%	
Governance	Management	34	19%	
	Shareholders	12	7%	20.50%
	CSR Strategy	8	4.50%	
Total		178	100%	100%
		Source: Thomson Reuters (2019)		

Notes: Appendix 1 shows the environment, social, and governance (ESG) structure with their corresponding pillar weights.

Appendix 2: Summary statistics of ESG scores

ESG score	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average
obs	3,648	3,804	3,953	4,032	4,073	4,232	4,413	4,542	4,991	5,300	5,458	5,457	4,492
mean	56.62	57.61	58.65	59.29	59.96	60.37	62.44	63.13	63.63	65.27	67.37	70.40	62.06
std. Dev.	19.45	19.40	19.70	18.63	18.28	18.59	18.74	17.95	17.94	17.52	15.97	14.75	18.08
min	4.93	4.93	4.87	4.87	11.75	3.49	3.67	3.25	1.61	2.33	2.83	11.92	5.04
max	93.13	90.52	94.17	94.52	94.49	92.77	93.57	92.22	93.71	94.38	93.67	95.21	93.53

Notes: Appendix 2 provides the annual ESG summary statistics. Including the number of companies used, the average ESG score, the standard deviation of the ESG score and the minimum and maximum ESG score.

Appendix 3: Summary statistics of ESG scores per industries

ESG score	Obs.	Mean.	Std. Dev.	Min.	Max.

Technology	2,777	52.38	19.14	11.39	94.17
Telecommunications	2,377	68.92	16.53	7.28	91.87
Health Care	5,749	61.28	18.61	4.93	95.21
Real Estate	3,289	58.48	20.32	3.49	92.91
Cons. Discretionary	9,239	61.89	19.45	3.25	94.52
Cons. Staples	4,994	65.70	16.92	4.87	93.57
Industrials	13,771	59.15	18.34	1.61	93.91
Basic materials	5,375	66.14	17.10	11.18	91.73
Energy	1,753	75.37	10.42	46.06	90.16
Utilities	3,297	68.30	12.71	24.92	93.13

Notes: Appendix 3 provides the ESG summary statistics from 2009 to 2020, by industry. Including the number of companies used, the average ESG score, the standard deviation of the ESG score and the minimum and maximum ESG score.