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How is ESG Affecting Stock Returns?

A Portfolio- and Panel Data Analysis of US Firms in the S&P 500

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ABSTRACT

The last two decades, socially responsible investing has emerged such that there is a value in itself to invest responsibly. This paper analyzes the relationship between Environmental, Social, Governance (ESG) and stock returns, and investigate if any of these three individual pillars have a more significant impact during the period 2005 – 2018. The study contributes to the field by applying an ESG portfolio approach using the Fama-French Five-factor Model with momentum, as well as studying the direct- and indirect effect of ESG using a time- and firm fixed effects model with double-clustered standard errors. The results show that portfolios with a low ESG score outperform the market and portfolios with a higher score in general, where the impact of the environmental pillar is distinctive. Whether or not we conditioned the analysis on the financial crisis in 2008, a portfolio with lower ESG score still performs better in terms of abnormal returns. The panel data study finds support for an indirect positive effect of the ESG variable interacting with the market-based measure, while the environmental pillar displays a negative effect through accounting-based measures. The paper concludes that it is more beneficial for a mean-variance investor to hold stocks with lower ESG ratings since higher-rated portfolios cannot outperform the market.

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1 Introduction

In making investment decisions, investors today are more often concerned with ethics and Corporate Social Responsibility (CSR), such that there is a value in itself to invest responsibly. The market of Socially Responsible Investments (SRI) and the reporting of Environmental, Social, and Governance (ESG) have increased in volume and seemingly still increasing (US SIF, 2018). The value of the ESG-considered investments in global assets has 15-folded during the period from 2006 to 2016, where the net value increased from USD 4 trillion to 60 trillion (Pagano, Sinclair & Yang, 2018). This paper aims to extend the empirical research on ESG and financial performance by analyzing the relationship between ESG and stock returns, and further investigate if any of the three pillars in ESG have a greater impact on stock returns. We perform an integrated time series- and a panel data analysis to capture more dimensions of the relationship.

ESG got more attention during the beginning of the millennium as a consequence of the dot-com crisis, where many suggested that the companies were mismanaged, and by that, giving recognition to the importance of corporate behavior and how companies are managing social and environmental responsibilities (Galbreath, 2013). Further, the Great Financial Crisis (GFC) uncovered the risks that investors are exposed to. Many blamed the banks for the crisis, arguing that financial institutions had become too greedy and lacked governance. Consequently, the public and government necessitated the financial markets to revise the capital allocation policies to solve environmental and social problems more effectively, while higher governance monitored the activities. The implementation of these policies is today thought of as ESG-related policies, which have lifted the integration of non-financial information in the reporting among corporations (Fidelity, 2018). Therefore, it is interesting to investigate the effect of ESG, as today's investors are more frequently using it as a factor for their investment decision.

Previous research that has investigated the effect of ESG on financial performance has not reached a consensus regarding the relationship or if there indeed is one. By using ESG as a constraint in the investment decision, studies have shown that there is a positive- (Clark, Feinger, & Viehs, 2015; Dalal & Thaker, 2019; Alsayegh, Rahman, & Homayoun, 2020), a negative- (Fisher-Vanden & Thorburn, 2011), and a null effect of ESG on financial performance (Revelli & Viviani, 2015; Halbritter & Dorfleitner, 2015; Petitjean, 2019; Landi & Sciarelli, 2019).

To extend the empirical literature and to understand the potential relationship between ESG and stock return, this paper uses two new theoretical frameworks that augment the original CAPM by incorporating nonpecuniary criteria. These frameworks builds the foundation such that we can empirically perform a hypothesis testing connected to the aim. The main objective of the paper can be concluded into two research questions: (1) *How do ESG scores impact the performance of stock returns, and do any of the three pillars have a greater impact?,* and (2), *Is it beneficial to invest in stocks with higher ESG scores during crises, and if so, is it any of the pillars that have more impact?*

In this paper, we use data for US firms included in the S&P 500 between 2005 and 2018. We sort the ESG portfolios in two stages. The initial portfolios are sorted into three groups based on the scores collected from Refinitiv. Extending the initial sorting, the final portfolios are sorted by combining all possible combinations of high and low scores of the three pillars, constructing 24 ESG portfolios. Besides, we employ a long-short strategy, constructing eight additional portfolios. The portfolio performance is evaluated by the Fama-French Five-factor model with momentum and the Sharpe Ratio. The panel data approach employs a time- and firm fixed effects model with double-clustered standard errors, accounting for the interaction effect of ESG through financial performance measures, and periods of crisis, on stock returns.

The study finds evidence on distinguishable impacts on stock returns, depending on both ESG score and pillar performance. The result shows that portfolios constructed with a low ESG score outperform those with higher scores in general, where the impact of the environmental and to some extent, the governance pillar, seems to be of greater importance when constructing the portfolios. However, when evaluating the portfolio's excess return to its risk, higher-rated ESG portfolios are performing better. It might reflect the relationship to the systematic risk that all companies are facing. Whether or not we conditioned the analysis on the GFC, the portfolios with a low ESG score still perform better than the market and the higher-rated portfolios. The results from the panel data regressions show that stock returns are affected differently depending on which ESG variable one is analyzing. The ESG variable by itself does not display a direct effect on stock returns. Yet, through the interaction with variables reflecting how the companies are financially performing, the effect is significant such that there is an indirect positive effect of ESG on stock returns. The environmental pillar also shows an indirect negative effect through an accounting-based measure.

The remainder of this paper is organized as follows. Section 2 introduces the concept of sustainable investing and ESG. In section 3, the paper presents the theoretical framework, followed by the literature review. Section 4 describes the data and methodology. The results are reported in section 5, followed by the analysis and discussion in section 6. Section 7 concludes the paper.

2 Background

This section provides a foundation by introducing the concept of sustainability and ESG. The section further introduces the three pillars of ESG and how the chosen measurement is constructed.

2.1 Sustainability in Multiple Dimensions

Sustainability has been one of the most significant trends in financial markets during the past decades. Companies have been encouraged by their customers, investors, and governments to take sustainable initiatives (van Beurden & Gössling, 2008). Being aware of how the actions we take impact future generations have paved the way for sustainable development. To a higher degree, sustainability is considered at all levels in our societies, including the financial market. Investors are incorporating non-financial criterion and measures into their investment strategy, such as different rankings on how the company is affecting the environment.

It is important to emphasize that there are differences in objectives regarding sustainable investing. The current business organization, acting on the global market with large-scale production, disables shareholders in the company to actively participate in the day-to-day management and instead select a board of directors. The structure incentivizes dividing owners and managers into two groups where their objectives can differ in terms of how profits should be generated and to what cost (Bodie, Kane & Marcus, 2017, p.6). Therefore, it is important to distinguish sustainability from an investor's and a company's perspective. Investors may have preferences for how sustainable an asset or firm should be in order to be considered as a potential investment. Thus, investors' preferences for sustainability could be used as a threshold by integrating sustainable principles into their investment process. On the other end is the company's perspective of sustainability. It can either be seen as something the company is forced to follow in terms of laws and restrictions or may bolster its image by manifesting its brand. It could also be seen as a long-term strategy for the companies since they need acceptance from social actors who are affected by the company's operations.

There is not a clear definition of SRI or ethical investing – it comes in many shapes and does not necessarily mean the same thing. The umbrella term "sustainable investment" describes the overall goal that investments should be based on longer horizons and have a positive effect on the environment and society. One of the earliest definitions of sustainable investments was by Davis

(1973). He defined social responsibility, from a company perspective, as what a firm ensures by additional actions onto where the law ends. Thus, a firm is not socially responsible if it only complies with the minimum requirements of the law. In contrast, a socially responsible firm goes one step further and accepts the social obligations beyond the requirement of the law.

Nonetheless, from an investor perspective, the definition of sustainable investments or ethical investing rephrases. For example, Cowton (1999) came with the definition: *"(...) a set of approaches which include social or ethical goals or constraints as well as more conventional financial criteria in decisions over whether to acquire, hold or dispose of a particular investment."*. One of the newest definitions is by Caplan, Griswold and Jarvis (2013), who state that SRI is: *"A portfolio construction process that attempts to avoid investments in certain stocks or industries through negative screening according to defined ethical guidelines."*.

The absence of a consensus concerning a definition and a measurement contributes to a more doubtful market. Even if a company could have, e.g., low carbon emissions, it does not make the business by-default sustainable. The same company could have insufficient human rights policies. This highlights that the concept of sustainability has multiple dimensions, reflecting the complexity of being or becoming a sustainable investor. However, all definitions are grounded in the understanding of the links between firms and how they interact with the environment and society. These links make the firms' future profit affected, and dependent by changes in the society in which they operate. Thus, since a company's survival depends on its ability to gain profits, where investment decisions are based on economic payback projections, the financial performance is of primary concern for a company. Therefore, for companies to be motivated to engage in responsible and sustainable activities, there should exist financial benefits by engaging in such activities.

2.2 The Development of ESG

One of the most used sustainability measures is ESG scores, where the term "ESG investing" is commonly used synonymously with SRI, sustainable investing, or screening. In 1990, almost no company reported how they were managing social responsibility in the form of ESG. Reporting has increased since then, and in 2018, sustainable and responsible investing in the US was worth USD 12 trillion, which was a 38 percent increase since 2016. For money managers, the most substantial increase was for social and governance, but, the top criteria was climate change with a net value of USD 3 trillion (US SIF, 2018). Even though the rapid increase, the practice of ESG investing is not a new phenomenon. The concept began in the 1960s as responsible investing, where investors excluded stocks or industries from their portfolios based on the business activities. These activities were, e.g., if the business were in tobacco production, so-called “sin” stocks, or were involved in the South African apartheid regime (MSCI, 2020). In the 1970s, the socially responsible investing increased around US involvement in the Vietnam War and the use of chemical weapons. The anti-war movement led to the establishment of the first sustainable mutual funds.

In the millennium, Kofi Annan, former secretary-general of the United Nations, introduced the Global Compact Initiative intending to encourage environmental, social, and corporate governance into capital markets (UN Global Compact, 2020). This initiative can be seen as the first to assemble the concept of ESG investing (Townsend, 2017). After that, the embodiment of the ESG integration concept increased rapidly with the belief that ESG issues are a driver of financial returns (BSR, 2009). Moreover, new regulations were adopted after the GFC as an outcome of the pressure from the millennial generation, which reinforced the involvement in ESG responsibilities by corporates.

Since the introduction of the Global Compact Initiative, many other initiatives have been implemented to incorporate more social responsibility into firms’ activities. One of these, and perhaps one of the most influential ones in recent years, is the Paris Agreement. In 2015, world leaders reached a consensus and common cause to undertake ambitious efforts to combat climate change and adapt to its effect. As such, there is an increasing research interest in the motivation behind ESG activities undertaken by firms, whereas sustainability has entered the mainstream. The activities are important for both institutional and individual investors, where investors can recognize that ESG represents opportunities and risks (Limkriangkrai, Koh & Durand, 2017).

The lack of a consistent and comparable measure, as well as the exact definition, has been one of the substantial barriers for ESG integration. Businesses are also poor in integrating the ESG issues into strategic planning (KPMG, 2018). Hence, the methods to measure ESG differs, and the rating systems may vary for the same issuing shares. Today, asset managers increasingly rely on different ESG measurements to assess, measure and compare a firm’s sustainable performance. These users are inquiring about a more standardized reporting mechanism to improve the quality to be able to compare investments with confidence (Caplan, Griswold & Jarvis, 2013). Therefore, it is essential to investigate the impact that ESG ratings have on financial performance and how it may differ depending on market conditions.

2.3 The Pillars of ESG

An ESG investing strategy regards the components of ESG to have an essential impact on a company's success and market returns. These types of investors seek not only economic profits, but also a social good. Managers and investors can use the three pillars separately to evaluate and compare specific criteria or issues for individual companies and determine how they perform compared to other companies. Thus, a company's performance in each of the pillars may play a substantial role in evaluating its long-term potentials and risks.

The first pillar, the environmental pillar, is a broad category. It focuses on how a company performs as a steward of nature. The environmental pillar often gets the most attention since climate change has been one of the leading environmental issues that shareholders, money managers, and institutional investors consider. Climate change affects all companies and, thus, provides a systematic risk (Collin, 2009). To address this, companies have started to strategically position themselves to deal with increased sensitivity to the implications of climate change. Thus, acknowledging the effect of sustainability on financial performance (KPMG, 2018).

The second pillar, the social pillar, considers how a firm manages relationships with employees, suppliers, customers, and the community it operates within. A company can choose to harness social concerns and issues as a way to improve these relationships. Social factors such as human rights, safety, and child labor play an important role in the investment decision, where information spreads instantaneously such that investors can observe a company's social behavior within seconds and act on it. Social media is influencing social norms and is effective in communicating new values and norms in responsible consumption and investing (Hill, 2020, p. 2-3). Social issues may affect all companies' financial performance, but it is particularly important for consumer-facing sectors since they depend on a good social reputation and brand value (Collin, 2009).

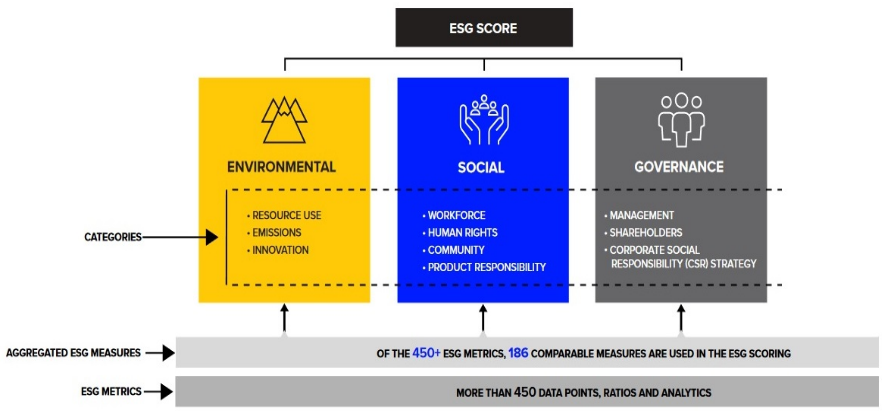
The third and last pillar, the governance pillar, reflects how a company deals with leadership, executive pay, internal controls, and shareholders' rights. Compared to the environmental and social pillars, the governance pillar focuses on how a company operates internally and not how their behavior affects the world. The evaluation of governance requires monitoring and reporting on the company's performance. Investors want to know if a company uses accurate and transparent accounting methods, and that stockholders are given a chance to vote on important issues. Poor corporate governance has been shown to have serious consequences for its financial performance (Collin, 2009). Therefore, an increasing number of investors have become more active in pushing for corporate governance changes, especially since the GFC (Hill, 2020, p.2).

2.4 The Definition of ESG by Refinitiv

In this paper, Refinitiv's (2020) definition and data of ESG are used. As one can see in figure 1, each of the pillars is divided into main categories that include several different themes (see table 10 in Appendix A for a more detailed description of the themes). Refinitiv's measure is chosen since it offers one of the most comprehensive databases in the industry, covering over 70 percent of global market cap across more than 450 different ESG metrics. Refinitiv has one of the most extensive content collection operations globally, including both algorithmic and human processes. The Refinitiv data process consists of over 150 content research analysts trained to collect ESG data, creating a well-established index.

Refinitiv's database is designed to transparently and objectively measure a company's relative ESG performance, commitment, and effectiveness. The two overall scores in our dataset are the ESG score and the combined score. The ESG score measures companies' performance based on reported data from the public domain, and the combined score overlays the ESG score with controversies. The combined score is calculated as the weighted average of the ESG score and a controversies score, which is based on 23 controversial topics, where if a company was not involved in any controversies, the combined score is equal to the ESG score. The scores are a percentage ranking, spanning between 0-100.

We want to point out a limitation regarding the generalizability and transferability while only using one source of the measurement. Halbritter and Dorfleitner (2015) highlight in their study that the magnitude and the direction of the results are related on the ESG rating provider. Therefore, this study's results are connected to the definition by Refinitiv. As earlier mentioned regarding the problems concerning no consensus of an exact definition of ESG, the rating providers are not free from subjective influences when constructing the measures, which might affect the results.



Source: Refinitiv, 2020

Figure 1. The Pillars of ESG

3 Theoretical and Literature Review

This section describes the theoretical frameworks as the foundation of the hypotheses tested in the paper. The theory of the multifactor models is also described. The section ends with a detailed literature review of previous empirical research.

3.1 Theoretical Framework

Markowitz (1952) introduced a formal model of portfolio selection embodying principles of efficient diversification. The model is commonly seen as the first step of portfolio management, i.e., the so-called efficient frontier of risky assets. The efficient frontier is a set of portfolios that minimized the variance for any targeted expected return. Markowitz's portfolio selection model is called the *Mean-Variance Portfolio Theory* and is often today referred to as the standard solution for the portfolio problem.

Following the Mean-Variance Theory, the *Capital Asset Pricing Model* (CAPM) introduced by Sharpe (1964), Lintner (1965), and Mossin (1966) describes the relationship between systematic risk and expected returns for assets. The framework is frequently used in the academic and empirical field of finance for pricing risky securities. The CAPM is a financial equilibrium theory that was the first financial model to allow economists to organize the risk and return trade-off in a systematic way. The model evaluates the amount of systematic risk, i.e., the market risk, for an asset or portfolio given a certain expected return. The Security Market Line in this paper is defined as:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,M}(R_{M,t} - R_{f,t}) + \varepsilon_{i,t} \tag{3.1}$$

where $R_{i,t}$ represents the return for asset *i*, $R_{f,t}$ is the risk-free interest rate, and $R_{M,t}$ is the return of the market portfolio. The intercept term (α_i) represents *Jensen's alpha*, which is commonly used as a measure of abnormal performance. When alpha is positive, the portfolio outperforms the market, given its risk, and vice versa. The coefficient of the excess return ($\beta_{i,M}$), referred to as the market beta, shows the volatility of an asset to the market, i.e., the sensitivity of an asset's return to variation in the market return. If the beta value is less than one, the expectation is that the asset decreases a portfolio's risk since the asset has a lower risk than the market risk, and the opposite if the beta value is above one. The beta value also shows the sign of the correlation. If the beta is less than zero, it indicates that the asset has a negative relation to the market.

Markowitz's Mean-Variance theory and the CAPM framework is the foundation of this paper. Building upon this, two augmented CAPM model that incorporates non-financial criteria operates as the theoretical framework of this paper.

3.1.1 Asset Pricing with a Nonpecuniary Clientele

Baker, Bergstresser, Serafeim and Wurgler (2018) presents a general standard asset pricing framework, an augmented CAPM, with the ambition to understand how a clientele with a non-financial objective affect prices and portfolio choice. Baker et al. use the model for pricing green bonds. Nevertheless, the framework is generalizable and applicable to all kinds of non-financial criteria, such as ESG scores. Therefore, the framework will be explained in this paper's setting.

The model assumes that there are two groups of investors. The first group consists of investors that are mean-variance maximizers, preferring higher returns and lower risk. Thus, they only care about financial performance. The second group of investors are also mean-variance maximizers but additionally care about ESG ratings. The framework assumes that some securities have a relatively positive ESG score ($\mathbf{ESG} > 0$), where investors in the second group gain extra utility from holding these securities. Thus, capturing both positive and negative screening. Positive screening can be interpreted as the gain of extra utility by an investor when holding securities with high ESG scores. Negative screening suggests that the investor loses utility by holding, e.g., sin-stocks.

Both groups have a common risk aversion parameter (γ), a common expectation for security return ($\mathbf{r}$), and common risk ($\mathbf{\Sigma}$). Each group chooses a vector of portfolio weights ($\mathbf{w}$) in each security. The maximization problem for the second group, obtaining higher utility by investing in securities with a higher ESG score, is defined as:

$$\max \mathbf{w_2'r} + \mathbf{w_2'ESG} - \frac{\gamma}{2}\mathbf{w_2'\Sigma w_2} \tag{3.2}$$

In equation (3.2), one can see how ESG mandates are implemented in practice. This additional term does not exist for the first group of investors, where their maximization problem only consists of the first and last term in the equation. The model assumes that the relative overall average of the ESG score is zero. Both groups have capital (a_i) and since the market clears, the relation can be expressed as:

$$\frac{a_1}{a_1+a_2}\mathbf{w}_1 + \frac{a_2}{a_1+a_2}\mathbf{w}_2 = \mathbf{w}_m \tag{3.3}$$

where $\mathbf{w}_m$ represents the market portfolio, which is a vector of weights, where the weights are equal to each securities' market value as a fraction of the total market value of all securities. If $a_2 = 0$, then the first group of investors is alone on the market. In that case, for market clearing, the first group must choose weights that equal the market weight, given their common return and risk expectations. For the second group (ESG), the portfolio weights are defined as:

$$\mathbf{w}_2 = \frac{1}{\gamma}\boldsymbol{\Sigma}^{-1}(\mathbf{r} + \mathbf{ESG}) \tag{3.4}$$

The first group of investors does not include the ESG score into their portfolio weights. Otherwise, it is the same as specified in equation (3.4). The equation derives the expected return of the market, which allows substituting the market Sharpe Ratio for the inverse of risk aversion (γ). The model assumes that the average ESG score is mean zero. With this in mind and the assumption regarding market clearing, one can see that the augmented CAPM becomes:

$$\mathbf{r} = \frac{r_m}{\sigma_m}\boldsymbol{\Sigma}\mathbf{w}_m = \boldsymbol{\beta} r_m - \frac{a_2}{a_1 + a_2}\mathbf{ESG} \tag{3.5}$$

Equation (3.5) shows that adding additional preference concerning non-financial criteria, as the ESG score, alters the original CAPM by an additional negative term. Consequently, it implies that when an investor has preferences for ESG securities, it bids up the price of these securities, i.e., the securities are priced at a premium, while earning lower returns. Therefore, Baker et al. (2018) state the prediction, in the general setting: "*Securities with positive environmental scores have lower expected returns.".* In our context, it means that securities with a high ESG score should have lower expected returns. Thus, our first hypothesis is:

H1: *The study expects that portfolios with a higher ESG score will have lower expected stock returns than those with lower ESG scores.*

3.1.2 The ESG-Efficient Frontier

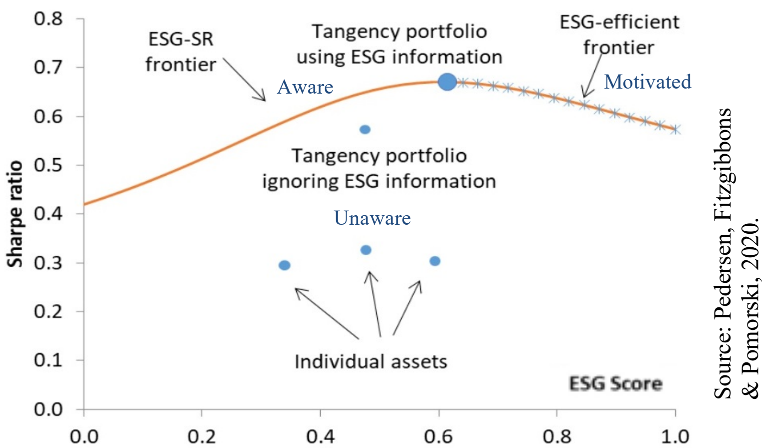
Pedersen, Fitzgibbons and Pomorski (2020) introduce a theoretical framework called the *ESG-Efficient Frontier*, incorporating non-financial preferences in CAPM. However, the framework is not general and instead focuses on the role ESG score plays for different types of investors. In contrast to Baker et al. (2018), this framework assumes that there are three types of investors.

The first investor type, the *type-U*, is the ESG-unaware investor. This type of investor seeks to maximize their unconditional mean-variance utility, i.e., do not use ESG information. The second type of investor is the *type-A*, the ESG-aware investor. Type-A also has mean-variance preferences, but they use assets' ESG scores to update their views on risk and expected return. If an economy has many type-A, they bid up the prices on stocks with a high ESG score such that the prices precisely reflects the expected profits to eliminate the connection between ESG and expected returns. Both the type-U and the type-A has the standard Markowitz solution.

The third investor type is ESG-motivated, the *type-M*. This investor uses ESG information in the investment decision process and has preferences for high ESG scores. The type-M looks for a portfolio with an optimal trade-off between low risk, high expected return, and high average ESG score. If an economy has many ESG-motivated investors, stocks with high ESG scores deliver low expected returns since they are willing to accept a lower return for a portfolio with higher ESG.

Within the theoretical framework, each stock's score plays two roles. Firstly, the score is providing information about firm fundamentals, and secondly, the score is affecting an investor's preferences. According to the model, the solution to the investor's portfolio problem is characterized by an ESG-Efficient Frontier. Theoretically, an investor optimally chooses a portfolio on the ESG-Efficient Frontier. The portfolios that span over the frontier are all combinations of the risk-free asset, the tangency portfolio, the minimum-variance portfolio, and the so-called ESG-tangency portfolio. Since the frontier only depends on security characteristics, one can first compute the frontier and, thereafter, choose a point on the frontier based on preferences.

Figure 2 displays the trade-offs between the security characteristics of the three different types of investors. A type-A investor chooses the portfolio with the highest Sharpe Ratio, which is the peak of the ESG-SR frontier – "the tangency portfolio using ESG information". The type-M investor have preferences for both high Sharpe Ratio and high ESG, and choose a portfolio to the right of the tangency portfolio, on the frontier. This means that a high ESG will yield a lower Sharpe Ratio. Choosing a portfolio to the left or below the efficient frontier is suboptimal since then, the investor–



Note: The connection between ESG scores (on the x-axis) and the Sharpe Ratio (on the y-axis) is called the ESG-SR frontier. The ESG-SR frontier illustrates the investment opportunity set when investors care about risk, return, and ESG score.

Figure 2. The ESG-Efficient Frontier

–can improve the Sharpe Ratio, the ESG or, both without reducing the other. However, a type-U investor might choose a portfolio below the frontier since a type-U investor calculates the tangency portfolio while ignoring the security information contained in the scores, i.e., conditioning on less information than the other types of investors.

It should be noted that the framework does not predict the distribution of the investor-types in an economy. Therefore, we need to make assumptions regarding the fractions. Since both ESG-aware and ESG-motivated investors take into account ESG information into their investment decision, they should, by nature, construct and reconstruct their portfolios when new information is available. We assume that there are a greater fraction of type-M investors in the economy, particularly after the GFC. We also assume that a high ESG score signals something positive in a nonpecuniary sense for securities and firms. Therefore, the second hypothesis depends on the assumption of a greater fraction of type-M investors:

H2: *The study expects that higher ESG scores will yield lower yearly risk-adjusted financial performance, measured by the Sharpe Ratio.*

Furthermore, the theory shows both the potential costs and benefits of a ESG-based investing. It also aims to explain how the increasing adoption of ESG affects portfolio choice and equilibrium asset price. When Pedersen, Fitzgibbons and Pomorski empirically estimate the theoretical ESG-Efficient Frontier, more specifically the costs and benefits of ESG-investing, four different proxies are used, i.e., proxies for E, S, G, and overall ESG. Thus, it demonstrates how the framework allows for the different components in ESG to diverge. Therefore, the third hypothesis is:

H3: *The three pillars (environmental, social, and governance) do not affect financial performance in the same proportion.*

3.1.3 The Efficient Market Hypothesis

There is some skepticism towards earning abnormal returns with an ESG-strategy and often refer it to the *Efficient-Market Hypothesis* (EMH). Fama (1970) developed the concept of the efficient market, which is characterized by prices always “fully reflect” available information and thus “efficient”. According to EMH, an instant change in prices reflects new information, and hence, it should be impossible to “beat the market” consistently by using information that the market already knows. Therefore, ESG score would already be integrated into the investment process, and thus, there would be no advantage for companies to have low or high scores.

Nevertheless, asset prices seem to lose their grounding in reality occasionally. Speculative "bubbles" seems to arise when a rapid run-up in prices, creating a widespread expectation that they will continue to rise. Consequently, the prices continue to rise even further when more investors try to get in on the action, and unavoidably, the bubble ends in a crash. This phenomenon is recurring in history, e.g., the dot-com boom and bust, or, more recently, the GFC in 2007 – 2009 (Bodie, Kane & Marcus, 2017, p.358-359). In times when bubbles bursts, the expectations on the market are decisive for the progress of the asset prices since it will reflect the updated information about economic prospects. Assuming that ESG information is publicly known and reflected in the prices, it should not matter if a portfolio has stocks with high or low ESG in times of crisis.

Linking this to the two augmented CAPM, the EMH is consistent with the framework by Baker et al. (2018) but not with the ESG-Efficient Frontier framework. Since the type-U investor is, by definition, unaware of the ESG score and does not use ESG information at all, it is impossible for a type-U investor to even exist according to EMH. Since prices fully reflect all available information, including the score, it is not possible to avoid scored assets or securities, and thus, the investor incorporates it into the investment decision by default. Furthermore, since the ESG-motivated investor is willing to accept a lower return for a portfolio with higher ESG, we assume, in accordance with the EMH, that the state of the market should not affect the investment decision of the type-M investor. We have already assumed a greater fraction of the type-M investor, such that the fourth and final hypothesis is:

H4: *The study expects that during a crisis, there is no significant difference by having stocks in portfolios that have a high or low ESG score.*

3.2 The Multifactor Models

The empirical asset pricing models aim to identify factors that explain the return of risky assets. The most common ones in the financial field are the models presented by Fama and French (1993, 1996). They introduced the *Three-factor* (FF3) model as an extension of the CAPM, where the underlying concept is that returns generated by portfolio managers are partly due to the factors beyond the manager's control. The FF3 is designed to capture patterns consistently contributing to a portfolio's performance. Hence, there are two factors in addition to market performance. These are the *Small minus Big* (SMB) for the size of the firms, and the *High minus Low* (HML) for the *Book-to-Market* (B/M) values. Thus, FF3 is defined as:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{1,i}(R_{M,t} - R_{f,t}) + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \varepsilon_{i,t} \tag{3.6}$$

The terms that are defined by equation (3.1) have the same interpretation, but now the $\beta_{1,i}$ represents the market beta. The SMB factor is the difference between the returns on diversified portfolios of small and big stocks, which refers to the outperformance of smaller companies, i.e., the size effect. The size factor is based on a company's market capitalization. It says that if a portfolio contains more small-cap companies, it should outperform the market over the long-run. The coefficient for the SMB variable ($\beta_{2,i}$) is interpreted as if the beta value is bigger than zero, then the portfolio is heavily invested in small stocks, and if opposite, the portfolio has invested in big stocks.

The HML factor is the difference between the returns on diversified portfolios of high and low B/M values, i.e., the value effect. The concept of the factor is that companies with a high B/M ratio, referred to as value stock, outperform those companies with a lower B/M ratio, referred to as growth stocks. Hence, the factor accounts for the spread in returns between value stocks and growth stocks. In the FF3, it shows whether a manager is relying on the value premium by investing in stocks with a high B/M ratio to earn abnormal returns. If the portfolio manager only buys value stocks, the coefficient for HML ($\beta_{3,i}$) in the regression will display a positive relation to the HML factor, suggesting that the portfolio returns are attributable to the value premium.

Carhart (1997) extended the FF3 by adding one additional factor, *Momentum* (MOM). Arguing that the effect of positive returns of an asset tends to last up to a year. Carhart showed that performance improved significantly when adding the momentum factor to the FF3. According to Jegadeesh and Titman (1993), there is a tendency for the good or bad performance of stocks that can persist over a longer period, which can be interpreted as a momentum property. The augmented model is referred to as the *Carhart Four-factor* (CFF) and is defined as:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{1,i}(R_{M,t} - R_{f,t}) + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \beta_{4,i}MOM_t + \varepsilon_{i,t} \tag{3.7}$$

The MOM variable is the difference between the returns on diversified portfolios of short-term winners and losers. The coefficient ($\beta_{4,i}$) is interpreted as an indicator in which the portfolio tilts according to momentum. If the coefficient is above zero, it indicates that portfolio *i* is mainly investing in winning stock, and vice versa, if the coefficient below zero.

Fama and French (2015) extended the FF3 to a *Five-factor* (FF5) model, arguing that it was an incomplete model for expected returns by not capturing the variation in average returns related to profitability and investment. Along with the three original factors, the FF5 adds the factors of profitability and investments. Thus, FF5 is defined as:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{1,i}(R_{M,t} - R_{f,t}) + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \beta_{4,i}RMW_t + \beta_{5,i}CMA_t + \varepsilon_{i,t} \tag{3.8}$$

The profitability factor is referred to as *Robust minus Weak* (RMW), which is the difference between the returns on diversified portfolios of stocks with robust and weak profitability. The RMW suggests that companies that report higher future earnings have higher returns on the stock market. Moreover, the investment factor is referred to as the *Conservative minus Aggressive* (CMA), which is the difference between the returns on diversified portfolios of the stocks of low and high investment firms. The CMA suggests that companies that are directing profit towards major growth projects are more likely to experience losses in the stock market.

The multifactor models can determine how much of the portfolio manager's performance is attributable to these factors. If the portfolio's performance can be assigned to these risk factors, then the manager has not added any value or demonstrated any skills. Thus, the factors can fully explain the portfolio's performance and cannot be explained by the manager's ability.

3.3 Empirical Research

This literature review includes both empirical research and meta-analysis that studies the effect of ESG, both as a score and through the individual pillars. It also includes some studies that look specifically at the period of the GFC. An overview of the literature is presented in table 1. Before presenting earlier empirical studies, one should know how the research interest in sustainable investing began. The foundation of the field is consigned to Friedman (1970), responding to if a company should be considering social responsibility to gain better financial performance. He presented the shareholder theory based on the neoclassical free-market theory that managers are employed to run the business for the shareholders and in their interest. The implementation of CSR would create undemocratic taxation on the shareholders such that it outweighs the profits. Thus, CSR will not affect financial performance.

Davis (1973) took a more liberal stand on the shareholder theory by stating arguments for and against the effect of social responsibility. On the one hand, Davis acknowledges Friedman's neoclassical view on profit maximization. On the other hand, he presents several arguments for social responsibility as a contributing factor in the enhancement of financial performance. For example, the long-run self-interest of a business, the idea of an improved public image, the avoidance of government regulations, socio-cultural norms, and stockholder's interest.

Table 1. Summary of Literature Targeting ESG/SRI and Financial Performance

Authors	Focus	Time Period	Sample Description	Research Method	Dep. variable	Relationship to FP
Van Beurden and Gössling (2008)	CSP-CFP[1]	Empirical research since 1990	Global	Literature review/Meta-analysis	n/a	Majority show positive
Friede, Bush and Bassen (2015)	ESG-CFP	1970s onward	Global	Literature review/Meta-analysis	n/a	Non-negative, many of the studies show positive
Clark, Feinger, and Viehs (2015)	E, S, G	1970s onward	Global	Report investigating over 200 studies	n/a	Positive
Dalal and Thaker (2019)	E, S, G	2015 – 2017	Indian NSE 100 ESG Index	(Random effect) Panel data regression study	ROA[2] Tobin's Q	Positive Positive
Kumar, Smith, Badis, Wang, Ambrosy, and Tavares (2016)	ESG	2014 – 2015	US companies from DJSI + other firms	Time series analysis	(Volatility of) SR[3]	Positive
Al-Tuwaijri, Christensen, and Hughes (2004)	E	1994	US market	Cross-sectional data for OLS, 2SLS, and 3SLS	SR (Industry-adjusted)	Positive
Hvidkjær (2017)	E, S, G	1984 onward	Global	Literature review	n/a	Mixed – depending on the time period of the research
Han, Kim and Yu (2016)	E, S, G	2008 – 2014	Korea Stock Market (KOSPI)	Panel data with Pooled OLS and quasi-ML	ROE, MBR, SR[7]	GOV – Positive, SOC – Null, ENV – Negative
Velte (2017)	ESG	2010 – 2014	German Prime Standard (not SDAX)	Correlation and regression analysis[4]	ROA Tobin's Q	Positive Null
Limkriangkrai, Koh, and Durand (2017)	E, S, G	2009 – 2014	Australian Securities Exchange (ASX200)	CFF	SR	Null, but mixed on accounting-based measures
Landi and Sciarelli (2019)	ESG	2007 – 2015	Milano, Italy (FTSE MIB)	Panel data study and FF3	SR	Null
Revelli and Viviani (2015)	CSP-CFP	Empirical research since 1972	Global	Meta-analysis	n/a	Null
Petitjean (2019)	E	2005 – 2017	US Large Cap (S&P 500)	Panel data study	ROA, EPS, PM, SR, PB[5]	Null
Halbritter and Dorfleitner (2015)	E, S, G	1991 – 2012	US market	CFF and cross-sectional Fama-Macbeth regressions	SR	Null. But the pillars affect SR differently
Sahut and Pasquini-Descomps (2015)	ESG	2007 – 2011	UK, US, Swiss firms	CFF and linear regression	SR	Null for US and Swiss Negative for UK
Fisher-Vanden and Thorburn (2011)	E	1993 – 2008	US firms in voluntary environment programs	Event study approach	CAR[6]	Negative

Note: The table presents a comprehensive overview of the literature reviewed, studying how ESG principles are affecting financial performance in the form of both a portfolio- and an accounting-based approach. From the table, one can see that a typical strategy is either to only look at the accounting-based financial performance or combining it with a portfolio approach.

[1] CSP – Corporate Social Performance, CFP – Corporate Financial Performance
[3] SR – Stock Returns
[5] EPS – Earnings per Share, PM – Profit Margin, PB – Price to Book ratio
[7] ROE – Return on Equity, MBR – Market to Book ratio
[2] ROA – Return on Assets
[4] Assumptions for regression: linearity, homoscedasticity of residual, normal distribution, multicollinearity
[6] CAR – Cumulative Abnormal Returns

Challenging the shareholder theory and building upon the latter arguments by Davis, is the stakeholder theory. The foundation of the theory originates from Freeman (1984), who states that managers must consider other groups, e.g., employees, the civil society, suppliers, etcetera, in their investment strategy. Thus, *Corporate Social Performance* (CSP) is needed to attain business legitimacy, suggesting that there is a positive correlation between CSP and *Corporate Financial Performance* (CFP). The stakeholder theory has laid the framework for the methods of CSR. Even though it does not provide information about relative performance when using ESG principles, it is still the core of the research associated with ESG.

3.3.1 The Relationship between ESG and Financial Performance

Friede, Bush and Bassen (2015) perform a literature review examining the relationship between ESG and CFP in more than 2200 empirical studies. Using a two-step research method, the paper provides aggregated evidence that approximately 90 percent is emphasizing that the positive impact of ESG on CFP appears to be stable over time. Clark, Feinger and Viehs (2015) get similar results from their literature studies. They show that there is clear empirical evidence for a positive correlation between CSR and financial performance and it is in the best economic interest for managers and investors to incorporate sustainability considerations into the decision-making process. This has also been shown by Dalal and Thaker (2019), who uses a panel data analysis on Indian firms listed on the ESG index. Their result shows that good corporate ESG performance enhances financial performance for both the accounting (ROA)- and market-based (Tobins's Q) variables. The results are significant, indicating that investors prefer socially responsible companies.

Even though many studies present results of a positive relationship between ESG and financial performance, researchers often claim that the results are inconclusive or contradictory (Van Beurden & Gössling, 2008; Friede, Busch & Bassen, 2015; Bansal, Wu & Yaron, 2018). Revelli and Viviani (2015) perform a meta-analysis consisting of 85 studies and 190 experiments to investigate the relationship between SRI and financial performance. The paper aims to determine if it is more profitable to include CSR and ethical concerns in portfolio management, rather than conventional investment policies. The result indicates neither a weakness nor a strength regarding the consideration of including CSR in a portfolio. Similar results are suggested by Landi and Sciarelli (2019). They investigate how ESG rating may influence the listed Italian companies' excess return on the stock exchange market. The paper uses a fixed-effects model to see the impact of the rating on stock return and the FF3 to quantify the abnormal stock returns by using Jensen's Alpha to measure the difference in financial performance. The authors present evidence on improving quality in ESG assessments. After the GFC, new regulations were issued, and since then, more reliable corporate disclosures have emerged. However, the relationship between ESG and stock return is neither positive nor negative.

Velte (2017) investigates if ESG has an impact on how the German firms are performing. The ambition is to evaluate the reaction of the decreased trust of the companies after the GFC, with the implementation of a stakeholder management approach and CSR strategy. The German legislator introduced mandatory CSR management board compensation for listed companies in 2010, such that the management incentives for stipulating a CSR management tool increased. The paper presents evidence that ESG displays a positive impact on ROA, but no impact on Tobin's Q, i.e., there is evidence that in the short-term, the financial performance is enhanced but not in the long-term.

Halbritter and Dorfleitner (2015) get a similar result for the latter case, i.e., market-based financial performance. They investigate the link between ESG rating and financial performance, and also reviewed the existing empirical evidence on this relation. With the ambition to gain evidence from different perspectives, the authors applied two approaches. Firstly, CFF, and secondly, a cross-sectional Fama-McBeth regression, using ESG data from Refinitiv, Bloomberg, and KLD. The paper finds that the ESG portfolios do not display a significant return difference between companies with a high respectively low rating, applying to both the overall scores and the different pillars. The result indicates that investors should not expect abnormal returns by trading a different portfolio of high- and low rated firms, thus, supporting the EMH.

Kumar, Smith, Badis, Wang, Ambrosy and Tavares (2016) also investigates US firms but listed on Dow Jones Sustainability Index and other US firms equivalently complying with these requirements. The purpose is to identify how the ESG score is affecting the volatility of the stock return on the industry level. The authors find that firms incorporating ESG principles display lower volatility in their stock performance than their peers in the same industry. They also present evidence that each industry is affected differently by ESG principles and that companies with higher ESG scores generate higher returns.

Among the studies explicitly looking at ESG and financial performance, few exhibit the negative relationship. Nevertheless, Sahut and Pasquini-Descomps (2015) find indications of this relationship by investigating news-based scores in ESG for three countries, US, UK, and Switzerland, using the CFF and linear regression. The result is not as clear-cut since they only find a statistically significant negative result for UK-based firms. The US and Swiss firms did not show significant results, such that it is difficult to prove any connections.

3.3.2 The Three Pillars and Financial Performance

Some studies have further investigated the three pillars of ESG to see if there are any specific effects on financial performance, including portfolio strategies. Petitjean (2019) investigates the relationship between CSR and financial performance with a focus on the environmental dimension using a panel consisting of 58 US firms. The paper uses several proxies for environmental performance and looks at both accounting- and market-based financial performance. The results suggest that emission reduction or climate change policies, i.e., eco-friendly policies, in large US companies do not seem to be broadly associated with financial performance. Similarly, Fisher-Vanden and Thorburn (2011) investigate environmental performance by specifically studying US firms that become members in voluntary environmental programs, where the purpose is to reduce greenhouse gas emissions. The result shows that the firms experience significantly negative abnormal stock returns and that the price seems to decline even further in larger firms with poor CSR. Thus, committing to reduce emission appears to conflict with firm value maximization. In contrast, Al-Tuwaijri, Christensen, and Hughes (2004) obtain results that suggest “good” environmental performance is significantly associated with “good” economic performance.

Limkriangkrai, Koh and Durand (2017) also investigate the independent effects of E, S, and G scores, as well as the effect of the compounded score. The paper focuses on the largest Australian companies’ stock returns and these company’s corporate financing decisions. Their objective is to examine if there is a significant difference in returns between the firms with a high- and low ESG score. The authors generate high- and low ESG portfolios for the three pillars and the composited ESG group. Furthermore, the authors create a risk-adjusted hedge (High minus Low) portfolio regressed with the CFF. The result displays that there are differences in average returns for high- and low score portfolios in all groups, whereas portfolios with high E- and S ratings generate slightly higher average monthly returns. Moreover, the author states that portfolios with a high governance ranking seem to have a lower average return. It goes against the study by Velte (2017), who also investigates the three different components of ESG and finds that governance performance has the strongest impact on financial performance in comparison to environmental and social performance.

Limkriangkrai, Koh and Durand also find that after the returns are adjusted for the risk factors, the hedge portfolios do not generate abnormal returns. They argue that this result is beneficial for both institutional and individual investors due to expectations after risk adjustment – firms that perform ESG activities are likely to underperform due to reduced availability of assets for investments. The author concludes that there is no risk-adjusted cost of ESG investment.

Han, Kim and Yu (2016) also get different results depending on which of the pillars that are studied. Their research looks at the Korean financial market to see how ESG, separately and combined, affect accounting-based measures and Sharpe Ratio on financial performance. They find that the environmental principle has a u-formed negative relationship with financial performance, whereas the governmental principle has a positive (inverse u-formed) relationship. Although, the paper do not find a statistically significant relationship between the social principle and financial performance.

3.3.3 The ESG during the GFC

The GFC uncovered the financial risks exposing investors. Both the market and academia argue that having a share of the financial markets obliges all actors to do the utmost to avoid such a crisis. The GFC highlighted the importance of accountability, transparency, the consideration of non-financial criteria in the investment decision process, responsible ownership, and a stronger focus on long-term investing (Collin, 2009).

In a literature review by Hvidkjær (2017), ESG investing is reviewed and analyzed. The author examines how investments based on ESG considerations affect the value of an investors' portfolio. The paper finds that stocks with high ESG ratings exhibit high future stock returns during specific periods. Between 1991 and 2004, the evidence is strong, while between 2005 and 2012, stock returns with high scores do not appear to differ from the benchmark. Moreover, Hvidkjær states that some evidence suggests that returns were again high after 2012. One of the main results presented in the paper is that active ownership by ESG investors may create value for both shareholders and other stakeholders, but not during the GFC.

Białkowski and Starks (2016) investigates inflows and outflows to SRI funds compared to conventional funds from 1991 until after the GFC. While accounting for general differences compared to conventional funds, they find that there is no significant difference in inflows and outflows during the crisis for SRI funds. That does not say anything about the excess returns or the actual financial performance. Nevertheless, it does provide a hint that ESG mutual funds should have better financial performance than conventional mutual funds.

Petitjean (2019) also investigates the relationship between social responsibility and financial performance before, during, and after the GFC. The paper does not find clear-cut changes over the investigated periods, even when conditioning the GFC analysis. Besides, the evidence is weak for the relationship between financial performance and environmental performance in periods of low trust, i.e., during crises.

3.4 Summary of Theoretical and Literature Review

The overall results from previous research indicate that many observe a positive relation of a higher ESG score to financial performance, measured both in accounting- and market-based variables. Few studies also find this through a multifactor model. Nevertheless, there are also as many studies that do not show a significant or neither positive nor negative relation to financial performance. A small number of studies show a negative relation, which is only for a single market or measurement based on another criterion than the "standard" ESG. Therefore, if there is a statistically significant result, one would expect a slight positive effect on financial performance from having higher ESG-scores when investigating the relationship, at least when looking at variables measuring how the firm is performing. This is particularly visible for the accounting-based measures. When instead looking at the studies that employ a multifactor model, the result is less compelling toward a positive effect on portfolio performance. Most of the previous research shows that the effect is nonexistent, such that it does not significantly affect abnormal returns. Yet, a higher score of ESG seems to lower the investment volatility, such that it is a more stable investment when accounting for risk.

The research that additionally is examining how the three pillars are affecting financial performance seems to suggest that the three pillars of ESG affect financial performance in different ways and proportion. Particularly, the environmental pillar seems to have a stronger negative effect, while mixed for the governance score, where the studies have shown both a positive and a negative effect.

Those researchers that have accounted for a period of crisis are highlighting arguments as to why ESG is particularly important. The expectation is that ESG has some real effect on financial performance during financial crises. However, there is no convincing evidence for the expectation. Previous research does not show any significant effect when accounting for ESG while investing during the GFC.

To conclude this section, this paper will use the theoretical frameworks by Baker et al. (2018), and Pedersen, Fitzgibbons and Pomorski (2020) to answer the stated research questions through hypothesis testing. The interpretation of the first hypothesis suggests that this study should not expect to have abnormal returns by possessing a higher ESG score. The second hypothesis suggests that a higher ESG score will affect the Sharpe Ratio negatively. The third hypothesis suggests that the pillars affect stock return differently. Lastly, the fourth hypothesis suggests that ESG will not have a significant effect on financial performance during periods of crisis.

4 Methodology

This section starts by presenting the data used in the paper. Next, the section presents the research approach that the study builds upon and the portfolios' construction based upon the ESG score. Furthermore, the models employed in the study are described, together with the robustness checks.

4.1 Data

The paper collects data containing US large-cap firms in the S&P 500 stock index between the period 2005 – 2018 (14 years or 168 months) from Thomson Reuters Datastream. We choose to look at the US market and the S&P 500 since it represents a large market with multiple sectors. Besides, we are looking at a period when there was a major global financial crisis that did not spread uniformly. By looking at a single market that is well-represented, we avoid any misrepresentation or lead-lag effects in our results.

The main focus of this paper is the ESG score and its pillars. Therefore, the paper bases the firm selection on the availability of ESG ratings for the firms in the S&P 500. Not all firms have reported their ESG scores from the start of the period of interest, and the list is continuously updated with new firms while excluding firms that no longer qualify. To handle this, we choose to exclude those firms to obtain a more balanced dataset. Thus, the paper excludes firms from the original set of 505 firms in March 2020 to 353 (see Online Appendix). There are two separate datasets for the methodological approach, presented in the following subsections.

4.1.1 Data for the ESG Scores

The paper gathers ESG scores from Refinitiv, and the variables are presented in table 2. The scores are updated annually; however, the company's score may be presented in different months, e.g., company A's score is presented in January while company B's score in June. Hence, this paper chooses to use monthly data for the scores such that the portfolios are more accurately constructed and updated more frequently for the time series analysis. The monthly data also fits the data for the panel data analysis. The distribution of the ESG and the combined score is presented in figure 6 in Appendix B. One can see that the distribution for ESG is skewed to the right, i.e., a larger proportion of the companies are reported to have a higher ESG score. The opposite is true for the combined score since bad media reporting has a negative effect such that the distribution is skewed to the left.

Table 2. Summary Statistics of the ESG Scores

Variable	Obs	Mean	Std. Dev.	Min	P25	P50	P75	Max
ESG	59 304	61.84	16.81	7.29	49.5	64.04	75.2	97.66
COMB	59 304	48.59	16.32	7.29	36.98	44.69	60.04	94.56
CONTRO	59 304	36.40	25.51	0.08	9.04	53.42	59.59	80.00
ENV	59 304	61.44	22.17	4.77	42.68	65.1	79.65	99.09
GOV	59 304	60.32	20.54	3.08	45.8	62.82	76.68	99.05
SOC	59 304	63.52	18.75	3.76	49.54	65.35	78.31	99.04

Note: The variables are the overall *ESG* score, the combined (*COMB*) score subtracting controversies from ESG, the controversies (*CONTRO*) score, environmental (*ENV*) score, governance (*GOV*) score, and social (*SOC*) score. Possible number of observations is 59 304 covering monthly data from 2005 to 2018. P25, P50 and P75 represents the first, second and third quantile.

4.1.2 Data for the Time Series Analysis

For the time series analysis, the paper collects daily data from the first trading day in 2005 (January 3rd) until the last trading day in 2018 (December 31st). Therefore, there are 3 523 observations in this dataset. The paper collects the factors from Kenneth R. French's Data Library (French, 2020). The FF5 contains excess return on the market (MktRf), and the risk factors: Small minus Big (SML); High minus Low (HML); Robust minus Weak (RMW); and Conservative minus Aggressive (CMA). In addition, we use Momentum (MOM) in our model, thus, extending the FF5. The paper presents the construction of the risk factors and their components in table 11 in Appendix B.

Table 3 presents the summary statistics. One can see that the portfolio returns are missing one observation, which is due to the calculation of returns. Our data allows that stock returns are discretely compounded. Usually, modern portfolio theory assumes asset returns to be normally distributed, which is practical since then it can completely describe the mean and variance, hence, consistent with mean-variance analysis (Bodie, Kane & Marcus, 2017, p.175). The correlation table for the risk factors is presented in table 12 in Appendix B.

Table 3. Summary Statistics of the Time Series Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
MktRf	3 523	0.0322	1.1870	-8.95	11.35
SMB	3 523	0.0024	0.5625	-3.4	4.49
HML	3 523	-0.0014	0.6423	-4.24	4.83
RMW	3 523	0.0118	0.3586	-2.62	1.95
CMA	3 523	0.0007	0.3021	-1.74	1.96
MOM	3 523	0.0095	0.9461	-8.21	7.01
Portfolio returns					
Low ESG score	3 522	0.0453	1.3547	-10.83	10.35
Medium ESG score	3 522	0.0401	1.3252	-10.28	12.24
High ESG score	3 522	0.0374	1.2261	-9.32	12.54
H-L ESG score	3 522	-0.0079	0.3332	-2.76	3.19

Note: All the variables are reported in %. Here we have the excess market return (*MktRf*), Small minus Big (*SMB*), High minus Low (*HML*), Robust minus Weak (*RMW*), Conservative minus Aggressive (*CMA*), and Momentum (*MOM*). In this table, overall portfolio returns are reported. The general trend of the portfolio returns suggests that the average return is higher for portfolios with low ESG score compared to both the medium and high ESG scored portfolios. For a complete list of portfolio returns, see Table 13 in Appendix B.

4.1.3 Data for the Panel Data Analysis

For the panel data analysis, the paper collects monthly data. Here, we choose to include control variables that can test the effect of the ESG score itself and its pillars on financial performance. These control variables have also frequently been used in the previous literature (see the summary of empirical literature in table 1). Thus, the control variables are Tobin's Q (Q), Return on Assets (ROA), Return on Equity (ROE), Leverage (LEV), Earning per Share (EPS), log of Total Assets (ln TOT A), and Profit Margin (Margin). The summary statistics of these, including monthly stock returns, are presented in table 4. As one can see in the table, the observations vary somewhat since there are some missing observations for every control variable. But this should not create any problem since it is still a reasonably balanced dataset. Table 14 in Appendix B presents the correlation between all variables, where the correlation is quite high between the ESG variables. However, between the ESG scores and the control variables, and among the control variables, does not display any worrisome correlations. As such, there should not be any problems with multicollinearity.

Table 4. Summary Statistics of the Panel Data Analysis

Variable	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Return	58 425	0.9620	8.8669	-81.6194	198.8593
Q	58 535	1.9657	1.1571	0.5060	14.9283
ROA	59 129	0.0657	0.0781	-0.8313	1.8121
ROE	58 536	0.8337	1.1411	0.0141	69.8454
LEV	58 536	1.7214	5.5035	-0.0441	501.8695
EPS	58 724	3.1712	5.4736	0	180.69
ln TOT A	59 160	16.7850	1.3915	12.1158	21.6846
Margin	59 149	4.8745	751.1678	-105 428.70	213.27

Note: The variables are Stock Return (*Return*) in %, Tobin's Q (*Q*) is a ratio, Return on Assets (*ROA*) in %, Return on Equity (*ROE*) in %, Leverage (*LEV*) in %, Earning Per Share (*EPS*) in %, log of Total Assets (*ln TOT A*), and Profit Margin (*Margin*) in %. Possible number of observations is 59 304.

4.2 Research Approach

Based on the theoretical framework and with the ambition to test the hypothesis and answer the research questions of this paper, we use two methodological approaches. The first research approach is a time series analysis where we employ the Fama and French multifactor models. As shown in previous research, Fama and French methods are commonly used to investigate the relationship between sustainability and financial performance. To our best knowledge, no previous research has specifically used the FF5 with momentum to investigate the relation between ESG, its pillars, and financial performance. Thus, it makes it interesting to analyze the abnormal returns with an extended model, and perhaps, in a more accurate way.

Constructing ESG portfolios provides a straightforward strategy to exploit a potential relationship between ESG and stock returns. Nonetheless, we create a new portfolio construction approach by sorting the portfolios, not only by its overall ESG score, i.e., initial sorting, but also by the performance of the three individual pillars, i.e., final sorting. This design captures more dimensions of sustainability performance. The construction makes it possible to distinguish if any of the pillars have a more outstanding effect than the other pillars.

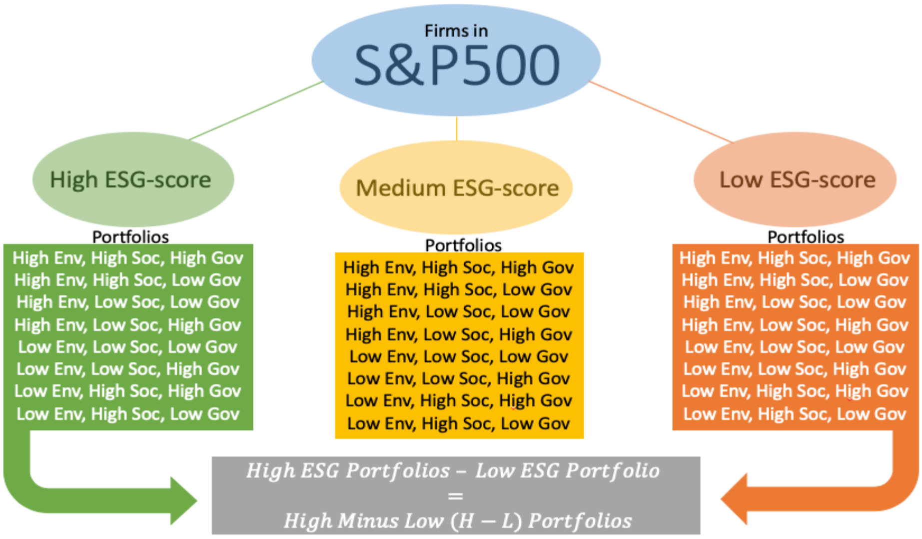
The second approach is a panel data analysis. When investigating the relationship between sustainable and financial performance, it is common to use a pooled OLS or a cross-section approach to find the direct effect of ESG on financial performance. In addition to only focus on the direct effect, we extend the approach to investigate the interacting effect. The ESG score is interacting with financial measures, both accounting- and market-based, and with dummies for the GFC. The interaction design in this setting can be referred to as heterogeneity in response.

4.3 The Construction of the ESG Portfolios

Portfolio construction based on characteristics, such as ESG scores, is a well-established method to investigate the relationship between firms' social and financial performance. Such portfolios tend to generate returns that cannot always be explained by the standard asset pricing models, and thus, can represent, to some extent, empirical anomalies (Hjalmarsson, 2009).

Firstly, the firms are sorted into three portfolios, depending on their overall ESG score, i.e., the initial portfolio sorting. As such, there are three portfolios where the firms are ranked as high, medium, or low ESG. The groups stay the same for one year, and after one year, the portfolios are re-sorted based on the companies score. The method allows a company to change score and portfolio every year, e.g., a company with a high overall ESG score one year may change the score to an overall medium or low score and, thus, be sorted into another portfolio the year after.

Secondly, based on the initial sorting, additional eight portfolios are constructed for all the combinations of high (*h*) and low (*l*) scores of the three pillars. The final sorting generates 24 different ESG portfolios, consisting of all possible combinations of the ESG score and the different pillars. The high and low scores for all the pillars, for all the companies, are also reconstructed every year. It means that a company can change scores from, e.g., a low score in the governance pillar to a high governance score after one year. The design allows changes in the pillars without that the overall ESG score changes.



Note: The figure illustrates the construction of the ESG portfolios. For example, *High* ESG *hhh*-portfolio represents a portfolio with a high overall ESG score and a high environmental, social, and governance score, etcetera.

Figure 3. The General Construction of the ESG Portfolios

One advantage of this method is that it decreases the concern regarding the relative nature of that the scores may be misleading and might even be elusive for an investor. If a portfolio has, e.g., a high overall ESG score, it does not mean that all the assets or firms in the portfolio have a high rank in all the separate pillars. It might instead mean that the average rank is high. With our approach, we capture this dimension. The design of the approach allows the portfolios to have a high overall ESG score, while the pillars may be low-scored, such that it may reflect the market in a better way.

In addition, the paper constructs portfolios with a long-short ESG strategy. Diversification across characteristics is a common approach for portfolio management under risk or uncertainty. For example, Hjalmarsson (2009) investigates long-short portfolio strategies based on several different stock characteristics. The author presents substantial empirical evidence on the benefits of diversifying by characteristics-based long-short strategies. As such, a firms' score is a characteristic that can be of use to construct diversification portfolios. In this context, we are interested in comparing portfolios with a high score to portfolios with a low score.

To analyze the performance of the high and the low ESG portfolios, we employ a *High* minus *Low* (*H-L*) strategy to provide risk-adjustment of the hedge portfolio returns (see figure 3 above). Following Halbritter and Dorfleitner (2015), the purpose of the H-L portfolios is to test if companies with a high score outperform companies with a low score. These portfolios are constructed by subtracting low ESG portfolios from high ESG portfolios. The H-L portfolio implies taking a long position in companies with a high overall score and shorting companies with low scores.

Nonetheless, to still capture if any of the three pillars have more impact on financial performance than the others, we construct the H-L portfolios using the already existing portfolios from the final sorting. For example, the *H-L* ESG *hhh*-portfolio is constructed by subtracting the *Low* ESG *hhh*-portfolio from the *High* ESG *hhh*-portfolio. Thus, there are eight H-L portfolios.

4.4 Portfolio Approach

In line with previous studies, this paper uses a Fama-French model to investigate non-financial criteria on financial performance. Therefore, we interpret the alpha values as previous studies have done, i.e., when alpha is not statistically significant, there are no abnormal returns. Hence, the portfolio follows the market. The multifactor specification is suitable for this study since it will enable us to answer the first research question and test the first three hypotheses. For the second research question and the last hypothesis, we need to do a split sample, such that we only control for the period before, during, and after the financial crisis. According to Lins, Servaes and Tamayo (2017), the GFC in the US occurred for eight months: between August 2008 to March 2009. Moreover, 30 months are included before and after the crisis to see the crisis's progression.

One of this paper's contribution to the empirical field of finance is to extend the FF5 with momentum. Fama and French (2015) had a few arguments about why they did not include momentum into the model. Foremost, their test showed that momentum does not improve the model significantly and that the regression slopes were close to zero. Besides, the most severe problems of asset pricing models concern small stocks, whereas the momentum is more connected to big stocks. Another concern, which later has been studied by Ehsani and Linnainmaa (2019), is that models that do not include momentum cannot say anything about momentum. However, models that do include momentum can only explain momentum.

The reasons to why or why not to one should include momentum seems to be up for debate since many have questioned why the model did not include the momentum factor in the first place, especially since it has widely been used in the previous literature and in-practice by money managers (Blitz, Hanauer, Vidojevic & van Vliet, 2017). Momentum is regarded to be one of the most pervasive asset pricing anomalies – the portfolios that have had the highest returns over the past year will continue to outperform the average return (Jegadeesh & Titman, 1993, 2002).

Our choice to extend the FF5 with the momentum is founded in several reasons. First, to answer the research questions, the alpha values are the indicator that says if a portfolio is earning abnormal returns to the market portfolio. If the sensitivities to the factors, the coefficients, captures all variations in the expected returns, the intercept is zero for all portfolio i. If instead, the intercept is distinguishable from zero, it indicates that the zero-intercept hypothesis does not hold, i.e., the existence of abnormal returns. Hence, the factors are not the main objective of the paper, such that we do not need to worry about the potential effect momentum may have on the other factors. Also, by including momentum, the effect that perhaps otherwise would be left to the constant is now captured. As such, the alpha becomes more accurate. Second, the sample of the paper consists of the largest companies in the US market during a shorter period than what the Fama-French model can handle. Thus, the concerns that momentum would overrun all other factors should be marginal. Lastly, previous research studying ESG and financial performance have, to our knowledge, at most used the CFF. It makes it interesting to use an FF5 with momentum since it is rather unexplored, and many money managers are in practice, including momentum into their evaluations of portfolio performance. Therefore, the paper's asset pricing model is defined as:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{1,i}(R_{M,t} - R_{f,t}) + \beta_{2,i}SMB_t + \beta_{3,i}HML_t + \beta_{4,i}RMW_t + \beta_{5,i}CMA_t + \beta_{6,i}MOM_t + \varepsilon_{i,t} \tag{4.1}$$

The interpretation of the factors is the same as described in subsection 3.2. To check the robustness, several multifactor models are employed. In accordance with earlier studies and the evolvement of the FF5 with momentum, we check our results against FF3, CFF, and FF5. These models are specified in subsection 3.2.

4.4.1 Portfolio Evaluation with the Sharpe Ratio

To evaluate the performance of the ESG portfolios, without the setting of risk-adjustment by the FF5 with momentum, we follow the ESG-Efficient Frontier theory and use the Sharpe Ratio. As argued by Pedersen, Fitzgibbons and Pomorski (2020), one can quantify the benefit of ESG information as a resulting increase in the maximum Sharpe Ratio. In contrast, the cost of ESG preferences can be quantified as a drop in Sharpe Ratio when choosing a portfolio with better ESG characteristics than those of the portfolio with maximum Sharpe Ratio. Since we assume that there is a greater fraction of the ESG-motivated investor, we want to be able to quantify the trade-off faced by these investors, who are willing to sacrifice some of the Sharpe Ratio to improve their portfolio's ESG profile.

The Sharpe Ratio is commonly used to analyze and understand the return of an investment to the investments' risk in portfolio analysis, i.e., it reports the excess return of a portfolio per unit of standard deviation. Subtracting the risk-free rate from the expected return, i.e., the excess return, allows an investor to isolate better the profits associated with the risk. This means that an investor or portfolio manager wants to increase the positive Sharpe Ratio by increasing the returns while decreasing the volatility. Hence, the Sharpe Ratio allows us to evaluate how well the ESG portfolios are performing compared to their risk and, most importantly, to each other.

4.5 Panel Data Approach

The panel data strategy is employed to analyze the impact of the different ESG variables on the stock return. The panel-based procedure will account for the full panel data without making any specific portfolio constructions. This method will, e.g., allow a better study of the dynamics of adjustments, control for individual heterogeneity, and ability to identify and measure the effects that are not visible in the time series data (Baltagi, 2005, p.4-6). Since we want to account for more than the pure effect of the ESG variables on stock return, we construct different interacting variables such that one can see how ESG is interacting with other financially essential controls and how these are affecting the stock returns. The interaction effect occurs when the effect on one variable depends on the value of another variable.

Besides the independent ESG variables, the interacting- and control variables are based on which control variables previous empirical studies have demonstrated to be important in determining financial performance. Previous studies have stated that for investors, the firm's valuation is important, as well as indicators of how the firms perform in order to form an investment decision. In addition, size and risk are such factors that can determine whether an agent will invest in the stock. Thus, the interacting- and control variables of the paper for the panel data analysis are Tobin's Q to explain the valuation of the firms; Return on Assets, Return on Equity, Earnings Per Share and Profit Margin to explain how well the firm is performing; log of Total Assets, and Leverage to capture the size of the firm. The interacting terms are constructed by capturing the effect of the ESG variables and firm valuation, how the firm is performing, and the size. Thus, the ESG variables will be interacting with Q, ROA, and ln TOT A. The first panel data regression model is defined as:

$$R_{i,t} = \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2(ESG_{i,t-1} \times Q_{i,t-1}) + \beta_3(ESG_{i,t-1} \times ROA_{i,t-1}) + \beta_4(ESG_{i,t-1} \times \ln TOT\,A_{i,t-1}) + \beta_5 \mathbf{X}'_{i,t-1} + \gamma_i + \delta_t + \varepsilon_{i,t} \tag{4.2}$$

In equation (4.2), *i* represents the firm ranging from $1, 2, \dots, 353$, and *t* represents time ranging from $1, 2, \dots, 168$. The $ESG_{i,t-1}$ term is representing the ESG variables, i.e., the overall ESG score, the combined (COMB) score, and the three individual pillars' scores (ENV, SOC, and GOV). Hence, there will be three different specifications. $\mathbf{X}'_{i,t-1}$ represents the set of the control variables: ROE, LEV, EPS, and Profit Margin. In addition, Q, ROA, and ln TOT A are also controlled, such that they are included in the vector variable. γ_i represents the firm fixed effects control for time-invariant omitted risk factors. δ_t is the time dummy, which is specified at the annual level. Lastly, $\varepsilon_{i,t}$ is the error term. Since there might be an endogeneity problem with the data, we need to account for this. One method is to lag the independent- and control variables by one period (e.g., Petitjean, 2019; Dyck, Lins, Roth & Wagner, 2019).

One of the research questions in the paper is to see if the result differs during a crisis. To investigate how ESG behaves during crises, we create an interaction term between the ESG variables and: the pre-period of the GFC (30 months before the crisis), the actual crisis-period (eight months), and the post-period of the GFC (30 months after the crisis). The reason why the pre- and post-periods are 30 months is to have enough information to account for any behavior before the economy crashes and when it is recovering. The second panel data regression model is defined as:

$$R_{i,t} = \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2(ESG_{i,t-1} \times PreCrisis_t) + \beta_3(ESG_{i,t-1} \times Crisis_t) + \beta_4(ESG_{i,t-1} \times PostCrisis_t) + \beta_5 \mathbf{X}'_{i,t-1} + \gamma_i + \delta_t + \varepsilon_{i,t} \tag{4.3}$$

Equation (4.3) follows the same structure as (4.2). Here, the difference is that *PreCrisis*, *Crisis*, and *PostCrisis* are dummy variables indicating *one* if the month is during these periods, otherwise *zero*. In the vector of controls, all the listed controls are included.

The last panel data regression model is by combining all of the interacting terms from (4.2) and (4.3) with the vector of controls, as such, the model is defined as:

$$R_{i,t} = \beta_0 + \beta_1 ESG_{i,t-1} + \beta_2(ESG_{i,t-1} \times Q_{i,t-1}) + \beta_3(ESG_{i,t-1} \times ROA_{i,t-1}) + \beta_4(ESG_{i,t-1} \times \ln TOT\,A_{i,t-1}) + \beta_5(ESG_{i,t-1} \times PreCrisis_t) + \beta_6(ESG_{i,t-1} \times Crisis_t) + \beta_7(ESG_{i,t-1} \times PostCrisis_t) + \beta_8 \mathbf{X}'_{i,t-1} + \gamma_i + \delta_t + \varepsilon_{i,t} \tag{4.4}$$

To test the robustness, the paper checks the results against when the models instead are lagged 12 months, i.e., one year. Since the ESG scores are updated yearly, but in different months depending on when the firm started to report the score, we think that the one-year lag may be able to verify our results.

5 Results

This section presents the empirical results from the methodological strategy. The first subsection reports the results from the portfolio analysis, and robustness checks. The second subsection presents the empirical results of the panel data analysis, together with its robustness check.

5.1 Empirical Results from the Portfolio Approach

Before we regress any of the models, the data is tested empirically. We find that the model suffers from heteroscedasticity (see table 15 in Appendix C). We also perform a test for serial correlation where some of the models have problems. Although, this is usually not something one correct when using financial data. If serial correlation would be a potential problem, then it would be possible to predict the financial market, which we know is not true (see test results, and a complete list of the tests employed, in the Online Appendix). Therefore, the only correction of the models is to use robust standard errors clustered on firms for all regressions, including the corresponding robustness checks.

5.1.1 Initial Portfolio Sorting

The results from the initial sorting, i.e., equally sorting the portfolios based on whether the firms have a high-, medium-, or low ESG score, are presented in table 5. Besides, model (4) in the same table displays the results of the long-short strategy. One can see that a high ESG score will turn out with the lowest value on the alpha, i.e., the constant, but the result is not statistically significant such that the portfolio performs as the market. Next, a portfolio with a medium ESG score have a slightly higher coefficient, but it is not statistically significant. Nevertheless, a portfolio with a low ESG score does provide a statistically significant result with the comparably highest abnormal return, about 0.0122 percent, such that it overperform both the *High*, *Medium,* and *H-L* ESG portfolios. Thus, neglecting high ESG for the investment strategy will provide better stock returns than the market. Although one should note that the coefficient is rather small. If an investor instead decides to diversify the portfolio by going long on high ESG and short on low ESG, the result suggests that the portfolio exhibits negative abnormal returns, about 0.0084 percent lower than the market. The result is just about statistically significant. It could be considered as an indication that the hedge portfolio based on the scores may not be the best way to diversify the portfolio. Also, it indicates that higher-rated portfolios are not beneficial in terms of the abnormal return.

Table 5. The FF5 with Momentum for the Initial Portfolio Sorting

Model Variables	(1) High ESG	(2) Medium ESG	(3) Low ESG	(4) H-L ESG
MktRf	1.0189***	1.0614***	1.0331***	-0.0142
	(0.0049)	*(0.0060)*	*(0.0089)*	*(0.0111)*
SMB	-0.0644***	0.0602***	0.1614***	-0.2258***
	(0.0086)	*(0.0110)*	*(0.0152)*	*(0.0175)*
HML	0.0427***	0.0877***	0.1662***	-0.1234***
	(0.0106)	*(0.0150)*	*(0.0166)*	*(0.0194)*
RMW	0.1034***	0.0745***	0.0262	0.0772***
	(0.0121)	*(0.0169)*	*(0.0195)*	*(0.0207)*
CMA	0.1212***	0.1655***	0.0001	0.1211***
	(0.0168)	*(0.0262)*	*(0.0265)*	*(0.0270)*
MOM	-0.0751***	-0.1011***	-0.1107***	0.0355***
	(0.0051)	*(0.0068)*	*(0.0083)*	*(0.0084)*
Constant	0.0038	0.0055	0.0122***	-0.0084*
	(0.0027)	*(0.0038)*	*(0.0044)*	*(0.0046)*
Non-risk-adjusted average return	0.0374	0.0401	0.0453	-0.0079
R^2	0.984	0.973	0.963	0.334
Adjusted R^2	0.984	0.973	0.963	0.333

Note: The dependent variables are the average portfolio return from the initial portfolio sorting. There are 3 522 observations in every model. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Comparing the abnormal returns to non-risk-adjusted returns, one can see that the highest average return is by the *Low* ESG portfolio and negative return by the *H-L* ESG portfolio. Hence, corresponding to how the abnormal returns behave in magnitude.

Regarding the factor loadings of the FF5 with momentum, one can see that there are small differences between the market betas, i.e., the MktRf coefficient. The lowest beta is given by model (1). It indicates that portfolios with high ESG scores are exposed to lower systematic risk, resulting in the lower beta. Although, the beta is only marginally lower than the portfolios in model (2) and (3). The market beta for the *H-L* ESG portfolio is not positive, suggesting that it moves opposite to the market, which also is the intention of the portfolio. However, the coefficient is not statistically significant. When looking at the coefficient for the size factor (SMB), it seems to influence the portfolios' returns differently depending on the score. The portfolio in model (1) is less subjected to the size factor, both when compared to *Medium*- and *Low* ESG portfolio. The HML coefficient also differs depending on the score, where model (3) has a higher coefficient than (1) and (2), suggesting that the lower-rated portfolios have higher B/M risk. Besides, model (4) shows a negative coefficient, suggesting that the H-L strategy has the lowest B/M risk. The factor loading for RMW and CMA are positive for all portfolios but not statistically significant for model (3). The highest coefficients are given by model (1), respectively (2). The coefficient for MOM is negative for model (1) to (3), but not for model (4). It indicates that the portfolios in model (1) to (3) are investing in losing stocks, whereas the H-L strategy is investing in winning stocks.

5.1.2 Final Portfolio Sorting

The regression results from the final portfolio sorting, i.e., extending the sorting of the three initial portfolios based on whether the firms have a high or low E, S, or G score, are presented in table 6. As one can see from the table, when the environmental score is high, the alpha coefficient shows that it is only statistically significant for the low ESG portfolios. In contrast, when the environmental score is low, the low ESG portfolios do not show statistical significance. When a model does not have a statistically significant alpha coefficient, i.e., model (7), (10), and (11), the low ESG portfolios possess the largest coefficient in magnitude. However, there is little evidence that it would deviate from the market performance. Another observation is that the portfolios with a low ESG score are consistently positive, independently from the final sorting. When analyzing the portfolios with a high- and medium overall score, the impact of a high environmental score together with the other pillars does not differ from the market. When the environmental and governance score is low, the medium- and high ESG portfolios, i.e., model (9) and (12), yield a statistically significant and positive alpha coefficient. Thus, the social score does not seem to be as crucial for portfolios with higher ESG score. Moreover, the H-L portfolios yield almost always (seven out of eight models) a negative coefficient for alpha.

In conclusion, one can assume that the environmental score, and to some extent, the governance score, compared to the social score, seems to be of greater importance when constructing the portfolios. One can also see from the results that the highest statistically significant alpha coefficient is given by the *Medium* ESG *lll*-portfolio, i.e., model (9). Besides, the combination of *hll*-, *lll*-, and *lhl*-portfolios, i.e., model (7), (9), and (12), yields consistently positive results independently of the initial sorting.

When it comes to the factor loadings of the regressions, one can see that the market beta varies between 0.8325 and 1.1523 for the *High*-, *Medium*- and *Low* ESG portfolios. Apart from the H-L portfolios, the lowest market beta is for the *High* ESG *lhh*-portfolio. There is not a clear trend for the market betas depending on whether the pillars score is low or high. A higher beta coefficient is more frequent for the medium ESG rated portfolios, where the highest beta coefficient is given by model (12). It weakly indicates that portfolios with medium ESG scores are exposed to a higher systematic risk inherent to the entire market. Yet, the beta is only marginally lower than medium- and low ESG rated portfolios. The beta for the H-L portfolios can be seen as the unsystematic risk or the diversifiable risk. Such that it is always lower than one and sometimes negative. It means that the portfolio will move opposite to the market, in a whole macro setting.

Table 6. The FF5 with Momentum for the Final Portfolios Sorting

Model Variables	(5) hhh High ESG	(5) hhh Medium ESG	(5) hhh Low ESG	(5) hhh H-L ESG	(6) hhl High ESG	(6) hhl Medium ESG	(6) hhl Low ESG	(6) hhl H-L ESG
MktRf	1.0508***	1.0859***	1.0154***	0.0354**	1.0824***	1.0686***	1.0884***	-0.0061
	(0.010)	*(0.019)*	*(0.013)*	*(0.015)*	*(0.010)*	*(0.011)*	*(0.012)*	*(0.015)*
SMB	-0.0751***	0.0795**	0.1585***	-0.2336***	-0.0917***	0.0595***	0.1448***	-0.2365***
	(0.016)	*(0.039)*	*(0.026)*	*(0.030)*	*(0.019)*	*(0.020)*	*(0.022)*	*(0.026)*
HML	-0.0085	-0.1074**	-0.0061	-0.0024	0.0733***	0.0958***	0.0320	0.0412
	(0.022)	*(0.045)*	*(0.029)*	*(0.036)*	*(0.026)*	*(0.023)*	*(0.028)*	*(0.037)*
RMW	0.1232***	-0.0289	0.0884**	0.0347	-0.0184	0.0477*	0.0013	-0.0197
	(0.028)	*(0.072)*	*(0.037)*	*(0.042)*	*(0.030)*	*(0.025)*	*(0.031)*	*(0.040)*
CMA	0.0668**	0.0713	0.1132**	-0.0463	0.0527	0.1353***	-0.0230	0.0757
	(0.033)	*(0.089)*	*(0.046)*	*(0.056)*	*(0.035)*	*(0.034)*	*(0.046)*	*(0.057)*
MOM	0.0060	0.0476*	-0.1208***	0.1268***	-0.1733***	-0.0991***	-0.0924***	-0.0809***
	(0.010)	*(0.028)*	*(0.016)*	*(0.018)*	*(0.014)*	*(0.011)*	*(0.014)*	*(0.019)*
Constant	0.0052	-0.0021	0.0192**	-0.0140	-0.0053	0.0091	0.0123*	-0.0176*
	(0.006)	*(0.018)*	*(0.009)*	*(0.010)*	*(0.007)*	*(0.006)*	*(0.007)*	*(0.009)*
R^2	0.920	0.577	0.857	0.077	0.925	0.930	0.909	0.075
Adjusted R^2	0.920	0.577	0.857	0.076	0.925	0.930	0.909	0.074
Model Variables	(7) hll High ESG	(7) hll Medium ESG	(7) hll Low ESG	(7) hll H-L ESG	(8) hlh High ESG	(8) hlh Medium ESG	(8) hlh Low ESG	(8) hlh H-L ESG
MktRf	1.0851***	1.0848***	1.1294***	-0.0443***	1.0664***	0.9779***	0.9631***	0.1033***
	(0.011)	*(0.011)*	*(0.012)*	*(0.016)*	*(0.025)*	*(0.018)*	*(0.010)*	*(0.027)*
SMB	-0.0598***	0.1245***	0.1584***	-0.2181***	-0.1278***	-0.0580**	0.0956***	-0.2234***
	(0.017)	*(0.021)*	*(0.023)*	*(0.027)*	*(0.035)*	*(0.025)*	*(0.020)*	*(0.042)*
HML	0.0889***	0.1648***	-0.0154	0.1043***	0.0563	0.0245	0.0935***	-0.0372
	(0.022)	*(0.028)*	*(0.027)*	*(0.034)*	*(0.044)*	*(0.029)*	*(0.024)*	*(0.052)*
RMW	-0.0883***	0.0528	0.0525	-0.1408***	0.1769***	0.0838**	0.0557	0.1212**
	(0.028)	*(0.034)*	*(0.040)*	*(0.048)*	*(0.039)*	*(0.035)*	*(0.036)*	*(0.056)*
CMA	-0.0064	0.0026	-0.0512	0.0448	0.0619	0.3304***	0.2266***	-0.1648**
	(0.040)	*(0.043)*	*(0.046)*	*(0.059)*	*(0.057)*	*(0.045)*	*(0.041)*	*(0.075)*
MOM	-0.0545***	-0.1428***	-0.0785***	0.0241	-0.1020***	-0.0384***	-0.0983***	-0.0036
	(0.011)	*(0.017)*	*(0.019)*	*(0.021)*	*(0.017)*	*(0.014)*	*(0.015)*	*(0.022)*
Constant	0.0027	0.0057	0.0149	-0.0121	-0.0034	0.0113	0.0149*	-0.0183
	(0.007)	*(0.008)*	*(0.011)*	*(0.012)*	*(0.008)*	*(0.008)*	*(0.008)*	*(0.011)*
R^2	0.923	0.898	0.824	0.040	0.865	0.866	0.871	0.061
Adjusted R^2	0.922	0.898	0.824	0.038	0.865	0.866	0.870	0.059

Note: The dependent variables are the average portfolio return from the final portfolio sorting. There are 3 522 observations in every model covering the period 2005 to 2018. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 7 continued

Model Variables	(9) lll High ESG	(9) lll Medium ESG	(9) lll Low ESG	(9) lll H-L ESG	(10) llh High ESG	(10) llh Medium ESG	(10) llh Low ESG	(10) llh H-L ESG
MktRf	1.0818***	1.0762***	1.0223***	0.0595***	0.9759***	1.0663***	0.9978***	-0.0219
	(0.013)	*(0.020)*	*(0.013)*	*(0.019)*	*(0.010)*	*(0.011)*	*(0.016)*	*(0.023)*
SMB	0.0116	0.1093***	0.2430***	-0.2315***	-0.0870***	0.0578***	0.2267***	-0.3137***
	(0.023)	*(0.037)*	*(0.023)*	*(0.031)*	*(0.017)*	*(0.018)*	*(0.030)*	*(0.039)*
HML	0.0343	0.1777***	0.0656**	-0.0313	0.0463**	0.0294	0.2746***	-0.2283***
	(0.026)	*(0.050)*	*(0.027)*	*(0.035)*	*(0.021)*	*(0.022)*	*(0.033)*	*(0.044)*
RMW	0.0109	0.0771	0.0772**	-0.0663	0.2158***	0.0680**	0.0227	0.1931***
	(0.034)	*(0.057)*	*(0.033)*	*(0.043)*	*(0.024)*	*(0.028)*	*(0.039)*	*(0.048)*
CMA	0.1161***	-0.0498	0.0349	0.0812	0.2713***	0.2052***	-0.0115	0.2828***
	(0.044)	*(0.067)*	*(0.042)*	*(0.056)*	*(0.033)*	*(0.036)*	*(0.056)*	*(0.071)*
MOM	-0.0569***	-0.1343***	-0.0739***	0.0171	-0.0513***	-0.1038***	-0.1148***	0.0634***
	(0.014)	*(0.023)*	*(0.015)*	*(0.018)*	*(0.010)*	*(0.011)*	*(0.016)*	*(0.021)*
Constant	0.0131	0.0251*	0.0110	0.0021	0.0058	-0.0047	0.0072	-0.0014
	(0.008)	*(0.013)*	*(0.008)*	*(0.011)*	*(0.006)*	*(0.006)*	*(0.009)*	*(0.010)*
R^2	0.876	0.767	0.887	0.039	0.911	0.924	0.870	0.211
Adjusted R^2	0.876	0.767	0.887	0.037	0.911	0.924	0.870	0.209

Model Variables	(11) lhh High ESG	(11) lhh Medium ESG	(11) lhh Low ESG	(11) lhh H-L ESG	(12) lhl High ESG	(12) lhl Medium ESG	(12) lhl Low ESG	(12) lhl H-L ESG
MktRf	0.8325***	1.0152***	1.0373***	-0.2048***	0.9773***	1.1523***	1.0212***	0.0143
	(0.016)	*(0.014)*	*(0.021)*	*(0.019)*	*(0.012)*	*(0.016)*	*(0.027)*	*(0.016)*
SMB	-0.0738***	0.0367	0.1409***	-0.2147***	-0.0259	0.1125***	0.1327***	-0.1216***
	(0.025)	*(0.031)*	*(0.031)*	*(0.033)*	*(0.022)*	*(0.026)*	*(0.048)*	*(0.027)*
HML	0.0595**	0.1658***	0.3590***	-0.2995***	-0.0203	0.1163***	0.5565***	-0.1137***
	(0.028)	*(0.034)*	*(0.037)*	*(0.039)*	*(0.026)*	*(0.040)*	*(0.052)*	*(0.034)*
RMW	0.1842***	0.0486	-0.0281	0.2123***	0.2085***	0.1919***	-0.0636	0.1528***
	(0.033)	*(0.033)*	*(0.035)*	*(0.045)*	*(0.034)*	*(0.038)*	*(0.060)*	*(0.046)*
CMA	0.1673***	0.2617***	0.0261	0.1411**	0.1514***	0.1235*	-0.4429***	-0.0753
	(0.040)	*(0.054)*	*(0.047)*	*(0.056)*	*(0.046)*	*(0.070)*	*(0.081)*	*(0.053)*
MOM	-0.1008***	-0.1088***	-0.1129***	0.0121	-0.0849***	-0.1416***	-0.2046***	0.0134
	(0.014)	*(0.014)*	*(0.018)*	*(0.021)*	*(0.013)*	*(0.020)*	*(0.023)*	*(0.018)*
Constant	-0.0010	0.0053	0.0114	-0.0123	0.0144*	0.0004	0.0028	-0.0004
	(0.008)	*(0.008)*	*(0.009)*	*(0.012)*	*(0.008)*	*(0.009)*	*(0.013)*	*(0.010)*
R^2	0.826	0.884	0.875	0.303	0.867	0.882	0.801	0.053
Adjusted R^2	0.826	0.884	0.874	0.301	0.866	0.881	0.801	0.052

Note: The dependent variables are the average portfolio return from the final portfolio sorting. There are 3 522 observations in every model covering the period 2005 to 2018. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Moreover, the size factor (SMB) for the high and H-L ESG portfolios is negative, except for model (8) when it is close to zero. It indicates that they are less subjected to the size factor than the medium and low ESG portfolio. The HML coefficient also differs depending on the score, where high ESG portfolios have lower coefficients than medium- and low ESG portfolios. It would suggest that the high-rated portfolios have lower B/M risk. The coefficients of the factor loading for RMW are positive when statistically significant, except for model (7). The same is true for CMA, except for model (8) and (12). Lastly, the coefficients for MOM is negative for all models when statistically significant, such that they are investing in losing stocks.

To conclude, the initial and final portfolio sorting results indicate that we cannot reject *H1* and *H3*.

5.1.3 The Abnormal Returns over Time

Since the paper is particularly interested in investigating how ESG affect stock return during a period of crisis, the data is split to reflect the period around the GFC. The split sample covers 30 months before the crisis, eight months representing the GFC period, and 30 months after the crisis. Table 16 in Appendix C displays the alpha values for all the portfolios. As one can see from the table, the result from the overall *Low* ESG portfolio displays similar results as obtained from the full sample - a statistically significant positive abnormal return. Thus, bolster the regression results that a portfolio with a low ESG score generates higher abnormal returns, even in times of crisis. The overall *Medium* ESG portfolio is now statistically significant. The alpha is higher for the split sample, presenting a coefficient of 0.0141, whereas the alpha value for the full sample period is 0.0055. Furthermore, similar to the full sample, the overall *High* ESG portfolio does not displays significance. Notably, The *H-L* ESG portfolios in the split sample does no longer exhibit statistical significant results for any models, indicating that a long-short strategy is not beneficial.

To analyze the changes in abnormal returns, we plot the alphas against time. As one can see in figure 4, the *Low* ESG portfolio is less volatile than the *High* and *Medium* ESG portfolio, and fluctuating around 0.5 percent. Nevertheless, in general, the portfolios seem to have a similar pattern of peaks and troughs. It is reasonable to assume that the general movement reflects the business cycle and the state of the economy. For example, the overall portfolios show a trend of a wider confidence interval during 2008-2009, reflecting the uncertainty during this period. The result from the overall scores shows tendencies towards rejecting *H4*. Hence, the overall ESG score does not seem to impact abnormal returns during times of crisis.

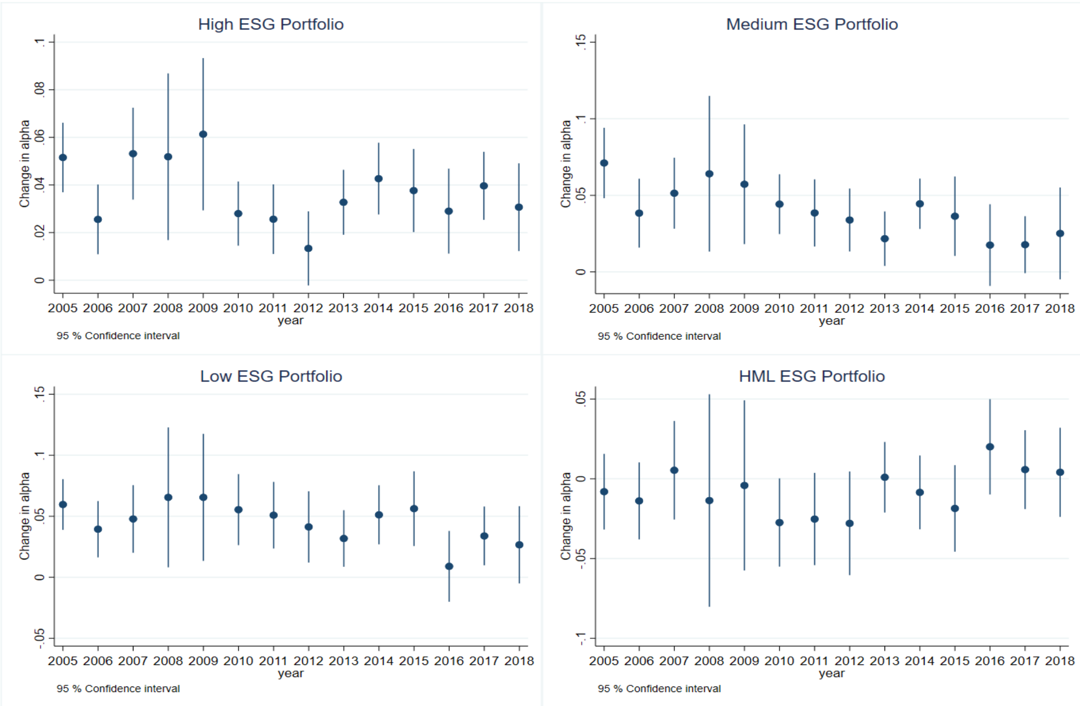


Figure 4. Abnormal Return over Time for the Initial Portfolios

The overall *H-L* ESG portfolio displays for almost every year a negative alpha, indicating that a long-short strategy is not able in "beating the market" during these periods. However, in 2007, at the beginning of the crisis, the overall *H-L* ESG portfolio shows an increasingly positive abnormal return, which instead indicates that the long-short strategy beats the market. Similarly, the long-short strategy appears to generate positive abnormal returns from 2016 to 2018.

The most interesting figures from the final portfolio sorting are presented in figures 7 and 8 in Appendix C (all figures are available in the Online Appendix). As one can see, the final sorted portfolios' results do not present the same apparent movement. For the GFC period, the confidence interval for most portfolios appears to become wider, similar to the result from the initial portfolio sorting. Regardless of the scores for the individual pillars, the portfolios with a lower score presents often the largest abnormal return for the full sample period. Even if the portfolios with a high ESG score still generate positive abnormal returns during the GFC, the portfolios with a low ESG score performs better. It indicates that firms with a lower ESG score outperform those with a higher score; thus, the result shows suggestive support to a certain degree to not reject *H1*.

Even though there is no evident trend for the individual pillars, we notice that the governance pillar shows tendencies towards a better financial performance compared to the other pillars around the GFC. The portfolios that have both an overall high ESG score and a high governance score (the *High* ESG *hhh-, hlh-, llh-, and lhh*-portfolio, see Appendix C) exhibits positive abnormal returns around the crisis. It indicates that the three pillars do not affect financial performance in the same proportion, i.e., another argument for not rejecting *H3*.

An interesting observation is that it appears to be a decrease in abnormal returns from 2015 to 2016 for the *High-*, *Medium-*, and *Low* ESG portfolio. After that, the *High-* and *Low* ESG portfolio increase again, while the *Medium* ESG portfolio does not exhibit the same increase. In contrast, the *H-L* ESG portfolio performs better in 2016 since it displays an increasing change in the abnormal returns from 2015 to 2016, indicating that a long-short strategy is favorable during this period.

5.1.4 Portfolio Performance with Sharpe Ratio

It is beneficial to evaluate further the performance of the portfolios where the multifactor model assumptions are disregarded, which is why we evaluate the portfolios with the annualized Sharpe Ratio, i.e., the stock return compared to the portfolio risk. The results are presented in table 7, where one can see that the highest Sharpe Ratio is shown for the *Low* ESG portfolio, with 0.531. The second-best is provided by the *High* ESG portfolio, followed by the *Medium* ESG portfolio, where the difference is 0.003. The *H-L* ESG portfolio exhibits a negative Sharpe Ratio. Next, the table presents the 32 portfolios from the final sorting. The paper finds that the annualized Sharpe Ratio exhibits the most apparent trend of the low *ESG* portfolios. The pattern of the Sharpe Ratio for those portfolios with initial low ESG scores seems to be dependent on the environmental pillar since the highest Sharpe Ratio is for portfolios with high environmental scores. When comparing if the portfolio has a high or low social pillar, it does not show any particular trend.

Table 7. Annualized Sharpe Ratio for the Portfolios

Model		Annualized Sharpe Ratio			
(1)	High ESG	0.484			
(2)	Medium ESG	0.481			
(3)	Low ESG	0.531			
(4)	H-L ESG	-0.379			
		HIGH ESG	MEDIUM ESG	LOW ESG	H-L ESG
(5)	***hhh***	0.512	0.322	0.617	-0.291
(6)	***hhl***	0.313	0.505	0.526	-0.533
(7)	***hll***	0.415	0.437	0.540	-0.336
(8)	***hlh***	0.372	0.564	0.571	-0.326
(9)	***lll***	0.546	0.603	0.525	0.070
(10)	***llh***	0.527	0.353	0.433	0.011
(11)	***lhh***	0.393	0.445	0.463	-0.318
(12)	***lhl***	0.618	0.406	0.307	0.045
Average:		0.498	0.454	0.462	-0.210

Note: The Sharpe Ratio ranges from red (lowest) to green (highest). The portfolio with highest Sharpe Ratio within their group is marked with black lines above and under.

The high ESG portfolios do not exhibit the same clear trend. The majority of the portfolios with low environmental score display a higher Sharpe Ratio. In contrast, the social and governance score does not suggest affecting the Sharpe Ratio to the same extent. For the medium ESG portfolios, the results from the evaluation instead suggest that by having a high social score in the portfolio will provide the highest Sharpe Ratio. The H-L ESG portfolios show that the environmental pillar is more of a concern than the others. With a low environmental score, the portfolio will get a higher Sharpe Ratio.

By summarizing the evaluation of the portfolios and comparing the average Sharpe Ratio, the best option is a high ESG portfolio. Thus, the results indicate a rejection of *H2*. Although, the differences are quite small. The *lhl*-portfolio gives the highest Sharpe Ratio with an overall high ESG score. Second-best is the *hhh*-portfolio with an overall low ESG score; the difference between these is about 0.001. An interesting observation when comparing these two is that the highest Sharpe Ratio for high ESG will yield the lowest Sharpe Ratio for low ESG. Among the portfolios with a medium ESG score, the highest tangible Sharpe Ratio is given by an *lll*-portfolio. The same goes for the H-L ESG portfolios, where the majority have a negative Sharpe Ratio.

5.1.5 Robustness Checks Employing the FF3, CFF, and FF5

To confirm the robustness of the time series results, we employ the three multifactor models described in subsection 3.2. Table 17 in Appendix C presents the alpha values for the FF3, CFF, and FF5 models. The CFF is the only model that displays a positive and statistically significant abnormal return for the *High*- and *Medium* ESG portfolio. The abnormal returns for the *Low* ESG portfolio are positive and statistically significant for all three robustness models. The FF5 is the only model that shows a statistical significance for the *H-L* ESG portfolio, with a negative abnormal return. As one can see from the table, the CFF displays seven portfolios exhibiting abnormal returns based on the final sorting. The FF3 exhibits six portfolios with abnormal returns, and the FF5 exhibits five portfolios with abnormal returns. The FF5 shows the same significant five portfolios as our model, but the FF5 with momentum exhibits one additional significant portfolio, the *Low* ESG *hhl*-portfolio. In general, and maybe not surprisingly, the H-L portfolios for all the robustness models are the portfolios that exhibit the most negative abnormal returns.

Similar to the FF5 with momentum, the *High* ESG *lhl-*, *Medium* ESG *lll-*, *Low* ESG *hhh-, hlh-,* and *H-L* ESG *hhl*-portfolio display significant abnormal returns in all the robustness models. All these portfolios present positive abnormal returns, except for the *H-L* portfolio. These results bolster and confirm the results of the FF5 with momentum. Even though the results between the FF5 with momentum and the robustness models are very similar, the FF5 model with momentum does not display significant abnormal returns for the *Medium* ESG *hlh*-portfolio. In contrast, both the FF3 and CFF do. On the other hand, the FF5 with momentum and the CFF displays significant positive abnormal returns for the *Low* ESG *hhl*-portfolio, while the FF3 model does not.

5.2 Empirical Results from the Panel Data Approach

Before we start regressing the models, several tests are performed on the panel data to investigate whether any changes need to be made (see table 18 in Appendix C). The test results suggest that it is appropriate with a fixed-effects model, and that there is no problem with multicollinearity, but with heteroscedasticity. Furthermore, some models have a problem with serial correlation and cross-sectional dependence. To correct the problems, we double-cluster the standard error based on firm and year for all models.

The regression results for the ESG- and combined score as independent variables are presented in table 8. Model (1) corresponds to equation (4.2) in subsection 4.5. Model (2) corresponds to equation (4.3), and model (3) corresponds to equation (4.4).

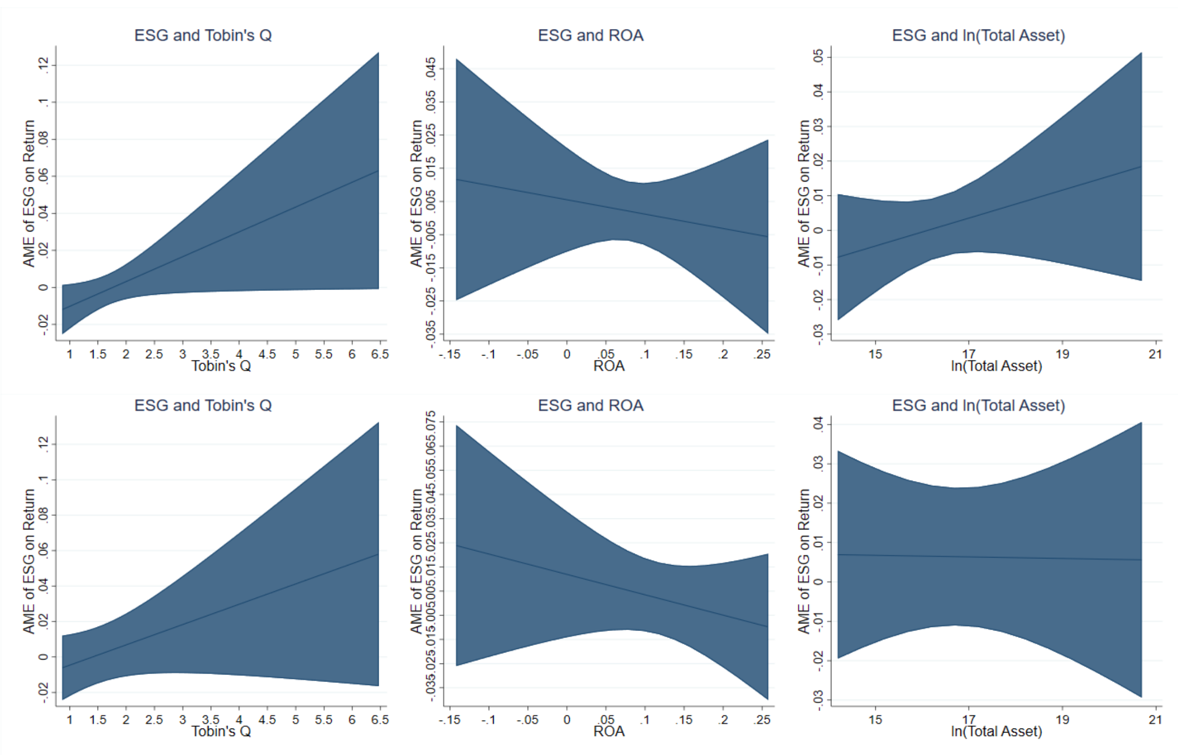
Table 8. The Panel Data Regression with ESG and COMB

Model Variables	(1) Return	(2) Return	(3) Return	(1) Return	(2) Return	(3) Return
ESG or COMB (E/C)-Variable	ESG_{t-1}	ESG_{t-1}	ESG_{t-1}	$COMB_{t-1}$	$COMB_{t-1}$	$COMB_{t-1}$
E/C_{t-1}	-0.089	0.016*	0.002	-0.035	0.006	0.018
	(0.069)	*(0.009)*	*(0.074)*	*(0.065)*	*(0.006)*	*(0.061)*
$E/C_{t-1} \times Q_{t-1}$	0.013*		0.011*	0.008*		0.007
	(0.007)		*(0.007)*	*(0.005)*		*(0.005)*
$E/C_{t-1} \times ROA_{t-1}$	-0.043		-0.084	-0.055		-0.080
	(0.081)		*(0.094)*	*(0.075)*		*(0.087)*
$E/C_{t-1} \times \ln TOT\ A_{t-1}$	0.004		-0.000	0.001		-0.001
	(0.004)		*(0.004)*	*(0.004)*		*(0.004)*
$E/C_{t-1} \times PreCrisis$		-0.023*	-0.023*		-0.027	-0.027
		(0.013)	*(0.013)*		*(0.017)*	*(0.017)*
$E/C_{t-1} \times Crisis$		-0.113***	-0.112***		-0.135***	-0.135***
		(0.022)	*(0.022)*		*(0.028)*	*(0.028)*
$E/C_{t-1} \times PostCrisis$		-0.016	-0.015		-0.007	-0.007
		(0.021)	*(0.022)*		*(0.032)*	*(0.033)*
Constant	34.453***	27.688***	29.603***	29.946***	28.334***	28.005***
	(5.180)	*(6.141)*	*(5.005)*	*(5.286)*	*(6.303)*	*(5.582)*
R^2	0.055	0.069	0.069	0.055	0.068	0.069
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes

Note: The regressions are based on the models specified in subsection 4.5. See the regression output including controls in table 19 in Appendix C. There are 58 098 observations in every model. Double clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. The models are clustered both on firm (=351) and year (=14).

The first three columns present the results for ESG. Model (1) show that the ESG variable by itself has a negative coefficent, but it is not statistically significant. When ESG is interacting with Tobin's Q and Total Asset, it displays a positive effect. In contrast, ROA has a negative effect on stock return. It indicates that there is an indirect effect of ESG on stock returns.

Figure 5 illustrates the *Average Marginal Effect* (AME) of ESG on stock return while interacting with the financial variables, where the first row in the figure corresponds to model (1). When inspecting the first row, one can see that the relationship between ESG and Tobin's Q is positive, but with a threshold. Moreover, the marginal effect of ESG on stock return when considering Total Assets has a positive slope, such that the larger value of total assets a firm has, the larger marginal effect ESG has on stock return. For the interaction with ROA, there is a negative relationship – when ROA reaches 0.12, it switches sign and becomes negative. Note that the only interaction that shows statistical significance is for the lagged ESG and Tobin's Q.



Note: The first row of graphs correspond to model (1). The second row of graphs corresponds to model (3). The Average Marginal Effect (AME) of ESG at values of Tobin's Q, ROA and ln(Total Asset) corresponding to the range between the 1st and 99th percentiles. The solid middle lines are point estimates, and the shaded areas represent 95 percent confidence intervals for the AME.

Figure 5. AME of ESG on Stock Returns

In model (2) in table 8, i.e., when ESG interacts with the crisis periods, the coefficient for ESG displays a positive and statistically significant impact on stock returns. Similarly, when combining model (1) and (2) into model (3), the coefficient for ESG is also positive, but now the it is not statistically significant. When ESG interacts with the dummies before and during the GFC, it shows a statistically significant negative impact on stock returns for both model (2) and (3). Moreover, the interaction between ESG and Tobin's Q is statistically significant positive for both model (1) and (3). In contrast, the interaction between ESG and the other financial measures do not present any statistical significance.

By comparing the first row with the second row in figure 5, i.e., comparing model (1) and (3) with ESG, one can see that nothing changes for Tobin's Q. For ROA, the slope is still negative, but the zero-effect comes at an earlier stage, 0.018. The slope for AME with Total Assets is now almost constant, such that ESG does not have an effect based on whether the firm is small or big. Note here that both ROA and Total Assets are not statistically significant.

If we instead focus on when COMB is the independent variable, one can see in table 8 that the direction of the coefficients goes in the same way as ESG, thus reacting similarly. The COMB coefficient by itself, unlike the ESG variable, is never statistically significant. Furthermore, when COMB is interacting with Tobin's Q, the effect does not persist from model (1) to (3). The coefficient for the interaction between COMB and *Crisis* is 0.022 points larger than the coefficient with ESG. Regarding the AME of COMB on stock returns, figure 9 in Appendix C display almost identical slopes, and confidence intervals, except for Total Assets in model (3). Notably, one can see that the marginal effect of COMB is always smaller than the marginal effect of ESG.

Next, the models are regressed by using the individual pillars as independent variables, and the results are presented in table 9. In model (1), the only pillar that is statistically significant by itself is SOC, where the coefficient is negative. The interaction between ENV and ROA and Total Assets is negative and statistically significant. GOV does not show any statistically significant results for any of the interactions. Regarding the AME of the pillars on stock returns, one can see in figure 10 (see Appendix C) that AME of ENV, SOC, and GOV on stock returns have a positive slope depending on the level of Tobin's Q. When looking at ENV with ROA and Total Assets, it shows a negative slope and opposite for SOC. For GOV, one can see that it has a negative slope with ROA, but a positive slope with Total Assets.

In model (2), the interaction with the crisis periods shows that all of the pillars interacting with *PreCrisis* are statistically significant, where ENV has a positive effect on stock returns. In contrast, SOC and GOV display a negative effect. During the GFC, the coefficient for SOC is the only pillar–

Table 9. The Panel Data Regressions with E, S, and G

Model Variables	(1) Return			(2) Return			(3) Return		
$Pillar_{t-1}$	ENV_{t-1}	SOC_{t-1}	GOV_{t-1}	ENV_{t-1}	SOC_{t-1}	GOV_{t-1}	ENV_{t-1}	SOC_{t-1}	GOV_{t-1}
$Pillar_{t-1}$	0.074	-0.123**	-0.057	-0.002	0.013**	0.005	0.087*	-0.071	-0.044
	(0.048)	*(0.052)*	*(0.052)*	*(0.005)*	*(0.005)*	*(0.005)*	*(0.047)*	*(0.058)*	*(0.061)*
$Pillar_{t-1}$	0.002	0.005	0.008				0.001	0.004	0.008
$\times Q_{t-1}$	*(0.006)*	*(0.004)*	*(0.007)*				*(0.006)*	*(0.005)*	*(0.008)*
$Pillar_{t-1}$	-0.083**	0.101	-0.090				-0.097**	0.085	-0.100
$\times ROA_{t-1}$	*(0.037)*	*(0.066)*	*(0.103)*				*(0.037)*	*(0.065)*	*(0.111)*
$Pillar_{t-1}$	-0.004*	0.007**	0.003				-0.005*	0.004	0.002
$\times \ln TOTA_{t-1}$	*(0.002)*	*(0.003)*	*(0.003)*				*(0.002)*	*(0.003)*	*(0.004)*
$Pillar_{t-1}$				0.023*	-0.036*	-0.014*	0.022*	-0.035*	-0.014*
$\times PreCrisis$				*(0.011)*	*(0.017)*	*(0.007)*	*(0.012)*	*(0.017)*	*(0.007)*
$Pillar_{t-1}$				0.008	-0.095***	-0.027	0.006	-0.093***	-0.026
$\times Crisis$				*(0.021)*	*(0.027)*	*(0.017)*	*(0.021)*	*(0.028)*	*(0.016)*
$Pillar_{t-1}$				0.002	-0.002	-0.018*	-0.000	-0.000	-0.016
$\times PostCrisis$				*(0.008)*	*(0.010)*	*(0.010)*	*(0.008)*	*(0.010)*	*(0.010)*
Constant	35.154***			27.858***			31.062***		
	(5.393)			*(6.202)*			*(5.027)*		
R^2	0.056			0.070			0.070		
Control Variables	Yes			Yes			Yes		

Note: The regressions are based on the models specified in subsection 4. Model (1) to (3) contains all three pillars plus the vector of controls. . See the regression output including controls in table 20 in Appendix C. There are 58 098 observations in every model. Double clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. The models are clustered both on firm (= 351) and year (= 14).

–that shows a statistically significant negative effect, and further, a statistically significant positive coefficient by itself. The GOV pillar displays a statistically significant negative effect on stock returns when the pillar interacts with *PreCrisis* and *PostCrisis*, but not during the *Crisis*. The significance of the interaction between GOV and *PostCrisis* is not displayed in model (3). Hence, there is little support that the pillars would affect stock returns after the crisis.

In model (3), ENV is the only variable that shows a statistically significant direct effect and also in the interaction settings, where both ROA and Total Assets display a negative effect. It indicates that the environmental pillar has a more substantial influence on stock returns than the other two pillars. Before and during GFC, the coefficient for all three pillars are still statistically significant, and the coefficient is almost identical to the coefficients in model (2). Comparing the marginal effect in model (3) with model (1) (see figure 11 in Appendix C), one can see that the AME with Tobin's Q, ROA, and Total Assets does not change, but the confidence intervals are larger.

The control variables for the three models behave in the same way in all regressions, regardless of the independent variable. ROA, ROE, Tobin's Q, and Total Assets show strong significance, where the two former displays a positive, while the latter displays negative coefficients. Notably, the control variables EPS, Profit Margin, and LEV are insignificant in all regressions.

In conclusion, there is little support for rejecting *H1* when analyzing the ESG variable by itself. However, if there is a high Tobin's Q, the stock return will be affected positively by a higher ESG. We can also see that *H3* cannot be rejected since the pillars are affecting the stock return in different proportions. Furthermore, the interaction terms with the crisis periods display a negative coefficient when it is statistically significant. Thus, the panel data analysis suggests a rejection of *H4*.

5.2.1 Robustness Check with One-Year Lag

Table 21 in Appendix C presents the result of the one-year lag regression with ESG and COMB as independent variables. The one-year lagged models confirm most of the results from the original models. However, the ESG variable by itself does not exhibit significance when lagged one year, while the interaction with ROA instead does. Again, ESG interaction with Tobin's Q displays a statistically significant positive effect on returns for both model (1) and model (3). Model (2) and model (3) bolsters the results regarding the interaction between ESG and the *PreCrisis* and *Crisis*. Interestingly, the interaction between ESG and the *PostCrisis* exhibits a significant negative effect on stock returns, indicating that the effects of the crisis might be lagged.

Profit Margin exhibits a significant negative effect when lagged one year; however, the effect is zero. Moreover, ROA does not exhibit significance for model (1) and model (2). Otherwise, it follows that the control variables Tobin's Q, Total Assets, and ROE shows strong statistical significance. The two former displays a negative effect on stock returns, while the latter displays a positive effect. Again, the control variables EPS and LEV are insignificant in all regressions. Similar to the one-year lagged ESG, the one-year lagged COMB variable also displays statistically significant negative coefficients when it interacts with the crisis periods. Besides, the results for Tobin's Q, Total Assets, and ROE, are confirmed. Again, the coefficient for ROA is insignificant, while Profit Margin is significant.

Table 22 in Appendix C displays the result from the one-year lag regression with the pillars as independent variables. As one can see from the table, all statistical significance disappears in model (1) for the E, S, and G, and its interaction variable. For model (2), SOC displays a significant negative effect when interacting with *PreCrisis,* and *PostCrisis* and GOV shows a statistically significant negative effect during the crisis. It indicates that firms with a higher social score before or after the crisis, or with high governance score during the crisis, exhibit a negative effect on stock returns. In model (3), SOC shows a statistically significant negative coefficient before and after the financial crisis, and GOV a negative coefficient during the crisis. For all models, the ROA, EPS, and LEV do not show significant results while Tobin's Q, Total Assets, and Profit Margin does.

6 Analysis and Discussion

In this section, the results are analyzed and discussed, to understand the effect of ESG within and without the portfolio setting. Moreover, the section discusses if the paper's hypotheses holds, which enables us to answer the research questions.

6.1 The Portfolio Analysis

From the initial portfolio sorting, the result suggests that portfolios with lower ESG scores generate statistically significant and positive abnormal returns, whereas higher does not show statistically significant results. The final portfolio sorting presents a similar result – portfolios with lower ESG scores displays most often positive abnormal returns, such that firms with a low ESG score outperform those with higher scores since the portfolios perform better than the market. The results also indicate that a long-short strategy is not a beneficial way to diversify a portfolio if an investor only cares about abnormal returns. In addition, it confirms that higher-scored portfolios are not able to outperfom the market. When the sample is split for the periods around the GFC, we again see how the lower ESG rated portfolios exhibits positive statistically significant abnormal returns. Even though the medium score portfolio exhibits significant positive results in the initial portfolio sorting, it still displays less abnormal returns. Likewise, the changes in alphas also indicate, in general, that lower scores generate higher abnormal returns than portfolios with higher scores. Therefore, the time series analysis cannot reject the first hypothesis.

The results indicate that a strategy of lower ESG scores will maximize the stock returns. Hence, as the framework by Baker et al. (2018) states, having a taste for higher ESG rated securities will come to a cost of lower abnormal returns when compared to portfolios with low scores. A possible explanation for the result is grounded on the increased interest for the ESG, especially after the GFC. Hong and Kacperczyk (2009) explain it as disinvestment to a specific set of securities due to a discriminatory taste. In our case, low ESG portfolios, will experience higher costs of equity generating higher stock returns. It could also be the other way around, i.e., high ESG is experiencing a lower cost of equity. However, the study does not prove that portfolios with higher ESG scores will perform worse than the market, such that it is difficult to make this connection.

Our results are different from, e.g., Bansal, Wu and Yaron (2018), who find that it is beneficial for financial performance to have a high sustainability score. The diverting results from ours might be since they use ESG data from the KLD and focuses on the years 1991 – 2011. Also, our results do neither supports the portfolio approach by Halbritter and Dorfleitner (2015), nor Landi and Sciarelli (2019). They did not find a difference in financial performance when looking at portfolios with a high or low score. Even though Halbritter and Dorfleitner also use data from Refinitiv, the sample period differ, and they do not use an FF5, which could explain why we do not get the same results. Also, Landi and Sciarelli focus on the Italian market. Thus, a smaller and a less diversified market than the US.

Building upon the ESG-Efficient Frontier theoretical framework and the assumption of a greater fraction of type-M investors in the economy, the second hypothesis expects that a higher ESG score yields lower Sharpe Ratio. The assumption holds for the initial portfolio sorting, again, indicating that the long-short strategy is not beneficial if the investor only cares about financial performance since it comes to the cost of a lower Sharpe Ratio to have preferences of nonpecuniary attributes. However, the final sorting alters the result, suggesting higher ESG portfolios are generating a higher Sharpe Ratio. The long-short strategy model (9), (10) and (12) exhibits a small but positive annualized Sharpe Ratio, indicating that a long-short strategy is only beneficial for these specific portfolios. Notably, these portfolios appear to benefit from possessing a low environmental score.

It seems like the final portfolio sorting does indeed captures additional dimensions of how the different scores behave in relation to each other, such that it does only depend on the overall score but also whether the pillar has a low or high score. It is, to some extent, contradicting that high ESG portfolios exhibit a higher Sharpe Ratio on average, while the regression results from the final sorting do not exhibit any significant difference compared to the market, thereby not having abnormal returns like the lower ESG portfolios. A possible explanation is connected to systematic risk. For example, climate change affects all companies regardless of which sector the firm operates in, and thus, provides a systematic risk. Portfolios with higher ESG will, on average, have a higher pillar score, signaling that the portfolios should be better equipped to circumvent the systematic risks. Thus, generating a higher Sharpe Ratio. The results for the low ESG portfolios confirm the argument – having a high score on the environmental pillar will generate a higher Sharpe Ratio. Furthermore, the difference between the Sharpe Ratios is quite small for the initial portfolios, and the final portfolios' differences are even smaller. Nevertheless, the differences are essential since it brings a more in-depth understanding of how ESG and its pillars are affecting stock returns, given the risks of the investment. Therefore, we reject the second hypothesis.

To fully answer the first research question, we also test the third hypothesis, which expects that ESG's pillars do not affect financial performance in the same proportion. In this sense, our portfolio construction approach shows its full capacity by making it more straightforward to analyze the performance of the individual pillars. The results from the final sorting present that the environmental pillar, and to some extent, the governance pillar, seems to be valuable for portfolio construction. The figures illustrating the changes in alpha for all the ESG portfolios indicate that portfolios with a high governance score seem to generate higher abnormal returns than other pillars during a financial crisis. However, this indication is not supported in any of the regressions, regardless of initial or final sorting. Instead, the regression results from the final portfolio sorting highlight how portfolios with a low governance score seem to consistently present positive results independently of the initial sorting. Thus, indicating that companies with low governance score exhibit better financial performance than those with a higher score. It could be the case that it is too costly for companies to have a high governance score, i.e., costly for firms to have a good CSR strategy, or to account for the shareholders' rights. Hence, one could argue that this result signals that the cost of good governance sustainability exceeds the benefits.

Compared to Fisher-Vanden and Thorburn (2011), who find that the environmental pillar has a negative relationship to financial performance, or to Petitjean (2019) who only finds weak evidence of the relationship, our results show a tendency of supporting Al-Tuwaijri, Christensen, and Hughes (2004). They find a positive relationship between a "good" environmental performances and "good" economic performance. The results from the final portfolios' Sharpe Ratio shows that the portfolios with an overall low ESG score seem to be dependent on the environmental pillar since the highest ratios are for the portfolios with high environmental scores. Similarly, the regression results from the final portfolio sorting display that when the environmental pillar is high, the alpha is only statistically significant for the low ESG portfolios. When the environmental score is low, the portfolios with a medium and high score display a statistically significant positive alpha. Hence, if the low or high environmental score is of greater importance is not straightforward. Nonetheless, we can say that the environmental pillar seems to have a distinguishable impact on financial performance, at least for lower ESG-rated portfolios.

All in all, the results show that the pillars have different impacts on stock returns, such that we cannot reject the third hypothesis. If the three pillars had affected stock returns in the same proportion, the only distinguishable difference would have been the overall scores, but the final portfolio sorting changes the results.

To answer the second research question, we get valuable information from the fourth hypothesis that expects that during a financial crisis, there is no significant difference by having stocks in portfolios that have a high or low ESG score. From the initial portfolio sorting, the figures illustrating the changes in alpha does not display any vast differences between portfolios with a high or low score, which at first sight might not be enough for rejecting the hypothesis. However, the split sample presents another story. Again, the portfolios with a low ESG score displays the most positive statistically significant effect on stock returns, resulting in portfolios with a low ESG score generate abnormal returns even in times of crisis. The changes in alphas for the final portfolio sorting does neither support the hypothesis. If it would be the case that it does not matter if a portfolio has a high or low ESG score during the crisis, it should be visible in the final sorting, e.g., by that all the *hhh*-portfolios follow the same pattern during the crisis. As one can see in figure 7 in Appendix C, this is not the case, and thus, it seems like it does matter which score a portfolio has during uncertain periods. Since the final portfolio sorting captures additional dimensions, the study relies on those results. Therefore, we reject the fourth hypothesis.

Another interesting observation from the figures of changes in alphas is that one can see a general drop in the abnormal returns in most of the portfolios from 2015 to 2016, which perhaps reflects the uncertainties on how the Paris Agreement would affect corporations. The presidential election also occurred in 2016, where the candidates had strongly opposite views on the Paris Agreement. In accordance with the EHM, news travels instantaneously, and 2016 was an eventful year for the US, filled with news affecting the markets, which most certainly was reflected in the stock prices. During this period, the *H-L* ESG portfolio presents positive abnormal returns, which continued to stay positive after 2016. Notably, even though we knew that sustainable and responsible investing had increased, one can see that when there is more attention to sustainability, it also performs better in terms of stock returns.

6.2 The Panel Data Analysis

The results from the panel data regressions show that stock returns are affected differently depending on which ESG variable one is analyzing. First, the ESG score does not have a direct effect on stock returns. Nevertheless, through the interacting combinations, one can see that a higher ratio of Tobin's Q will yield a positive effect of ESG on stock returns. It is also confirmed by the robustness check with a one-year lag. The same relation with Tobin's Q is observed when the combined score is the independent variable, as in model (1). It does not persist in model (3) where the interactions with the crisis periods are included. When we instead analyze the ENV, SOC, and GOV as the independent variables, one can see that the environmental pillar works through the interaction with ROA and Total Assets in model (1). These are persisting into model (3), where it also displays a positive effect by itself. The social pillar does possess statistically significant results in model (1) but not in model (3). The governmental pillar does not show a significant effect on stock return. If all the pillars would have shown statistically significant coefficients going in the same direction, then it would have indicated a direct relationship to stock returns, but the results do not display this. Besides, these results do not show robustness with the one-year lag model. Therefore, the panel data analysis does not provide supportive evidence rejecting the first hypothesis.

An interesting result is that the study finds evidence suggesting that the ESG variable has a positive effect on stock return when a firm has a higher ratio of Tobin's Q. In our sample, the average ratio for Tobin's Q is rather high, on about 1.96, suggesting that most of the companies' market value is higher than the replacement value. The zero-effect of ESG on stock return is 1.66, meaning that if a company has a Tobin's Q on 1.66, the marginal effect of ESG on stock return is zero. Above this threshold, the marginal effect of ESG becomes positively meaningful. Thus, the ESG score may work through how the companies are performing such that it may have a significant indirect effect.

There is also weak evidence for a negative effect by the environmental pillar on stock returns through ROA and Total Assets. One can see that if ROA increased, the environmental pillar would affect the stock returns negatively. The same goes if the total assets increase, although the effect is smaller. Besides, in model (3), the environmental pillar has a direct effect on stock returns. It is suggesting that the pillars affect stock returns in a different way, where the environmental pillar is both a positive source for higher stock returns, but also affecting negatively through ROA and Total Assets. This is opposing the results by Petitjean (2019), who did not find a statistically significant result for the environmental aspects. Nonetheless, the indication of a positive relationship between the environmental pillar and economic performance is in line with the results by Alsayegh, Rahman and Homayoun (2020). Moreover, the coefficient for the social pillar is negative and statistically significant in model (1), but loses its significance in model (3). The overall results are somewhat in line with studies by Limkriangkrai, Koh and Durand (2017), and Han, Kim and Yu (2016), signaling that the pillars affect financial performance in different ways. As such, the study cannot reject the third hypothesis.

Analyzing the result for the crisis period and thereby giving more insights for the second research question, we can see that the results would insinuate a rejection of the fourth hypothesis. By the interaction terms with the dummy variables for the crisis, the study finds that there is a negative effect of the ESG, COMB, and SOC variables during the actual period of crisis. These variables are persisting stably from model (2) to (3), i.e., not changing in significance nor magnitude. By interpreting the coefficients, the ESG variable suggests that by taking sustainable actions during the crisis would lessen the stock return by 0.11 percent for every higher level of ESG. The combined score provides an even larger negative coefficient, which might be due to the controversies. Assumedly, the investors that are ESG-motivated or aware know that there have been controversies reported about the firms, e.g., an oil spill or that the company is providing bad working conditions. Hence, the result might thereby reflect the uncertainty created by investors that are not fully aware of the controversies. Among the pillars, the social aspects seem to be the most important ones during the crisis, with a lessening by 0.09 percent of stock returns by every higher score of the pillar.

Regarding the period before the financial crisis, the ESG variable and the pillars are displaying statistically significant coefficients, where the direction is the same as for the actual crisis period. However, the effect is smaller and less significant. Now, one can also see that the environmental pillar is significant, indicating that taking environmental actions are rewarding for the outcomes of higher stock returns, about a 0.02 percent increase. Similarly, the governance pillar is statistically significant but displaying a negative impact on stock returns. The period after the financial crisis does not show significant results, such that ESG considerations are neither rewarding nor degrading financial performance. The reason might depend on investors and corporations only care about stabilizing the negative effects during the crisis or that the new regulations were to be formed during the period to ensure that such crises would not happen again. As mentioned earlier, the financial market was restructured such that the companies got more responsibilities in securing the sustainability of the financial market. With all this in mind, the panel data study suggests that the ESG measures, including the social pillar, have an effect during financial crises, where the social pillar have a distinguishable negative effect. Therefore, we reject the fourth hypothesis.

6.3 Summary of Analysis

To conclude and shortly answer the first research question, the study finds through the portfolio approach that ESG does have an impact on stock return. Low ESG portfolios outperform the market, and hence, also the medium- and high ESG portfolios. The long-short strategy provides negative abnormal returns, implying that going long on high ESG and short on low ESG is not financially beneficial. The results from the final portfolio sorting also show that a high environmental score in a portfolio with an overall low score outperforms those with an overall medium and high score. Furthermore, we find weak evidence that low governmental scores will incentivize higher abnormal returns. The portfolio evaluation with the Sharpe Ratio of the portfolios shows that the overall *Low* ESG portfolio gets the highest Sharpe Ratio. However, the final portfolio alters this result, suggesting that the highest Sharpe Ratio, on average, is given by high ESG scores. It further highlights the multiple dimensions that are left out if only conducting the initial portfolio sorting and not considering the pillars' performance. Thus, the pillars affect stock returns differently.

The panel data study partly supports these results since it does not find evidence for a positive relationship between the ESG variables and stock returns. Nevertheless, this paper finds support for an indirect effect of ESG while interacting with financial variables that measure a company's financial performance. The panel data also support that the environmental pillar has the largest effect on stock return, directly with a positive effect, and indirectly through the interaction with accounting-based measures, with a negative effect.

To answer the second research question, the split sample results support that low ESG portfolios outperform the market and higher ESG portfolios, regardless of whether the pillars have a high or low score. It suggests that low ESG portfolios generate higher abnormal returns during a period of crisis. Similarly, the panel data regressions showed a negative effect of the ESG- and combined score on stock returns during the GFC. The social pillar seems to affect stock returns negatively, whereas the other pillars displayed null effect. Thus, indicating that the pillars have different impacts on stock returns in times of crises.

This would mean that a mean-variance investor would maximize by choosing low-rated ESG portfolios. Thus, not disregarding the non-financial information, but instead, using it to choose securities with lower scores. The non-risk-adjusted return (see table 12 in Appendix B) also shows that the actual return of these portfolios is higher compared to higher-rated ESG portfolios. With that said, this study has not proven that it is a bad investment decision to trade portfolios with higher ESG scores, but that one should not expect abnormal returns. In fact, the Sharpe Ratio for higher ESG-rated portfolios is higher such that there might be more than a value in itself to invest socially responsible.

Furthermore, the results also highlight the environmental aspect, where our results might reflect that companies have started to strategically position themselves to deal with increased sensitivity to the implications of climate change. It is confirmed by the reporting of responsible investing. Climate change stood alone for a fourth of the net value in 2018, being the top criteria for money managers. Assumedly, ESG will continue to have a more substantial effect on investment decisions since the sensitivity of the companies is reflected in the market. One could argue that, in the future, none of the actors are able to disregard ESG, regardless of which type an investor is or in which sector a firm operates.

7 Conclusion

This paper's contribution to the field of empirical finance is first, the portfolio construction. We believe that it is better capable of capturing more dimensions since we both sort on ESG scores, and by the individual pillars. Secondly, the study is able to capture the effect of momentum while employing an FF5. It is widely recognized in the field that rising asset prices or volume will continue to rise, and falling prices to further fall. Therefore, we believe that this model is better equipped to capture the effect of ESG on abnormal returns, while not heavily focusing on the effects of the factors. Thirdly, the framework of the ESG-Efficient Frontier is a reasonably new theory that has not widely been explored empirically. Thus, the paper contributes with empirical data to the framework. Lastly, many of the earlier studies have employed a panel data study, but not while also allowing ESG to interact with measures on financial performance. Hence, this panel data approach is able to investigate beyond the direct effect of ESG on stock returns.

One of the most severe challenges of our time is climate change, and in order to reduce the impact on the planet, more action needs to be taken. Even though our results suggest that a mean-variance investor should invest in portfolios with lower ESG scores, we know that our planet needs sustainable investors, and the uptake in ESG assets must continue to increase. A positive thing in light of this is that our results indicate that an investor who has preferences for ESG should invest in portfolios with high ESG scores since the Sharpe Ratio is, on average, best for portfolios with higher ratings. However, the results from the multifactor model display that a high-ESG oriented investor should not expect abnormal returns. Our study shows that ESG-aware and motivated investors should, in fact, invest in the same portfolios, on the basis of the ESG-Efficient Frontier. Recall that the ESG-aware investor has a trade-off between low risk and high expected return, while the motivated investor's trade-off also includes a high average ESG score. Coincidentally, this is the same portfolio – containing the higher-rated stocks. Thereby, the investment strategy is rather straightforward if the investor would like to be responsible and sustainable.

This study can be complemented by future research to use an alternative measure for ESG. As argued, our findings are related to the ESG measure provided by Refinitiv. Therefore, conducting the same portfolio construction with an alternative rating provider would enhance the insights. Also, it would be interesting to investigate if the results are robust for other periods of crises not caused by the financial sector, e.g., study ESG when the COVID-19 pandemic is over.

References

Al-Tuwaijri, S.A., Christensen, T.E., & Hughes, K. (2004). The Relations Among Environmental Disclosure, Environmental Performance, and Economic Performance: a Simultaneous Equations Approach, *Accounting, Organizations and Society*, vol. 29, no. (5-6), pp. 447-471

Alsayegh, M.F., Rahman, R.A., & Homayoun, S. (2020). Corporate Economic, Environmental, and Social Sustainability Performance Transformation through ESG Disclosure, *Sustainability*, vol. 12, no.9, pp. 1-20

Baker, M.P., Bergstresser, D.B., Serafeim, G., & Wurgler, J.A. (2018). Financing the Response to Climate Change: The Pricing and Ownership of U.S. Green Bonds, *NBER Working Papers* 25194, National Bureau of Economic Research, Inc. Available Online: https://ssrn.com/abstract=3274420 [Accessed 19 April 2020]

Baltagi, B. (2005). *Econometric Analysis of Panel data*. 3rd ed. Chichester: John Wiley & Sons.

Bansal, R., Wu, D., & Yaron, A. (2018). Is Socially Responsible Investing a Luxury Good? Working paper, Duke University, University of Michigan, University of Pennsylvania

Białkowski, J. & Starks, L.T. (2016). SRI Funds: Investor Demand, Exogenous Shocks and ESG Profiles, Working Papers in Economics 16/11, University of Canterbury, Department of Economics and Finance

Blitz, D., Hanauer, M.X., Vidojevic, M., & van Vliet, P. (2017). Five Concerns with the Five-Factor Model, *SSRN Papers*, Available Online: https://ssrn.com/abstract=2862317 [Accessed 5 May 2020]

Bodie, Z., Kane, A., & Marcus, A. (2017). Investments. New York: McGraw-Hill Education

BSR. (2009). ESG in the Mainstream: The Role for Companies and Investors in Environmental, Social, and Governance Integration, Available Online: https://www.bsr.org/reports/BSR%20ESG%20Integration%20Report%20_Sept%202009_final.pdf [Accessed 27 March 2020]

Caplan, L., Griswold, J.S., & Jarvis, W.F. (2013). From SRI to ESG: The Changing World of Responsible Investing. Commonfund Institute, Available Online: https://eric.ed.gov/?id=ED559300 [Accessed 27 March 2020]

Carhart, M. (1997). On Persistence in Mutual Fund Performance. *Journal of Finance,* vol. 52, pp. 57–82

Clark, G.L., Feinger, A., & Viehs, M. (2015). From the Stockholder to the Stakeholder: How Sustainability Can Drive Financial Outperformance, Available Online: https://arabesque.com/research/From_the_stockholder_to_the_stakeholder_web.pdf [Accessed 3 May 2020]

Collin, S. (2009). The Value of Environmental, Social and Governance Factors for Foundation Investments, Available Online: http://www.charitysri.org/documents/Sustainablereturns.pdf [Accessed 20 April 2020]

Cowton, C.J. (1999). Playing by the Rules: Ethical Criteria at an Ethical Investment Fund, *Business Ethics: A European Review*, vol. 8, no. 1, pp.60-69

Dalal, K.K. & Thaker, N. (2019). ESG and Corporate Financial Performance: A Panel Study of Indian Companies, *IUP Journal of Corporate Governance*, vol.18, no. 1, pp.44-59

Davis, K. (1973). The Case for and against Business Assumption of Social Responsibilities, *Academy of Management Journal*, vol. 16, no. 2, pp.312-322

Dyck, A., Lins, K., Roth, L., & Wagner, H. (2019). Do Institutional Investors Drive Corporate Social Responsibility? International Evidence, *Journal of Financial Economics*, vol. 131, no. 3, pp. 693- 714

Ehsani, S. & Linnainmaa, J.T. (2019). Factor Momentum and the Momentum Factor, working paper 25551, *NBER Working Paper Series,* Available Online: http://www.nber.org/w25551 [Accessed 5 May 2020]

Fama, E. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work, *The Journal of Finance*, vol. 25, no.2, pp.383-417

Fama, E. & French, K. (1993). Common Risk Factors in the Returns on Stocks and Bonds, *Journal of Financial Economics*, vol.33, no.1, pp. 3-56

Fama, E. & French, K. (1996). Multifactor Explanations of Asset Pricing Anomalies, *The Journal of Finance*, vol. 51, no. 1, pp.55-84

Fama, E. & French, K. (2015). A five-factor asset pricing model, *Journal of Financial Economics*, vol. 116, no.1, pp.1-22

Fidelity. (2018). ESG an Enduring Legacy of the Financial Crisis, Available Online: https://www.fidelity.com.au/insights/investment-articles/esg-an-enduring-legacy-of-the-financial-crisis/ [Accessed 21 April 2020]

Fisher-Vanden, K. & Thorburn, K.S. (2011). Voluntary Corporate Environmental Initiatives and Shareholder Wealth, *Journal of Environmental Economics and Management*, vol. 62, no. 3, pp. 430-445

Freeman, R.E. (1984). Strategic Management: A Stakeholder Approach, Cambridge: Cambridge University Press

French. (2020). Kenneth R. French - Data Library, Available Online: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.htm [Accessed 20 April 2019].

Friedman, M. (1970). The Social Responsibility of Business is to Increase its Profits, *New York Times Magazine*, 13 September, pp.122–126

Friede, G., Busch, T., & Bassen, A. (2015). ESG and Financial Performance: Aggregated Evidence from more than 2000 Empirical Studies, *Journal of Sustainable Finance & Investment*, vol.5, no.4, pp. 210-233

Galbreath, J. (2013). ESG in Focus: The Australian Evidence, *Journal of Business Ethics*, vol. 118, no.3, pp.529-541

Han, J-J., Kim, H. J., & Yu, J. (2016). Empirical Study on Relationship Between Corporate Social Responsibility and Financial Performance in Korea, *Asian Journal of Sustainability and Social Responsibility*, vol.1, no. 1, pp. 61-76

Halbritter, G. & Dorfleitner, G. (2015). The Wages of Social Responsibility — Where are they? A Critical Review of ESG Investing, *Review of Financial Economics*, Elsevier, vol. 26, no.3, pp. 25-35

Hill, J. (2020). Environmental, Social, and Governance (ESG) Investing: A Balanced Analysis of the Theory and Practice of a Sustainable Portfolio, London: Academic Press

Hjalmarsson, E. (2009). Diversification Across Characteristics. FRB International Finance Discussion Paper No. 986. Available Online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1536765 [Accessed 23 March 2020]

Hvidkjær, S. (2017). ESG Investing: a Literature Review, *Report prepared for Dansif.*

Hong, H. & Kacperczyk, M. (2009). The Price of Sin: The Effect of Social Norms on Markets, *Journal of Financial Economics,* vol. 93, no. 1, pp. 15-36

Jegadeesh, N. & Titman, S. (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency, *Journal of Finance*, vol. 48, no.1, pp. 65–91

Jegadeesh, N. & Titman, S. (2002). Profitability of Momentum Strategies: An Evaluation of Alternative Explanations, *The Journal of Finance*, vol. 56, no. 2, pp.699-720

KPMG. (2018). ESG: A View from the top, Available Online: https://assets.kpmg/content/dam/kpmg/cn/pdf/en/2018/09/esg-a-view-from-the-top.pdf [Accessed 20 April 2020]

Kumar, A.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*, vol. 6, no.4, pp.292-300

Landi, G. & Sciarelli, M. (2019). Towards a More Ethical Market: the Impact of ESG Rating on Corporate Financial Performance, *Social Responsibility Journal*, vol. 15, no. 1, pp. 11-27.

Limkriangkrai, M., Koh, S.K., & Durand, R.B. (2017). Environmental, Social, and Governance (ESG) Profiles, Stock Returns, and Financial Policy: Australian Evidence, *International Review of Finance*, vol. 17, no.3, pp.461-47

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*, vol.72, no.4, pp.1785-1824

Lintner, J. (1965). The Valuation of Risky Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets, *The Review of Economics and Statistics*, vol.47, no.1, pp.13-37

Markowitz, H. (1952). Portfolio Selection, *Journal of Finance*, vol.7, no.1, pp.77-91

Mossin, J. (1966). Equilibrium in a Capital Asset Market, *Econometrica,* vol.34, no.4, pp.768-783

MSCI. (2020). What is ESG? Available Online: https://www.msci.com/what-is-esg [Accessed 26 March 2020]

Pagano, M.S., Sinclair, G., & Yang, T. (2018). Understanding ESG Ratings and ESG Indexes, in: Boubaker, S., Cumming, D., & Nguyen, D.K. Research Handbook of Finance and Sustainability, Cheltenham: Edward Elgar Publishing

Pedersen, L.H., Fitzgibbons, S., & Pomorski, L. (2020). Responsible Investing: The ESG-Efficient Frontier, working paper, NYU Stern School of Business.

Petitjean, M. (2019). Eco-friendly Policies and Financial Performance: Was the Financial Crisis a game changer for large US companies?, *Energy Economics*, Elsevier, vol. 80, pp. 502-511.

Refinitiv. (2020). Environmental, Social and Governance (ESG) Scores from Refinitiv, Available Online: https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/esg-scores-methodology.pdf [Accessed 19 April 2020]

Revelli, C. & Viviani, J-L. (2015). Financial Performance of Socially Responsible Investing (SRI): What Have We Learned? A Meta-analysis, *Business Ethics: A European Review*, vol.24, no.2, pp.158-185

Sahut, J-M. & Pasquini-Descomps, H. (2015). ESG Impact on Market Performance of Firms: International Evidence, *Management International/ International Management/Gestiòn Internacional*, vol. 19, no. 2, pp. 40-63

Sharpe, W.F. (1964). Capital Asset Prices: a Theory of Market Equilibrium Under Conditions of Risk, *Journal of Finance*, vol.19, no.3, pp. 425-442.

Townsend, B. (2017). From SRI to ESG: The Origins of Socially Responsible and Sustainable Investing, Available Online: https://www.bailard.com/wp-content/uploads/2017/06/Socially-Responsible-Investing-History-Bailard-White-Paper-FNL.pdf?pdf=SRI-Investing-History-White-Paper [Accessed 3 March 2020]

UN Global Compact. (2020). Available Online: https://www.unglobalcompact.org/about [Accessed 16 April 2020]

US SIF. (2018). Report on US Sustainable, Responsible and Impact Investing Trends 2018, Available Online: https://www.ussif.org/files/Trends/Trends%202018%20executive%20summary%20FINAL.pdf [Accessed 14 March 2020]

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,* vol. 82, no.2, pp.407-424.

Velte, P. (2017). Does ESG Performance Have an Impact on Financial Performance? Evidence from Germany, *Journal of Global Responsibility,* vol. 8, no.2, pp. 169–178

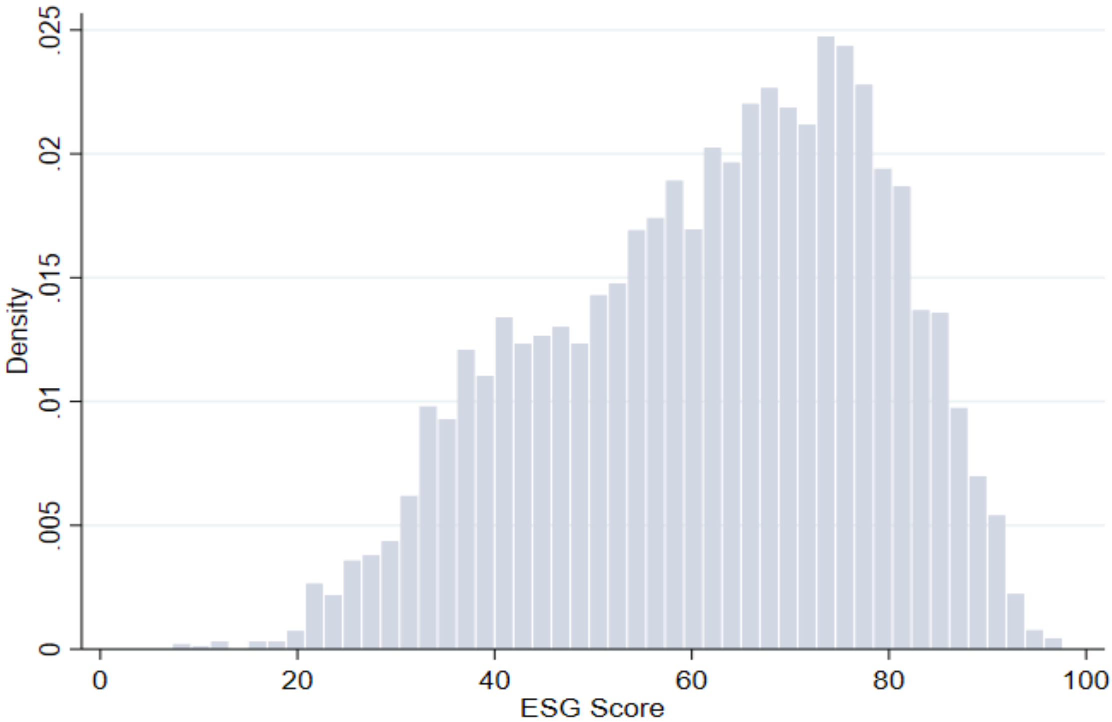
Appendix A

Table 10. The Categories and Themes of ESG

Pillars	Categories	Themes
Environmental	Emission	Emissions Waste Biodiversity Environmental Management Systems
	Innovation	Product Innovation Green Revenues/R&D/Capex
	Resource Use	Water Energy Sustainable Packaging Environmental Supply Chain
Social	Community	Equally important to all industry groups, hence a median weight of 5 is assigned to all industry groups
	Human Rights	Human Rights
	Product Responsibility	Responsible Marketing Product Quality Data Privacy
	Workforce	Diversity and Inclusion Career Development and Training Working Conditions Health and Safety
Governance	CSR Strategy	CSR Strategy ESG Reporting and Transparency
	Management	Structure (Independence, Diversity, Committees) Compensation
	Shareholders	Shareholder Rights Takeover Defenses

Note: The ESG performance of a company is measured across ten themes. These ten themes are based on publicly reported data for close to 9,000 companies globally, where the scores are updated weekly. The ESG score is aggregated based on the ten category weights, which is calculated and dynamically updated based on the Refinitiv magnitude matrix. The ten categories reformulate the three individual ESG pillar scores (the environmental-, social-, and governance scores). For the environmental and social pillars, the weights vary per industry, while the weights remain the same for the governance pillar. These weights are normalized to a percentage ranking, spanning between 0-100.
Source: Refinitiv (2020)

Appendix B



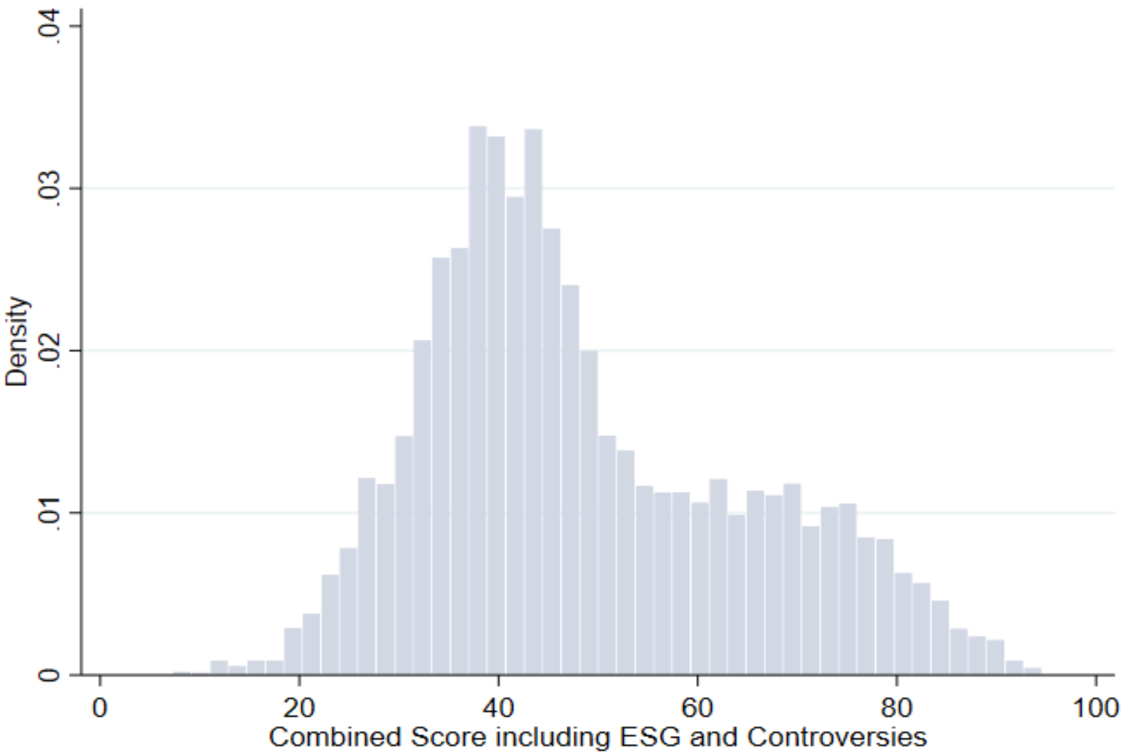


Figure 6. The Distribution of ESG and COMB Score

Table 11. The Construction of the Risk Factors

Sort	Breakpoints	Factors and their components
2 x 3 sorts on *Size* and *B/M*, or *Size* and *OP*, or *Size* and *Inv*	*Size:* NYSE median *B/M*, *OP* and *Inv*: 30th and 70th NYSE percentiles	$SMB_{B/M} = (SH + SN + SL)/3 - (BH + BN + BL)/3$ $SMB_{OP} = (SR + SN + SW)/3 - (BR + BN + BW)/3$ $SMB_{Inv} = (SC + SN + SA)/3 - (BC + BN + BA)/3$ $SMB = (SMB_{B/M} + SMB_{OP} + SMB_{Inv})/3$ $HML = (SH + BH)/2 - (SL + BL)/2$ $RMW = (SR + BR)/2 - (SW + BW)/2$ $CMA = (SC + BC)/2 - (SA + BA)/2$ * $MOM = (SH + BH)/2 - (SL + BL)/2$

Note: Size is sorted as small (S) or big (B). Book-to-Market (*B/M*) is sorted by high (H), neutral (N) or low (L). Operating Profitability (*OP*) is sorted by robust (R), neutral (N) and weak (W). Investment (*Inv*) group is sorted by conservative (C), neutral (N) and aggressive (A). Note also that there is a difference between FF5 and FF3 in terms of how Fama and French construct SMB. In FF5, the SMB is the average of the three SMB-factors when accounting for B/M value, operating profitability, and total asset growth.
Source: Fama & French, 2015*;* * French, 2020

Table 12. The Correlation Table for the FF5 Factors

	MktRf	SMB	HML	RMW	CMA	MOM
MktRf	-					
SMB	0.2621*	-				
	(0.0000)					
HML	0.3314*	0.0901*	-			
	(0.0000)	*(0.0000)*				
RMW	-0.3721*	-0.2870*	-0.3905*	-		
	(0.0000)	*(0.0000)*	*(0.0000)*			
CMA	-0.1764*	-0.0086	0.2745*	-0.0019	-	
	(0.0000)	*(0.6080)*	*(0.0000)*	*(0.9087)*		
MOM	-0.3210*	-0.0820*	-0.5524*	0.2786*	-0.0013	-
	(0.0000)	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.9402)*	

Note: * p-value <0.01

Table 13. Extended Summary Statistics of the Time Series Analysis with All Portfolios

Variable	Obs	Mean	Std. Dev.	Min	Max
MktRf	3 523	0.0323	1.1870	-8.95	11.35
SMB	3 523	0.0024	0.5625	-3.40	4.49
HML	3 523	-0.0014	0.6423	-4.24	4.83
RMW	3 523	0.0118	0.3586	-2.62	1.95
CMA	3 523	0.0007	0.3021	-1.74	1.96
MOM	3 523	0.0095	0.9461	-8.21	7.01
Low ESG score	3 522	0.0453	1.3547	-10.83	10.35
Medium ESG score	3 522	0.0401	1.3252	-10.28	12.24
High ESG score	3 522	0.0374	1.2261	-9.32	12.54
H-L ESG score	3 522	-0.0079	0.3332	-2.76	3.19
Low ESG *hhh*	3 522	0.0526	1.3542	-8.40	10.02
Low ESG *hhl*	3 522	0.0471	1.4210	-11.02	12.42
Low ESG *hll*	3 522	0.0519	1.5247	-10.75	13.74
Low ESG *llh*	3 522	0.0391	1.4309	-10.01	12.16
Low ESG *lhh*	3 522	0.0436	1.4942	-11.48	12.90
Low ESG *hlh*	3 522	0.0462	1.2842	-11.16	10.22
Low ESG *lhl*	3 522	0.0326	1.6901	-15.82	13.24
Medium ESG *hhh*	3 522	0.0338	1.6680	-13.48	13.53
Medium ESG *hhl*	3 522	0.0436	1.3706	-10.41	12.03
Medium ESG *lll*	3 522	0.0598	1.5742	-12.07	14.24
Medium ESG *llh*	3 522	0.0301	1.3507	-11.19	12.10
Medium ESG *lhh*	3 522	0.0380	1.3555	-11.38	11.12
Medium ESG *hlh*	3 522	0.0437	1.2319	-9.57	14.29
Medium ESG *lhl*	3 522	0.0391	1.5252	-11.76	15.06
High ESG *hhh*	3 522	0.0408	1.2662	-9.00	12.32
High ESG *hhl*	3 522	0.0277	1.4068	-10.21	13.24
High ESG *hll*	3 522	0.0362	1.3856	-10.61	12.11
High ESG *lll*	3 522	0.0480	1.3941	-10.45	13.57
High ESG *llh*	3 522	0.0395	1.1902	-8.77	12.87
High ESG *lhh*	3 522	0.0272	1.0969	-8.32	10.27
High ESG *hlh*	3 522	0.0321	1.3668	-10.22	18.57
High ESG *lhl*	3 522	0.0479	1.2316	-9.66	12.99
H-L ESG *hhh*	3 522	-0.0118	0.6433	-3.65	2.98
H-L ESG *hhl*	3 522	-0.0194	0.5776	-3.40	4.88
H-L ESG *hll*	3 522	-0.0157	0.7397	-12.99	3.89
H-L ESG *lll*	3 522	0.0029	0.6510	-5.88	5.35
H-L ESG *llh*	3 522	0.0005	0.7016	-7.14	8.39
H-L ESG *lhh*	3 522	-0.0164	0.8205	-7.48	6.22
H-L ESG *hlh*	3 522	-0.0141	0.6896	-5.29	8.35
H-L ESG *lhl*	3 522	0.0017	0.6193	-3.71	4.47

Note: All the variables are reported in %. The table presents the excess market return (*MktRf*), Small minus Big (*SMB*), High minus Low (*HML*), Robust minus Weak (*RMW*), Conservative minus Aggressive (*CMA*), and Momentum (*MOM*). This table also display the complete summary statistics for the portfolio returns based on both initial and final sorting.

Table 14. The Correlation Table for the Panel Data Analysis

	ESG	ENV	SOC	GOV	COMB	CONTRO	Return	Q	Margin	EPS	ROE	LEV	ROA	ln TOT_A
ESG	-													
ENV	0.8756*	-												
	(0.0000)													
SOC	0.8520*	0.6787*	-											
	(0.0000)	*(0.0000)*												
GOV	0.7245*	0.4252*	0.4069*	-										
	(0.0000)	*(0.0000)*	*(0.0000)*											
COMB	0.5516*	0.4609*	0.4184*	0.4810*	-									
	(0.0000)	*(0.0000)*	*(0.0000)*	*(0.0000)*										
CONTRO	-0.3213*	-0.3138*	-0.3310*	-0.1327*	0.5710*	-								
	(0.0000)	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*									
Return	-0.0066	-0.0030	-0.0051	-0.0088	-0.0041	-0.0025	-							
	(0.1080)	*(0.4678)*	*(0.2186)*	*(0.0325)*	*(0.3252)*	*(0.5456)*								
Q	0.0233*	0.0146*	0.0560*	-0.0147*	0.0522*	0.0503*	0.0549*	-						
	(0.0000)	*(0.0004)*	*(0.0000)*	*(0.0004)*	*(0.0000)*	*(0.0000)*	*(0.0000)*							
Margin	0.0101	0.0083	0.0037	0.0132*	0.0043	-0.0068	-0.0033	0.0001	-					
	(0.0142)	*(0.0444)*	*(0.3746)*	*(0.0013)*	*(0.2955)*	*(0.0967)*	*(0.4292)*	*(0.9865)*						
EPS	0.0413*	0.0303*	0.0288*	0.0437*	-0.0031	-0.0365*	-0.0140*	0.0122*	0.0065	-				
	(0.0000)	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.4560)*	*(0.0000)*	*(0.0007)*	*(0.0031)*	*(0.1157)*					
ROE	0.0223*	0.0273*	0.0089	0.0175*	-0.0522*	-0.0757*	-0.0438*	-0.2327*	-0.0007	-0.0079	-			
	(0.0000)	*(0.0000)*	*(0.0308)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.8660)*	*(0.0567)*				
LEV	0.0095	0.0159*	0.0112*	-0.0058	-0.0660*	-0.0931*	-0.0332*	-0.2075*	-0.0008	-0.0014	0.4548*	-		
	(0.0220)	*(0.0001)*	*(0.0067)*	*(0.1639)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.8404)*	*(0.7420)*	*(0.0000)*			
ROA	0.0661*	0.0613*	0.0927*	0.0049	0.0567*	0.0221*	0.0377*	0.5220*	0.0179*	0.1117*	-0.1335*	-0.1920*	-	
	(0.0000)	*(0.0000)*	*(0.0000)*	*(0.2316)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*		
ln TOT A	0.1815*	0.1919*	0.1681*	0.0768*	-0.0861*	-0.2509*	-0.0091	-0.1828*	0.0025	0.1156*	0.0420*	0.3783*	-0.1484*	-
	(0.0000)	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0287)*	*(0.0000)*	*(0.5360)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	

Note: * p-value <0.01

Appendix C

Table 15. The Breusch-Pagan Test for Heteroscedasticity

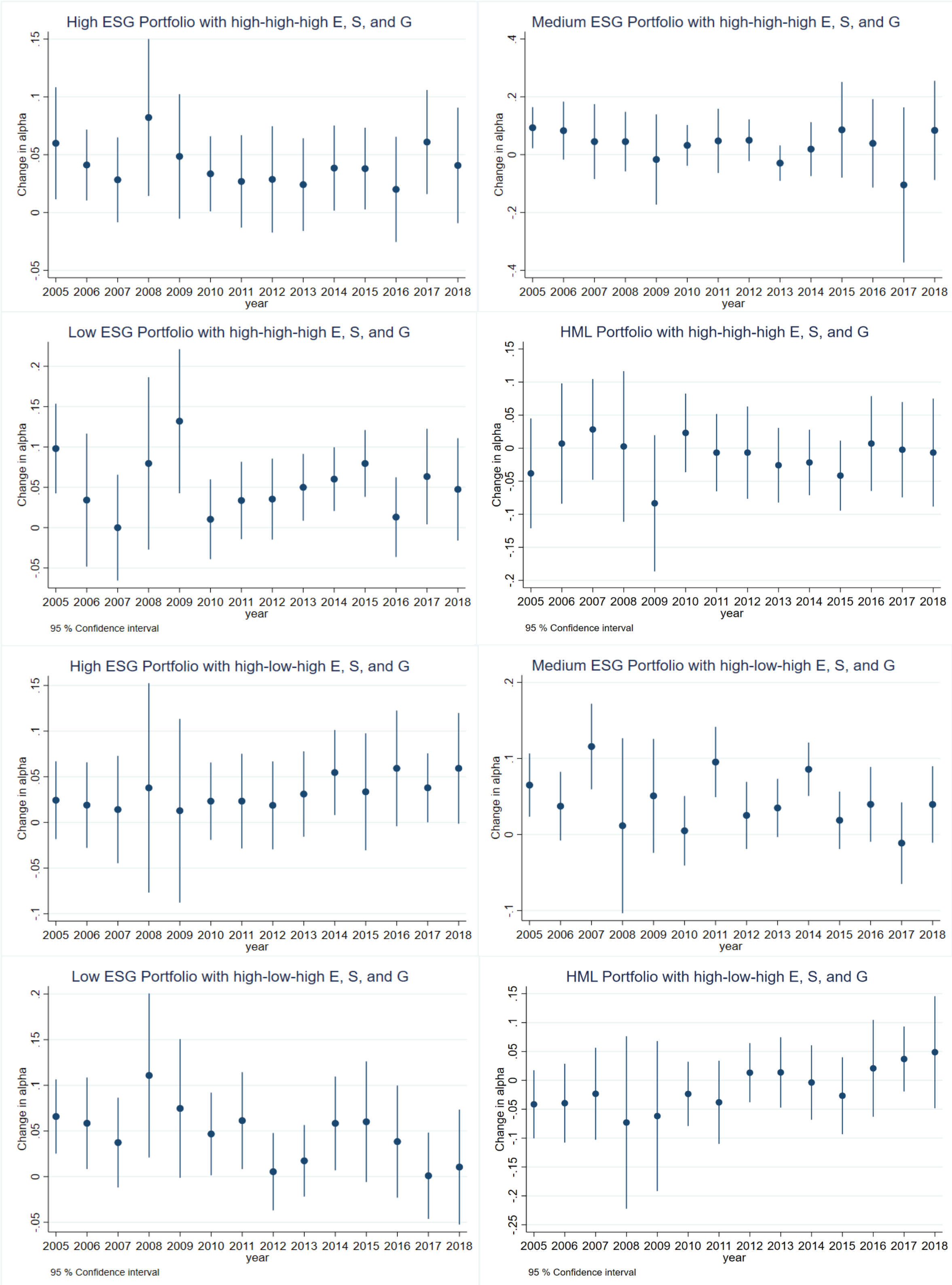
	Model	Overall Score	High Score	Medium Score	Low Score	H-L
(1)	High ESG	201.65***				
(2)	Medium ESG	409.20***				
(3)	Low ESG	258.98***				
(4)	H-L ESG	331.37***				
(5)	*hhh*		200.66***	52.48***	144.95***	70.83***
(6)	*hhl*		337.45***	152.11***	241.29***	393.56***
(7)	*hll*		197.89***	348.40***	105.77***	69.61***
(8)	*hlh*		508.60***	208.77***	125.54***	176.80***
(9)	*lll*		93.99***	316.84***	92.16***	49.69***
(10)	*llh*		101.07***	131.53***	290.43***	429.50***
(11)	*lhh*		160.12***	650.72***	349.11***	151.99***
(12)	*lhl*		190.84***	1065.84***	202.59***	77.41***

Note: The table shows the test scores for the Breusch-Pagan test. The null hypothesis is constant variance. *** p<0.01, ** p<0.05, * p<0.1

Table 16. Split Sample Regressions for the Time Series Analysis

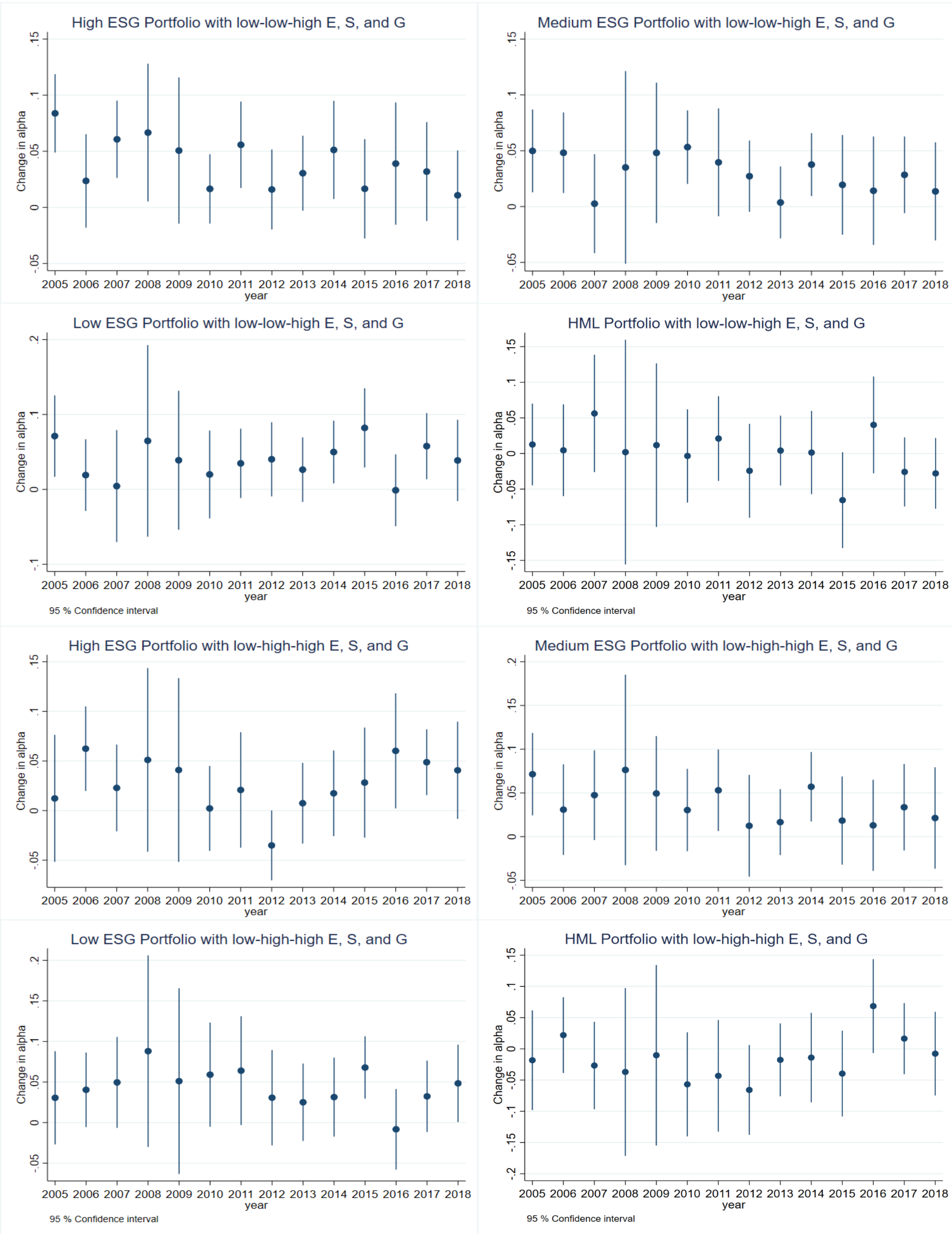
	Model	Overall Score	High Score	Medium Score	Low Score	H-L
(1)	High ESG	0.0080				
		(0.0052)				
(2)	Medium ESG	0.0141**				
		(0.0068)				
(3)	Low ESG	0.0219***				
		(0.0079)				
(4)	H-LESG	-0.0139				
		(0.0087)				
(5)	*hhh*		0.0031	-0.0058	0.0115	-0.0085
			(0.0099)	*(0.0240)*	*(0.0164)*	*(0.0185)*
(6)	*hhl*		0.0105	0.0158	0.0324**	-0.0219
			(0.0135)	*(0.0119)*	*(0.0143)*	*(0.0193)*
(7)	*hll*		0.0114	0.0179	0.0197	-0.0082
			(0.0114)	*(0.0152)*	*(0.0178)*	*(0.0208)*
(8)	*hlh*		-0.0088	0.0238	0.0352***	-0.0439
			(0.0160)	*(0.0146)*	*(0.0135)*	*(0.0212)*
(9)	*lll*		0.0162	0.0337	0.0287**	-0.0125
			(0.0157)	*(0.0225)*	*(0.0144)*	*(0.0201)*
(10)	*llh*		0.0125	0.0022	-0.007	-0.0133
			(0.0102)	*(0.0118)*	*(0.0167)*	*(0.0204)*
(11)	*lhh*		0.0019	0.0154	0.0246	-0.0227
			(0.0140)	*(0.0141)*	*(0.0172)*	*(0.0216)*
(12)	*lhl*		0.0126	0.0090	0.0165	-0.0226
			(0.0137)	*(0.0166)*	*(0.0233)*	*(0.0180)*

Note: The table presents the alphas (constant) for the split sample covering 30 months before the crisis, the period during the GFC (eight months) and 30 months after the crisis. The period is from February 1, 2006 to September 30, 2011. There are 1 428 observations in every model. Robust standard errors clustered on firm in parentheses *** p<0.01, ** p<0.05, * p<0.1. The full regression output is available in the Online Appendix.



Note: The figures illustrate the changes in alpha over time. The two upper rows presents the results from the portfolios with high environmental-, social-, and governance score. The two last rows presents the results from the portfolios with high environmental-, and governance score, and low social score.

Figure 7. The Abnormal Return over Time for the hhh-, and hlh-portfolios



Note: The figures illustrate the changes in alpha over time. The two upper rows present the results from the portfolios with high governance score, and low environmental- and social score. The two last rows present the results from the portfolios with high social-, and governance score, and low environmental score.

Figure 8. The Abnormal Return over Time for the llh-, and lhh-portfolios

Table 17. Robustness Check for the Time Series Analysis

		1. The FF3					*2. The CFF*					*3. The FF5*				
	Model	Overall Score	High Score	Medium Score	Low Score	H-L	Overall Score	High Score	Medium Score	Low Score	H-L	Overall Score	High Score	Medium Score	Low Score	H-L
(1)	High	0.0047					0.0055**					0.0031				
	ESG	*(0.003)*					*(0.003)*					*(0.003)*				
(2)	Medium	0.0059					0.0071*					0.0045				
	ESG	*(0.004)*					*(0.004)*					*(0.004)*				
(3)	Low	0.0113**					0.0127***					0.0111**				
	ESG	*(0.005)*					*(0.004)*					*(0.005)*				
(4)	H-L	-0.0066					-0.0072					-0.0080*				
	ESG	*(0.005)*					*(0.005)*					*(0.005)*				
(5)	*hhh*		0.0072	-0.0016	0.0194**	-0.0121		0.0071	-0.0022	0.0208**	-0.0138		0.0053	-0.0016	0.0179**	-0.0126
			(0.006)	*(0.018)*	*(0.009)*	*(0.011)*		*(0.006)*	*(0.018)*	*(0.009)*	*(0.010)*		*(0.006)*	*(0.018)*	*(0.009)*	*(0.011)*
(6)	*hhl*		-0.0076	0.0090	0.0111	-0.0187**		-0.0055	0.0101	0.0123*	-0.0178*		-0.0071	0.0080	0.0113	-0.0184*
			(0.007)	*(0.006)*	*(0.007)*	*(0.009)*		*(0.007)*	*(0.006)*	*(0.007)*	*(0.009)*		*(0.007)*	*(0.006)*	*(0.007)*	*(0.009)*
(7)	*hll*		0.0008	0.0047	0.0145	-0.0137		0.0015	0.0065	0.0156	-0.0141		0.0022	0.0043	0.0141	-0.0119
			(0.007)	*(0.008)*	*(0.011)*	*(0.012)*		*(0.007)*	*(0.008)*	*(0.011)*	*(0.012)*		*(0.007)*	*(0.008)*	*(0.011)*	*(0.012)*
(8)	*hlh*		-0.0021	0.0131*	0.0152*	-0.0173		-0.0009	0.0133*	0.0163**	-0.0172		-0.0044	0.0109	0.0139*	-0.0183
			(0.009)	*(0.008)*	*(0.008)*	*(0.011)*		*(0.008)*	*(0.008)*	*(0.008)*	*(0.011)*		*(0.009)*	*(0.008)*	*(0.008)*	*(0.011)*
(9)	*lll*		0.0129	0.0243*	0.0114	0.0015		0.0136	0.0261**	0.0124	0.0012		0.0125	0.0237*	0.0103	0.0022
			(0.008)	*(0.013)*	*(0.008)*	*(0.011)*		*(0.008)*	*(0.013)*	*(0.008)*	*(0.011)*		*(0.008)*	*(0.013)*	*(0.008)*	*(0.011)*
(10)	*llh*		0.0091	-0.0043	0.0061	0.0029		0.0095	-0.0032	0.0076	0.0019		0.0053	-0.0058	0.0060	-0.0007
			(0.006)	*(0.007)*	*(0.009)*	*(0.011)*		*(0.006)*	*(0.006)*	*(0.009)*	*(0.011)*		*(0.006)*	*(0.006)*	*(0.009)*	*(0.010)*
(11)	*lhh*		0.0008	0.0055	0.0097	-0.0088		0.0020	0.0035	0.0111	-0.0092		-0.0020	0.0042	0.0102	-0.0122
			(0.008)	*(0.008)*	*(0.009)*	*(0.012)*		*(0.008)*	*(0.009)*	*(0.009)*	*(0.012)*		*(0.008)*	*(0.008)*	*(0.009)*	*(0.012)*
(12)	*lhl*		0.0167**	0.0018	-0.0022	0.0015		0.0177**	0.0035	0.0007	0.0014		0.0136*	-0.0010	0.0007	-0.0003
			(0.008)	*(0.009)*	*(0.013)*	*(0.010)*		*(0.008)*	*(0.009)*	*(0.013)*	*(0.010)*		*(0.008)*	*(0.009)*	*(0.013)*	*(0.010)*

Note: Only alpha is presented. The SMB factor for the FF3 and CFF model is defined as *SMB =1/3 (Small Value + Small Neutral + Small Growth) - 1/3 (Big Value + Big Neutral + Big Growth)*. There are 3 522 observations in every model. Robust standard errors clustered on firm in parentheses *** p<0.01, ** p<0.05, * p<0.1. The full regressions output are available in the Online Appendix.

Table 18. Test Results of the Panel Data Regression Model

Empirical Tests for Fixed Effects, Heteroscedasticity, Serial Correlation, and Cross-section Dependence

Hausman Test

Model	ESG	COMB	ENV/SOC/GOV
(1)	719.83***	741.31***	732.93***
(2)	856.20***	857.23***	856.36***
(3)	858.00***	866.57***	855.10***

Note: H0: Random effects is appropriate

Breusch-Pagan test for heteroscedasticity

Model	ESG	COMB	ENV/SOC/GOV
(1)	39323.22***	39878.48***	40287.52***
(2)	59660.63***	61138.22***	60298.64***
(3)	59664.72***	61126.54***	60516.60***

Note: The table shows the test scores for the Breusch-Pagan test. The null hypothesis is constant variance. *** p<0.01, ** p<0.05, * p<0.1

Wooldridge test for serial correlation

Model	ESG	COMB	ENV/SOC/GOV
Not including crisis	105.03***	104.53***	105.01***
Including crisis	94.76***	94.34***	94.75***

Note: *** p<0.01, ** p<0.05, * p<0.1

Pesaran CD test for cross-sectional dependence

Model	ESG	COMB	ENV/SOC/GOV
(1)	1102.53***	1102.08***	1102.11***
(2)	1054.74***	1056.47***	1053.76***
(3)	1054.88***	1056.52***	1053.75***

Note: *** p<0.01, ** p<0.05, * p<0.1

Variance Inflation Factor (VIF) test

Variable	ESG	*Variable*	COMB	*Variable*	ENV/SOC/GOV
ln TOT A	1.86	Q	1.62	ENV	2.05
Q	1.67	LEV	1.47	SOC	2.02
LEV	1.51	ln TOT A	1.43	ln TOT A	1.89
ROA	1.44	ROA	1.42	Q	1.68
ROE	1.34	ROE	1.32	LEV	1.52
ESG	1.31	EPS	1.04	ROA	1.44
EPS	1.04	COMB	1.01	ROE	1.34
Margin	1.00	Margin	1.00	GOV	1.27
Mean VIF	1.40	Mean VIF	1.29	EPS	1.05
				Margin	1.00
				Mean VIF	1.52

Note: The Hausman test is used to secure that a fixed effects model is more appropriate, and the VIF test is used to verify that there is no problem with multicollinearity. The Breusch-Pagan test suggests that the data have some problem with heteroscedasticity, which needs to be corrected. Besides, the Wooldridge test and the Pesaran CD test suggests that some of the models have problems with serial correlation and cross-sectional dependence.

Table 19. The Panel Data Regression with ESG and COMB including Control Variables

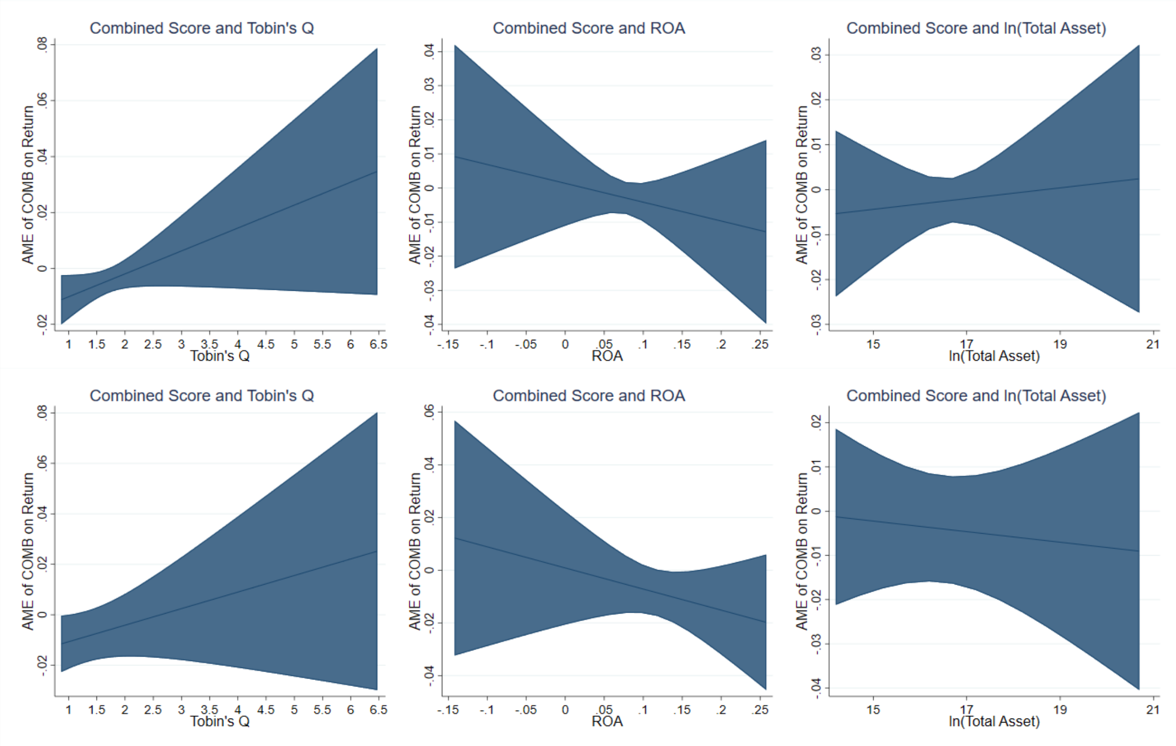
Model Variables	(1) Return	(2) Return	(3) Return	(1) Return	(2) Return	(3) Return
ESG or COMB (E/C)-Variable	ESG_{t-1}	ESG_{t-1}	ESG_{t-1}	$COMB_{t-1}$	$COMB_{t-1}$	$COMB_{t-1}$
E/C_{t-1}	-0.089	0.016*	0.002	-0.035	0.006	0.018
	(0.069)	*(0.009)*	*(0.074)*	*(0.065)*	*(0.006)*	*(0.061)*
$E/C_{t-1} \times Q_{t-1}$	0.013*		0.011*	0.008*		0.007
	(0.007)		*(0.007)*	*(0.005)*		*(0.005)*
$E/C_{t-1} \times ROA_{t-1}$	-0.043		-0.084	-0.055		-0.080
	(0.081)		*(0.094)*	*(0.075)*		*(0.087)*
$E/C_{t-1} \times \ln TOT\ A_{t-1}$	0.004		-0.000	0.001		-0.001
	(0.004)		*(0.004)*	*(0.004)*		*(0.004)*
$E/C_{t-1} \times PreCrisis$		-0.023*	-0.023*		-0.027	-0.027
		(0.013)	*(0.013)*		*(0.017)*	*(0.017)*
$E/C_{t-1} \times Crisis$		-0.113***	-0.112***		-0.135***	-0.135***
		(0.022)	*(0.022)*		*(0.028)*	*(0.028)*
$E/C_{t-1} \times PostCrisis$		-0.016	-0.015		-0.007	-0.007
		(0.021)	*(0.022)*		*(0.032)*	*(0.033)*
Q_{t-1}	-2.072***	-1.315***	-2.025***	-1.647***	-1.325***	-1.648***
	(0.493)	*(0.297)*	*(0.551)*	*(0.343)*	*(0.306)*	*(0.412)*
ROA_{t-1}	11.120**	8.999***	13.671**	11.250**	9.006***	12.619**
	(5.096)	*(2.008)*	*(5.971)*	*(4.403)*	*(2.027)*	*(5.000)*
$\ln TOT\ A_{t-1}$	-1.911***	-1.635***	-1.685***	-1.674***	-1.638***	-1.594***
	(0.292)	*(0.346)*	*(0.282)*	*(0.305)*	*(0.357)*	*(0.322)*
ROE_{t-1}	1.162***	1.368***	1.361***	1.163***	1.354***	1.352***
	(0.315)	*(0.390)*	*(0.388)*	*(0.314)*	*(0.396)*	*(0.394)*
EPS_{t-1}	0.006	0.010	0.012	0.006	0.012	0.013
	(0.030)	*(0.031)*	*(0.031)*	*(0.032)*	*(0.031)*	*(0.032)*
$Margin_{t-1}$	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
LEV_{t-1}	0.118	0.108	0.109	0.118	0.105	0.105
	(0.074)	*(0.080)*	*(0.082)*	*(0.072)*	*(0.081)*	*(0.081)*
Constant	34.453***	27.688***	29.603***	29.946***	28.334***	28.005***
	(5.180)	*(6.141)*	*(5.005)*	*(5.286)*	*(6.303)*	*(5.582)*
R^2	0.055	0.069	0.069	0.055	0.068	0.069

Note: The regressions are based on the models specified in subsection 4.5. The table is split into two where ESG and COMB are independent variables, respectively. There are 58 098 observations in every model. Double clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. The models are clustered both on firm (=351) and year (=14).

Table 20. The Panel Data Regression with E, S, and G including Control Variables

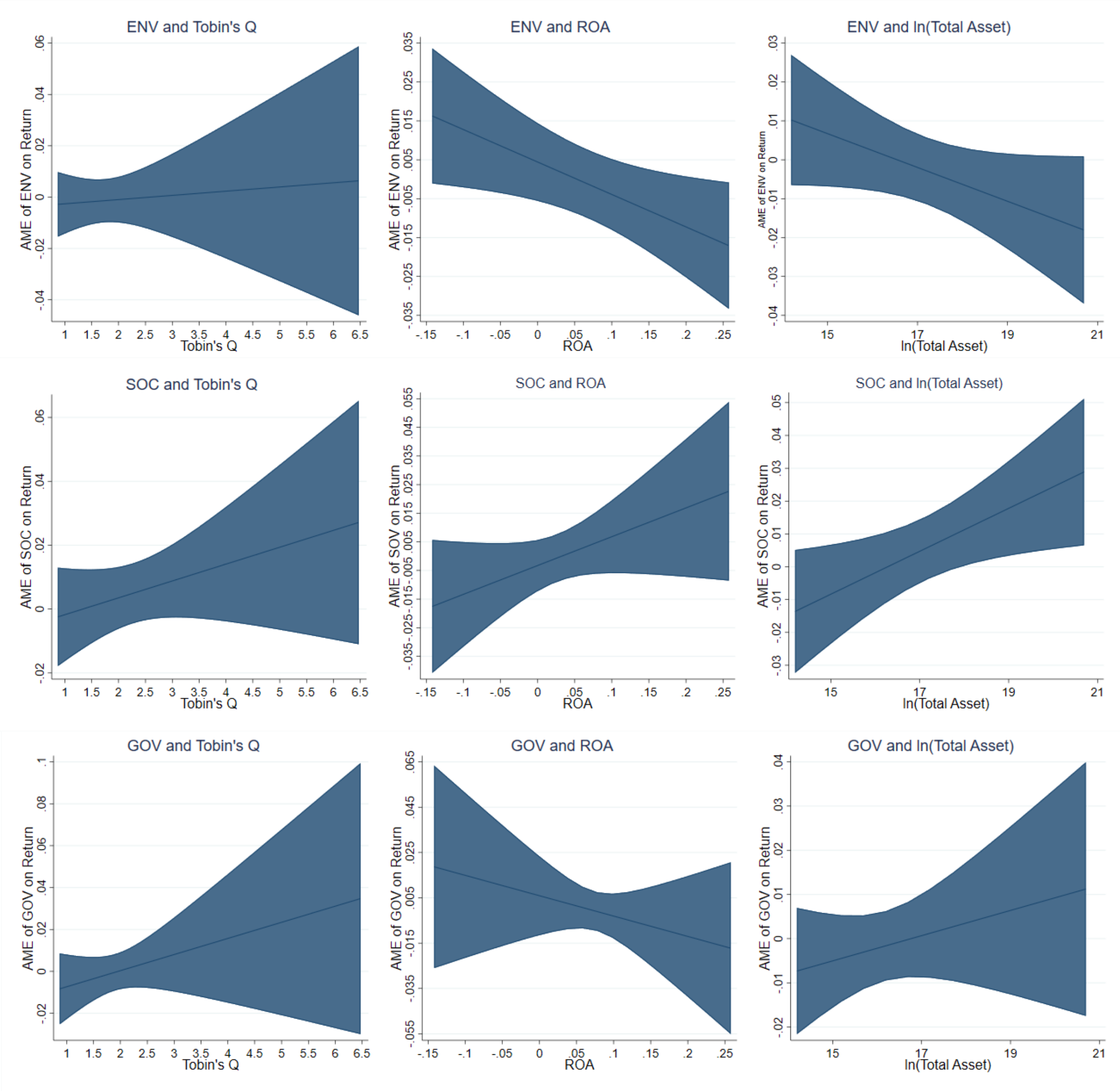
Model / Variables	(1) Return			(2) Return			(3) Return		
$Pillar_{t-1}$	ENV_{t-1}	SOC_{t-1}	GOV_{t-1}	ENV_{t-1}	SOC_{t-1}	GOV_{t-1}	ENV_{t-1}	SOC_{t-1}	GOV_{t-1}
$Pillar_{t-1}$	0.074	-0.123**	-0.057	-0.002	0.013**	0.005	0.087*	-0.071	-0.044
	(0.048)	*(0.052)*	*(0.052)*	*(0.005)*	*(0.005)*	*(0.005)*	*(0.047)*	*(0.058)*	*(0.061)*
$Pillar_{t-1}$	0.002	0.005	0.008				0.001	0.004	0.008
$\times Q_{t-1}$	*(0.006)*	*(0.004)*	*(0.007)*				*(0.006)*	*(0.005)*	*(0.008)*
$Pillar_{t-1}$	-0.083**	0.101	-0.090				-0.097**	0.085	-0.100
$\times ROA_{t-1}$	*(0.037)*	*(0.066)*	*(0.103)*				*(0.037)*	*(0.065)*	*(0.111)*
$Pillar_{t-1}$	-0.004*	0.007**	0.003				-0.005*	0.004	0.002
$\times \ln TOT\ A_{t-1}$	*(0.002)*	*(0.003)*	*(0.003)*				*(0.002)*	*(0.003)*	*(0.004)*
$Pillar_{t-1}$				0.023*	-0.036*	-0.014*	0.022*	-0.035*	-0.014*
$\times PreCrisis$				*(0.011)*	*(0.017)*	*(0.007)*	*(0.012)*	*(0.017)*	*(0.007)*
$Pillar_{t-1}$				0.008	-0.095***	-0.027	0.006	-0.093***	-0.026
$\times Crisis$				*(0.021)*	*(0.027)*	*(0.017)*	*(0.021)*	*(0.028)*	*(0.016)*
$Pillar_{t-1}$				0.002	-0.002	-0.018*	-0.000	-0.000	-0.016
$\times PostCrisis$				*(0.008)*	*(0.010)*	*(0.010)*	*(0.008)*	*(0.010)*	*(0.010)*
Q_{t-1}	-2.149***			-1.320***			-2.108***		
	(0.518)			*(0.298)*			*(0.584)*		
ROA_{t-1}	12.973**			8.965***			15.361**		
	(5.983)			*(1.989)*			*(6.965)*		
$\ln TOT\ A_{t-1}$	-1.950***			-1.650***			-1.773***		
	(0.302)			*(0.350)*			*(0.283)*		
ROE_{t-1}	1.165***			1.373***			1.368***		
	(0.312)			*(0.389)*			*(0.388)*		
EPS_{t-1}	0.005			0.009			0.010		
	(0.032)			*(0.031)*			*(0.033)*		
$Margin_{t-1}$	0.000			0.000			0.000		
	(0.000)			*(0.000)*			*(0.000)*		
LEV_{t-1}	0.118			0.108			0.110		
	(0.074)			*(0.080)*			*(0.083)*		
Constant	35.154***			27.858***			31.062***		
	(5.393)			*(6.202)*			*(5.027)*		
R^2	0.056			0.070			0.070		

Note: The regressions are based on the models specified in section 4. Model (1) to (3) contains all three pillars plus the vector of controls. There are 58 098 observations in every model. Double clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. The models are clustered both on firm (= 351) and year (= 14).



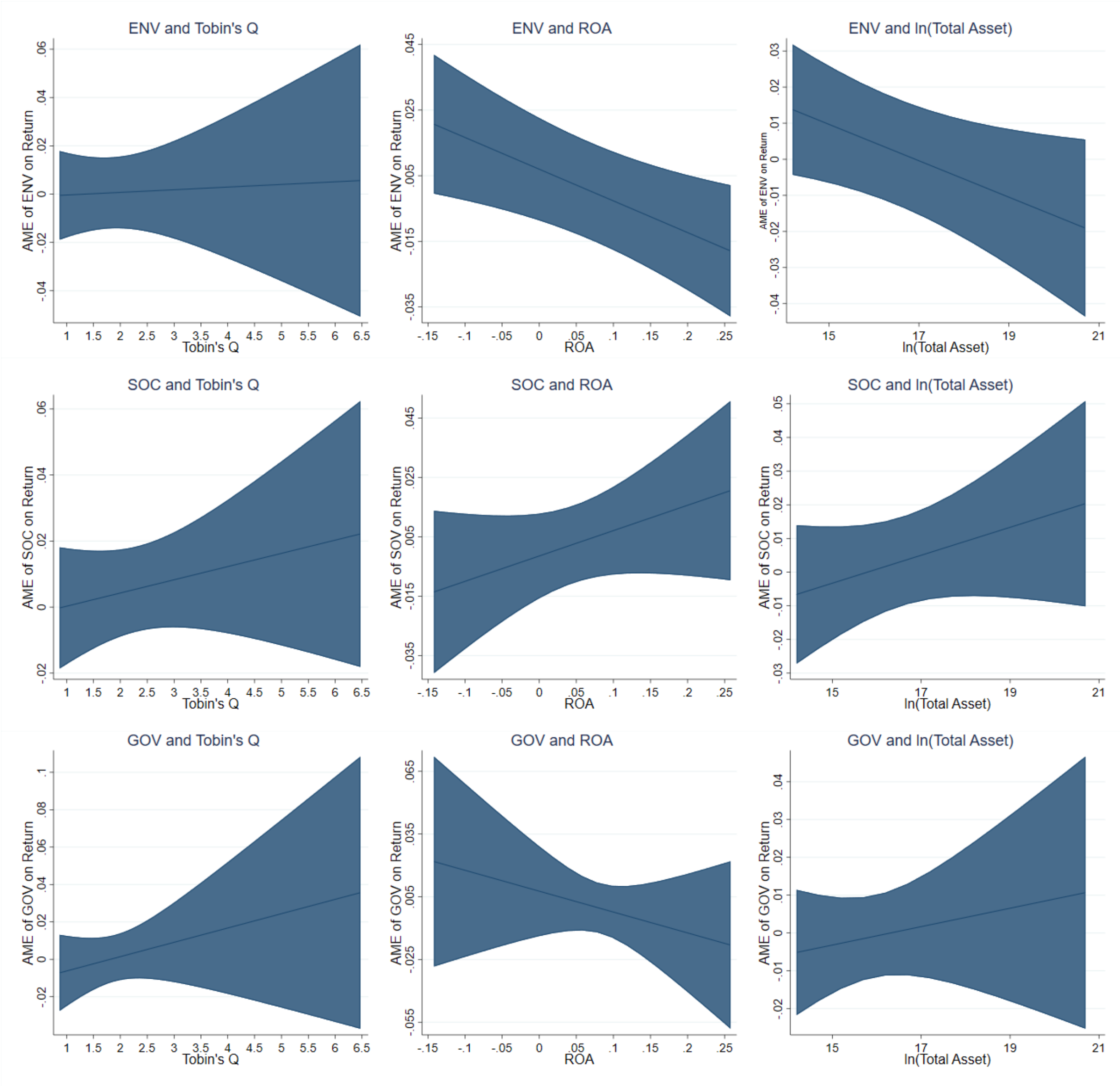
Note: The first row of graphs correspond to model (1). The second row of graphs corresponds to model (3). The Average Marginal Effect (AME) of ESG at values of Tobin's Q, ROA and ln(Total Asset) corresponding to the range between the 1st and 99th percentiles. The solid middle lines are point estimates, and the shaded areas represent 95 percent confidence intervals for the AME.

Figure 9. The AME of COMB on Stock Returns



Note: The graphs correspond to model (1). The Average Marginal Effect (AME) of ESG at values of Tobin's Q, ROA and ln(Total Asset) corresponding to the range between the 1st and 99th percentiles. The solid middle lines are point estimates, and the shaded areas represent 95 percent confidence intervals for the AME.

Figure 10. The AME of E, S, and G on Stock Returns Based on Model (1)



Note: The graphs correspond to model (3). The Average Marginal Effect (AME) of ESG at values of Tobin's Q, ROA and ln(Total Asset) corresponding to the range between the 1st and 99th percentiles. The solid middle lines are point estimates, and the shaded areas represent 95 percent confidence intervals for the AME.

Figure 11. The AME of E, S, and G on Stock Returns Based on Model (3)

Table 21. The One-Year Lag Panel Data Regressions with ESG and COMB

Model Variables	(1) Return	(2) Return	(3) Return	(1) Return	(2) Return	(3) Return
ESG or COMB (E/C)-Variable	ESG_{t-12}	ESG_{t-12}	ESG_{t-12}	$COMB_{t-12}$	$COMB_{t-12}$	$COMB_{t-12}$
E/C_{t-12}	0.002	0.007	0.074	0.065	0.008	0.108*
	(0.057)	*(0.010)*	*(0.073)*	*(0.050)*	*(0.007)*	*(0.051)*
$E/C_{t-12} \times Q_{t-12}$	0.010**		0.008**	0.004		0.002
	(0.004)		*(0.004)*	*(0.004)*		*(0.005)*
$E/C_{t-12} \times ROA_{t-12}$	-0.122*		-0.138**	-0.036		-0.043
	(0.058)		*(0.056)*	*(0.056)*		*(0.050)*
$E/C_{t-12} \times \ln TOT\ A_{t-12}$	-0.001		-0.004	-0.004		-0.006*
	(0.004)		*(0.004)*	*(0.003)*		*(0.003)*
$E/C_{t-12} \times PreCrisis$		-0.031***	-0.032***		-0.037***	-0.037***
		(0.005)	*(0.005)*		*(0.007)*	*(0.006)*
$E/C_{t-12} \times Crisis$		-0.032***	-0.033***		-0.035***	-0.036***
		(0.005)	*(0.005)*		*(0.007)*	*(0.007)*
$E/C_{t-12} \times PostCrisis$		-0.026***	-0.026***		-0.026**	-0.026***
		(0.004)	*(0.004)*		*(0.009)*	*(0.008)*
Q_{t-12}	-0.913***	-0.330*	-0.794***	-0.530*	-0.342**	-0.442
	(0.234)	*(0.158)*	*(0.248)*	*(0.256)*	*(0.156)*	*(0.262)*
ROA_{t-12}	4.248	-2.316	5.368*	-0.946	-2.400	-0.472
	(3.310)	*(1.939)*	*(2.879)*	*(3.582)*	*(1.934)*	*(3.253)*
$\ln TOT\ A_{t-12}$	-1.045**	-1.056***	-0.841**	-0.914***	-1.080***	-0.827**
	(0.344)	*(0.275)*	*(0.367)*	*(0.290)*	*(0.261)*	*(0.297)*
ROE_{t-12}	0.339***	0.358***	0.350***	0.342***	0.347***	0.349***
	(0.083)	*(0.081)*	*(0.089)*	*(0.085)*	*(0.080)*	*(0.091)*
EPS_{t-12}	-0.039	-0.040	-0.038	-0.041	-0.039	-0.038
	(0.033)	*(0.031)*	*(0.030)*	*(0.034)*	*(0.028)*	*(0.032)*
$Margin_{t-12}$	-0.000***	-0.000**	-0.000***	-0.000***	-0.000**	-0.000***
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
LEV_{t-12}	-0.015	-0.016	-0.015	-0.015	-0.017	-0.018
	(0.022)	*(0.022)*	*(0.022)*	*(0.023)*	*(0.024)*	*(0.026)*
Constant	19.958***	18.844***	15.683**	17.147***	19.317***	15.153***
	(5.482)	*(4.473)*	*(5.887)*	*(4.836)*	*(4.413)*	*(4.937)*
R^2	0.050	0.051	0.051	0.050	0.051	0.051

Note: The regressions are based on the models specified in section 4. Model (1) to (3) contains ESG for the first three columns and COMB for the last three columns, plus the vector of controls. There are 54 240 observations in every model. Double clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. The models are clustered both on firm (= 351) and year (= 14).

Table 22. The One-Year Lag Panel Data Regressions with E, S, and G

Model Variables	(1) Return			(2) Return			(3) Return		
$Pillar_{t-1}$	ENV_{t-12}	SOC_{t-12}	GOV_{t-12}	ENV_{t-12}	SOC_{t-12}	GOV_{t-12}	ENV_{t-12}	SOC_{t-12}	GOV_{t-12}
$Pillar_{t-12}$	0.023 *(0.034)*	-0.030 *(0.045)*	-0.006 *(0.062)*	-0.003 *(0.007)*	0.003 *(0.005)*	0.007 *(0.005)*	0.036 *(0.041)*	0.011 *(0.043)*	0.008 *(0.065)*
$Pillar_{t-12} \times Q_{t-12}$	0.004 *(0.004)*	0.004 *(0.004)*	0.002 *(0.005)*				0.004 *(0.004)*	0.002 *(0.005)*	0.001 *(0.005)*
$Pillar_{t-12} \times ROA_{t-12}$	-0.034 *(0.047)*	-0.095 *(0.055)*	0.031 *(0.077)*				-0.047 *(0.048)*	-0.094 *(0.058)*	0.029 *(0.073)*
$Pillar_{t-12} \times \ln TOT\ A_{t-12}$	-0.002 *(0.002)*	0.002 *(0.003)*	0.000 *(0.004)*				-0.003 *(0.002)*	-0.000 *(0.002)*	-0.000 *(0.004)*
$Pillar_{t-12} \times PreCrisis$				-0.003 *(0.005)*	-0.020** *(0.009)*	-0.007 *(0.011)*	-0.006 *(0.005)*	-0.021** *(0.009)*	-0.006 *(0.011)*
$Pillar_{t-12} \times Crisis$				0.001 *(0.008)*	-0.005 *(0.005)*	-0.030*** *(0.006)*	-0.000 *(0.009)*	-0.006 *(0.006)*	-0.028*** *(0.008)*
$Pillar_{t-12} \times PostCrisis$				0.000 *(0.009)*	-0.022*** *(0.006)*	-0.004 *(0.012)*	-0.000 *(0.009)*	-0.022*** *(0.006)*	-0.004 *(0.011)*
Q_{t-12}	-0.901*** *(0.264)*			-0.329* *(0.159)*			-0.775** *(0.266)*		
ROA_{t-12}	2.689 *(4.318)*			-2.300 *(1.935)*			3.628 *(3.979)*		
$\ln TOT\ A_{t-12}$	-1.106*** *(0.325)*			-1.045*** *(0.276)*			-0.912** *(0.339)*		
ROE_{t-12}	0.332*** *(0.087)*			0.354*** *(0.082)*			0.340*** *(0.093)*		
EPS_{t-12}	-0.039 *(0.031)*			-0.040 *(0.030)*			-0.038 *(0.030)*		
$Margin_{t-12}$	-0.000* *(0.000)*			-0.000** *(0.000)*			-0.000** *(0.000)*		
LEV_{t-12}	-0.014 *(0.022)*			-0.016 *(0.022)*			-0.015 *(0.023)*		
Constant	21.012*** *(5.188)*			18.642*** *(4.532)*			16.907*** *(5.472)*		
R^2	0.050			0.051			0.051		

Note: The regressions are based on the models specified in section 4. Model (1) to (3) contains all three pillars plus the vector of controls. There are 54 240 observations in every model. Double clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. The models are clustered both on firm (= 351) and year (= 14).

Online Appendix

To access the listed content in the online appendix, please follow the link:
https://drive.google.com/open?id=1VL976tmM0eeXTOOKmpaUO2mL-phYfYBW

- **Listed Companies in the Study**
- **Test for the Portfolio Approach**
  - Augmented Dickey-Fuller test for stationarity
  - Phillips-Perron test for stationarity
  - Variance Inflation Factor (VIF) test for multicollinearity
  - Breusch-Goodfry test for serial correlation

  Baseline results from the tests: The models reject the null hypothesis stating that it has a unit root by the Augmented Dickey Fuller test and Phillips Perron test. Thus, the variables can be assumed to be stationary, which is a valid assumption for financial data. The VIF test shows that the data does not have problem with multicollinearity
- **Abnormal Returns, Changes in Alphas over Time**
- **Output for the Split Sample Regressions**
- **Robustness Checks for the Portfolio Approach**
  - Regression output for FF3
  - Regression output for CFF
  - Regression output for FF5