LUND UNIVERSITY
School of Economics and Management

# ESG Performance in European Financials, Industrials, and Healthcare Sectors

***-the impact of ESG scores on stock returns***

Department of Economics

January 2024

NEKH02

*Bachelor thesis in Finance*

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## Abstract

The integration of environmental, social, and governance (ESG) considerations in investment decisions is pivotal, driven by global initiatives and a surge in sustainable investment strategies. This study, therefore, examines the relationship between ESG scores and stock returns over the period 2018-2022, focusing on the European financial, healthcare, and industrial sectors to identify potential differences among them. To explain these variations and understand the overall relationship between ESG and stock returns, I employ three theoretical frameworks: the ESG efficient frontier, an equilibrium model, and the stakeholder theory. To discover the relationship, I employ the Fama and French five-factor model on portfolios created based on ESG scores. I then evaluate if portfolios exhibit signs of abnormal returns and if they are performing differently from each other. The results highlight minor indications of sector-specific variations; specifically, I observe no relationship between ESG (including pillars) and stock returns in the financial sector. Meanwhile, I discover a negative relationship for the G-pillar of the healthcare sector and for overall ESG. In relation to the industrial sector, I find a negative relationship with the E-pillar and overall ESG. I also observe that low-scored portfolios generally tend to outperform their high-scored counterparts.

**Keywords:** ESG, Sustainable investing, CSR, Portfolio choice, Sector differences
Socially responsible investing.

**Acknowledgements:** I am grateful for helpful comments and guidance from my supervisor Anders Vilhelmsson throughout the work process.

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## 1. Introduction

Environmental, social, and governance (ESG) is a highly relevant topic in today's society. Consequently, it is becoming increasingly important for companies to demonstrate that they care and have plans for improving their operations for the better. This importance is underscored, for example, by the United Nations' Sustainable Development Goals and the Paris Agreement, as well as by the growth of sustainable investment strategies, wherein investors increasingly consider ESG views in their portfolios. In 2022, as much as $30.3 trillion is invested in sustainable assets worldwide (GSIA, 2022). The United Nations launched the Principles for Responsible Investments (PRI) in 2006, an agreement among institutional investors to incorporate ESG into investment analyses and decisions, and as of March 2023, the number of signatories is 5,391 (PRI, 2023). Research in this area seems to follow similar trends, with numerous new studies related to ESG. In the field of finance, research often explores the relationship between ESG and firms' financial performance, including asset returns. This study aims to further deepen the research in this area by considering the relationship between ESG scores and stock returns. More specifically it will broaden the coverage to, in addition to this, consider a yet less-discovered area by comparing outcomes related to three different sectors: financials, healthcare, and industrials.

Previous research does not fully agree on the overall impact of ESG on stock returns. There are findings where high scores indicate high stock returns (e.g., Dimson et al., 2015; Barko et al., 2018), but other studies suggest no significant patterns (e.g., Humphrey et al., 2012) and even negative relationships are found (e.g., Luo, 2022). Most studies, however, agree that a good ESG performance can enhance a firm's financial performance (Friede et al., 2015), but the conclusions on how this is reflected in stock prices differ. Moreover, there are studies covering the pillars E, S and, G separately (e.g., Bolton et al., 2021) and more often than not, they conclude that there are differences among their effects on stock returns. This aspect is also relevant to consider in relation to specific sectors, where a certain pillar can be more important for one of them. For example, the social pillar has historically been a priority of the healthcare sector due to its business operations. The environmental pillar is highly relevant in the industrial sector, mainly due to the emissions of carbon dioxide ($CO_2$). The financial sector needs to be considered both in relation to its own performance and in its decisions regarding investments and lending. A study by PRI on ESG integration finds that governance is the ESG factor most investors integrate into their investment process (PRI, 2022). My study will further contribute

to the existing research by examining the separate effects of E, S, and G on stock returns in the three sectors.

It can be challenging to handle the ESG metric and its related measures in research due to uncertainties in exact definitions. ESG can be briefly described as a way to assess firms' performance on various ethical and sustainability issues, where the pillars delve deeper into their specific areas. The Environment (E) pillar, for instance, explores aspects such as energy use, climate change, carbon dioxide emissions, biodiversity, water use, and deforestation. The Social (S) pillar encompasses health and safety, working conditions, diversity and inclusion, human rights etc. The Governance (G) pillar deals with ethical standards, board diversity and governance, stakeholder engagement and shareholder rights. Closely related is Corporate Social Responsibility (CSR), which is mentioned in many papers alongside ESG and is sometimes even used synonymously. CSR can be succinctly defined as a business approach in which companies voluntarily integrate social and environmental concerns into their operations and interactions with stakeholders. I mainly use the ESG measure in this study but need to incorporate the CSR to clarify sector differences.

Furthermore, I utilize two recently developed models for the purpose of better understanding the relationship between ESG and stock prices: the ESG efficient frontier by Pedersen et al. (2021) and an equilibrium model by Pástor et al. (2021). The more challenging aspect is finding a theory that describes why differences can be expected among industries related to ESG and returns. This area, as mentioned, is less considered in established research. The Stakeholder theory takes a step in this direction by describing the relationship between companies and their different stakeholders. By considering this perspective among industries, one can conclude that there are differences in the kind of stakeholders they have and what these stakeholders expect and care most about. This aspect, along with a CSR perspective and the ESG-stock price models, leads to hypotheses suggesting that portfolios with a higher ESG score will exhibit lower expected returns than their lower-rated counterparts, and also have a lower Sharpe ratio than them. More sector-specific hypotheses propose different outcomes for the ESG pillars among the sectors. Briefly, the industrial sector is expected to have a stronger outcome related to the E-pillar, while the healthcare sector is supposed to have it for the S pillar and, in turn, have less effect on the E-pillar. The financial sector is expected to have homogenous outcomes among the pillars.

The methodology I employ to test my hypotheses is a common method used in research to discover abnormal returns. It is based on Fama and French (1993, 2015) factor models, where the obtained constant in the regressions, called Jensen's alpha, explains if there is a sign of abnormal return for the portfolio tested as the dependent variable. The portfolios I test are created based on LSEG (formerly Refinitiv) ESG scores and weighted 30-40-30, i.e., the 30% highest rating in the first portfolio, and so forth. All portfolios are equally weighted, and high-minus low portfolios are created to compare the outcomes of the highest and lowest scored ESG portfolios. I have decided to limit the study to cover the three sectors in the European area during the time-period 2018-2022. Research has discovered continental differences, and industries differ among them, so for the objective of this study, companies in one continent make the industry comparison better. A longer period could be motivated, although the number of companies having a rating drops when going too far back in time. I therefore decide to consider the newest period possible where the data is relatively comprehensive.

The obtained results indicate that there are some differences among the three sectors, although all abnormal returns are relatively small. Specifically, I observe no relationship between ESG (including pillars) and stock returns in the financial sector. Meanwhile, I discover a negative relationship for the G-pillar of the healthcare sector and for overall ESG. In relation to the industrial sector, I find a negative relationship with the E-pillar and overall ESG. Some of these findings align with my hypotheses, while others do not. Moreover, when analyzing the Sharpe ratios of the portfolios, I realize that the results almost confirm my hypothesis, with an exception related to the E-pillar of the financial sector, showing the opposite relationship (i.e., high-rated portfolios having a higher Sharpe ratio). My findings indicate that this research area is worth exploring further.

This paper contributes to the literature on ESG versus stock performance, where several studies have been conducted (e.g., Albuquerque, 2020; Shanaev and Ghimire, 2022; Pástor et al., 2022). Additionally, it offers a more sector-based view, which hopefully will help clarify that aspect further. The remainder of this paper is organized as follows. Section 2 presents the theoretical framework, including the two models describing the relationship between ESG and stock returns, and the stakeholder-CSR perspective. Section 3 discusses previous research within the field. Section 4 shows and reflects on the data used. Section 5 describes the methodology of portfolio construction, performance, and the regression models. Section 6 analyzes and discusses the obtained results. Section 7 concludes.

## 2. Theoretical framework

This study builds upon a theoretical framework that, due to its purpose, naturally originates from asset pricing models and Jensen's alpha, a sign of abnormal return. These parts serve as the foundation for the theories used to describe the relationship between ESG performance and stock returns, as well as for parts of the upcoming methodology section. More specifically, the theories employed here are two recently developed models that describe how ESG can be reflected in stock returns. Based on these, I develop hypotheses of what to generally anticipate in the relationship between ESG performance and stock returns, including the three pillars. To elucidate potential industry differences, I further anchor the investigation in the well-known Stakeholder theory and connect it to CSR/ESG[1]. All the mentioned perspectives are elaborated in the sections below, concluding with the development of hypotheses.

### 2.1. Asset pricing models and Jensen's alpha

Markowitz (1952) lays the groundwork for portfolio choice with the so-called "mean-variance theory". Figure 1 shows the mean-variance frontier, which, in turn, forms the basis for the Capital Asset Pricing Model (CAPM), described below. The mean-variance frontier depicts various investment opportunities. On the horizontal axis, we have portfolio risk measured as standard deviation $\sigma(R)$, while the vertical axis represents the expected return *E(R)*. The curve is the minimum variance frontier, which provides combinations that minimize risk at different levels of returns. There is a trade-off between risk and return, meaning a high expected return also implies a higher risk. When adding risk-free borrowing and lending, the model extends with a straight line (the Capital Market Line, CML). The mean-variance efficient portfolios lie on this line that tangentially touches the frontier with the highest slope. All efficient portfolios are a combination of this risk-free rate $R_f$ and the tangency portfolio *T*. As a result, an investor ends up with the decision about how much to place in the risk-free asset and in the tangency portfolio depending on their risk aversion.

[1] The notation CSR/ESG stands for CSR and ESG overlapping each other.

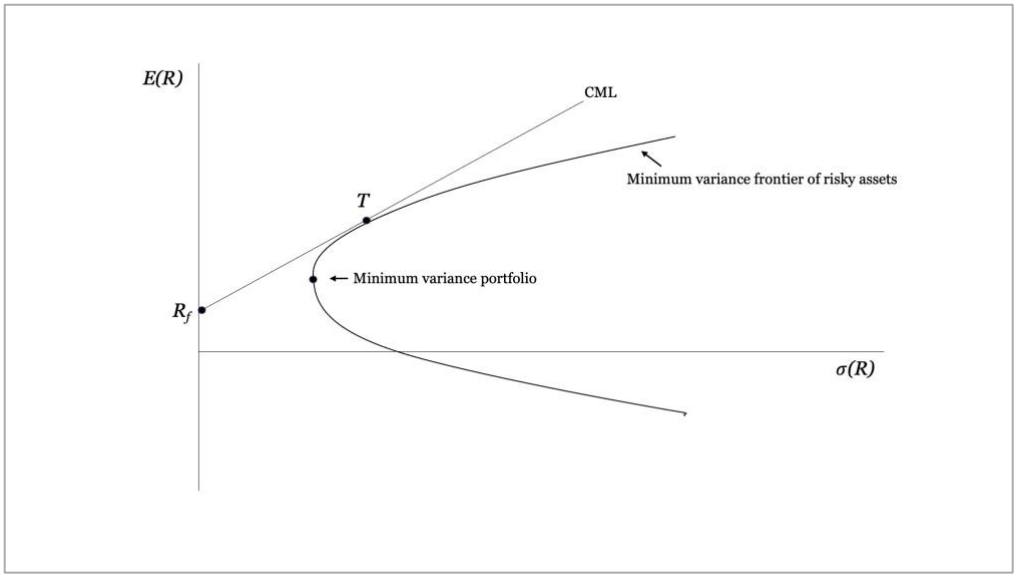



**Figure 1.** The mean-variance frontier. This figure illustrates investment opportunities, with expected return (*E(R)*) on the vertical axis and risk ($\sigma(R)$) measured as standard deviation, on the horizontal axis. The minimum variance frontier shows a collection of all minimum-variance portfolios, i.e., the portfolios with the highest return per level of risk. The minimum variance portfolio is the one with the lowest risk compared to all possible portfolios of risky assets. All portfolios above this lie on the efficient frontier and are the portfolios a rational, risk-averse investor would choose. Adding risk-free borrowing ($R_f$) extends the model with a straight line, the Capital Market Line (*CML*), which touches the mean-variance frontier at the tangency portfolio (*T*), representing the optimal portfolio of risky assets. This results in a portfolio choice of how much to allocate to the risk-free asset and the tangency portfolio.

The CAPM builds upon this and has been widely used since its development by Sharpe (1964) and Lintner (1965). The model establishes a relationship between expected return and risk, as explained by

$$E(R_i) = R_f + \beta_{iM}\,(E(R_M) - R_f) \tag{1}$$

where $E(R_i)$ is the expected return on asset $i$, $R_f$ is the risk-free rate, $ß_{iM}$ is the asset's market beta (measuring the sensitivity of the asset's return to variations in market return), and $E(R_M)$ is the expected return of the market. However, despite its common usage, there are critics about the assumptions underlying the model, which oversimplify many real-world circumstances (Fama and French, 2004). Research suggests that the relation between beta ($ß_{iM}$) and the average return is flatter than predicted in the CAPM (see e.g., Reinganum, 1981; Schwert, 2003). Several tests have been conducted on the model, with one important test being Jensen (1968) time-series regression test. If the CAPM holds, the intercept $\alpha_i$ in

$$R_{it} - R_{ft} = \alpha_i + \beta_{iM}\left(R_{Mt} - R_{ft}\right) + \varepsilon_{it} \tag{2}$$

should be zero. This intercept $\alpha_i$ is referred to as Jensen's alpha and is considered as a sign of abnormal return when regressing a portfolio return ($R_{it} - R_{ft}$) against the excess market return

factor in the CAPM ($R_{Mt}$ -$R_{ft}$). A positive alpha indicates that the portfolio outperforms the market given its risk, while a negative alpha suggests the opposite. Due to the drawbacks of the CAPM, which does not fully include the factors that explain portfolio returns, Fama and French (1993, 2015) develop extensions to this model. These extensions are relevant to use in this study as they capture more factors that might otherwise be interpreted as abnormal returns. Including more factors involves considering additional factors that can explain the returns of the considered portfolios. Jensen's alpha thus measures the marginal return associated with an additional strategy not explained by the existing factors. A significant and positive alpha indicates that the tested portfolio strategy generates returns on top of that explained by the other factors alone.

### 2.2. The ESG efficient frontier

Pedersen et al. (2021) propose a theory that considers both the potential costs and benefits of ESG investing, thereby incorporating both aspects of ESG and performance. They develop their model based on the mean-variance theory and the CAPM, as described in Section 2.1. Their theory shows how ESG affects portfolio choice, and equilibrium asset prices. The model does not state a single way in which ESG affects asset prices but instead demonstrates several possibilities depending on investors' preferences and knowledge about ESG. The number of investors of various types also influence the outcome. Specifically, three groups of investors are recognized. 1) Type-U (ESG-unaware): investors who do not know about ESG-scores and only strive to maximize mean-variance utility. 2) Type-A (ESG-aware): investors with mean-variance preferences but use assets' ESG scores to update their views on risk and expected return. 3) Type-M (ESG motivated): investors who use available ESG information and have preferences for high ESG scores. They seek portfolios that optimize a high expected return, low risk, and a high average ESG score. This problem can be reduced to a trade-off between ESG and the Sharpe ratio (SR).

The connection between ESG scores and the highest SR is represented by the ESG-SR frontier (Figure 2, Panel A). This frontier illustrates investment opportunities when people care about risk, return, and ESG. The frontier depends on security characteristics, independent of investor preferences. The frontier can therefore first be computed based on the same information held by the investors, so they agree upon it. Subsequently, each investor has the ability to choose a point on this frontier according to their own preferences. As a result, Type-A investors choose the portfolio with the highest SR on the ESG-SR frontier – the tangency portfolio using ESG

information. Type-M investors have preferences for higher ESG, so they select portfolios to the right of those chosen by Type-A on the ESG efficient frontier. Those with small preferences for ESG choose just to the right of the peak, nearly the maximum SR (higher than Type-U). Investors with strong preferences for ESG choose points farther right on the frontier (potentially lower than U investors' SR). Although portfolios below or to the left of the efficient frontier are suboptimal, Type-U investors choose them because they disregard the information in ESG scores in their calculations of optimal portfolios.

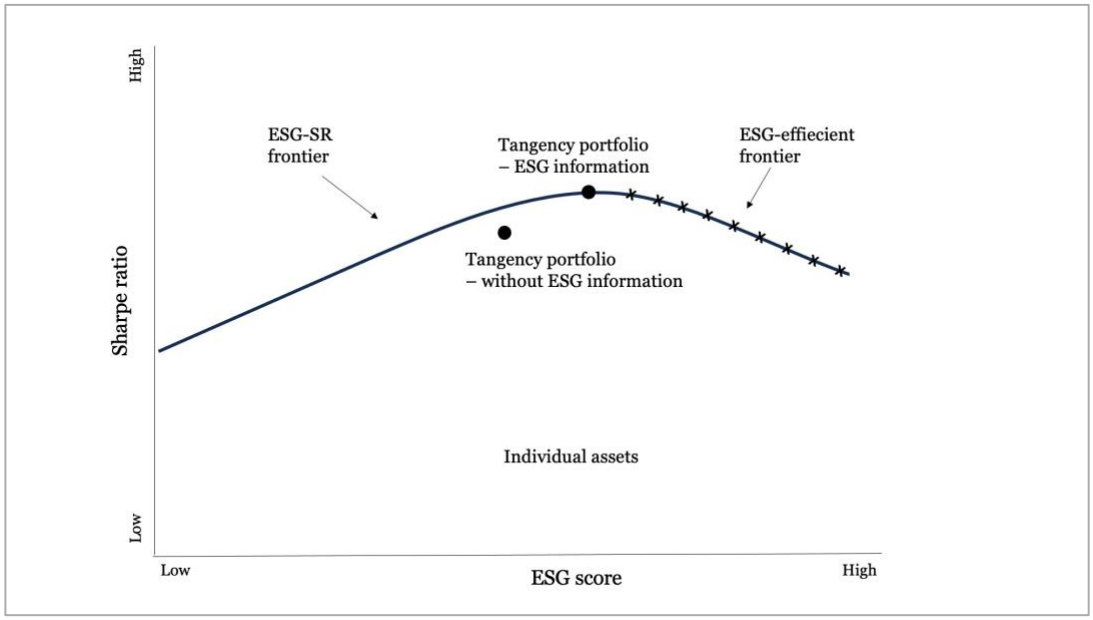
Pedersen et al. (2021) also demonstrate that expected returns can be explained by an ESG-adjusted CAPM, as seen in Figure 2, Panel B. Different scenarios of investors in the economy describe what to expect regarding asset prices. If there are many Type-U investors, and high ESG predicts high future profits, high-ESG stocks provide high expected returns. High-ESG stocks are profitable, but this profitability is not yet reflected in their prices due to unawareness, indicating higher future expected returns. An investor using ESG scores in this scenario earns alpha relative to the CAPM. If, on the other hand, there are many Type A investors, they bid up prices of high-ESG stocks to reflect their expected profits, eliminating the connection between ESG and expected returns. This scenario occurs when investors become aware of the positive alpha obtained by high ESG. Lastly, many Type-M investors result in high ESG stocks having low expected returns since these types of investors are willing to accept a lower return for a higher ESG portfolio. ESG scores thus function in two separate ways: investors have preferences for ESG, and ESG scores incorporates risks and expected returns.

If ESG investing sees a growing prevalence over time, with an increasing number of ESG-motivated investors, it could result in elevated valuations for stocks with high ESG ratings. If this trend is unforeseen or not entirely reflected in stock prices for other reasons, high-ESG stocks might undergo a surge in returns during this period of ESG repricing. On the other hand, if these shifts are anticipated, it is likely that expected returns would remain unaffected.

One last aspect raised by Pedersen et al. (2021) related to this model involves considering differences among the pillars of ESG. They conclude that the effect of their model varies when applied to various measures related to E, S, and G. Their proxy for G has a cheap valuation and, therefore high expected returns, causing the efficient frontier to differ among aware and unaware investors. The aware investor could earn a positive alpha based on this. In relation to the proxies for E, S, and ESG, where stocks are perceived to be valued higher and thus have

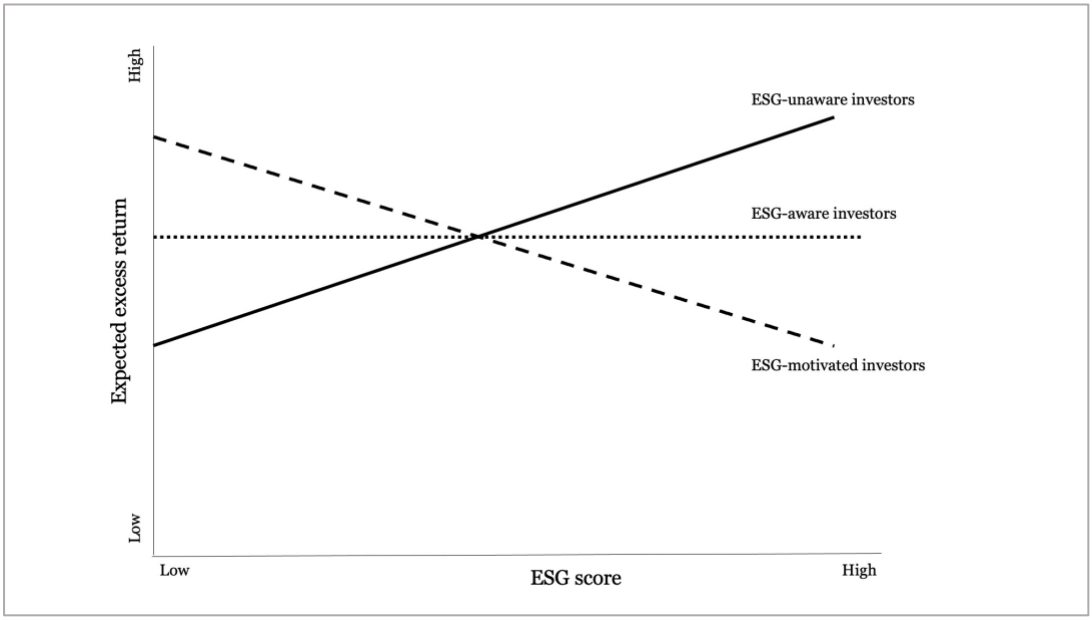
low or insignificant returns, there are no abnormal returns, and the efficient frontier of aware and unaware investors seems to be almost the same.

Panel A: The ESG-efficient frontier




Source: Pedersen et al. (2021)

Panel B: The ESG-adjusted CAPM




Source: Pedersen et al. (2021)

**Figure 2.** The ESG efficient frontier and the ESG adjusted CAPM. Panel A depicts the ESG-SR frontier, which shows the maximum Sharpe ratio (SR) (vertical axis) achievable for a portfolio with a certain ESG score (horizontal axis). The Tangency portfolio using ESG information is the portfolio with the highest SR one can achieve while including ESG information; this portfolio is held by ESG-aware investors. ESG-motivated investors hold portfolios to the right of this tangency portfolio. The Tangency portfolio without ESG information is held by the ESG-unaware investors. Panel B shows the ESG-CAPM. It describes the relation between expected excess return (vertical axis) and ESG score (horizontal axis) depending on the different types of investors in the economy. Many ESG-unaware investors indicate that a high ESG score relates to high expected excess return (the profitability of high ESG not yet priced into stock prices). Many ESG-aware investors lead to no connection (expected profits are priced in), while many ESG-motivated investors result in high ESG score having low expected return (willing to accept low return for high ESG).

### 2.3. Sustainable investing in equilibrium

Another model aimed at describing sustainable investing and asset prices is proposed by Pástor et al. (2021). Although there are some similarities to Pedersen et al.'s (2021) model described in the previous section, this model also illuminates other aspects of the relation between ESG and asset prices. The model covers several aspects; it shows channels through which preferences for sustainability move asset prices, tilt portfolios, and determine the size of the ESG investment industry. In the model, firms differ in terms of the sustainability of their activities; green firms contribute with positive externalities to society, whereas brown firms have negative externalities. There are also shades of green and brown. Investors differ in their preferences for ESG such as those with strong preferences overweight green firms and underweight brown ones. The opposite holds for investors with weaker tastes. And those with average tastes hold the market portfolio. If ESG tastes are equally strong, investors hold the market portfolio regardless of the strength of their preferences, as stock prices are adjusted to reflect these preferences. Therefore, dispersion in ESG tastes is important for the ESG investment industry to exist. Greater dispersion indicates a larger ESG industry[2].

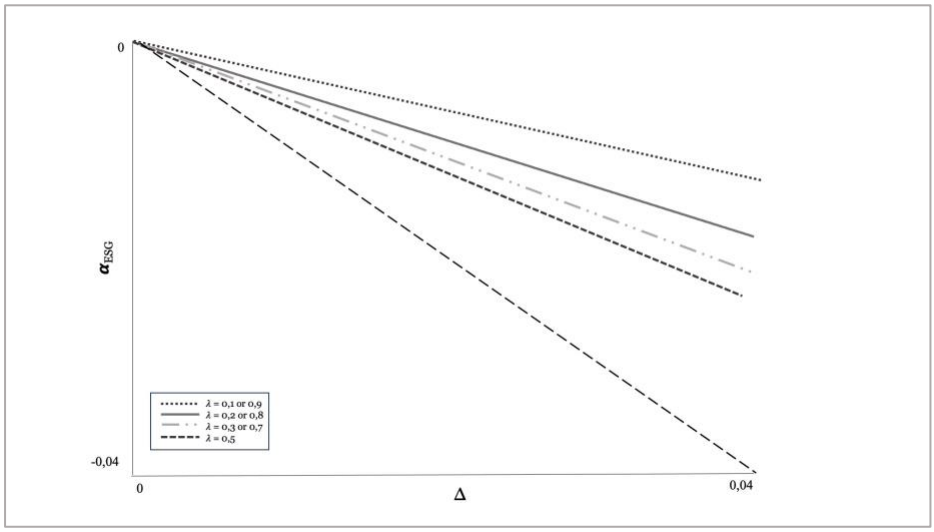
The ESG factor and the market portfolio build up a two-factor model for pricing assets. Green assets exhibit negative CAPM alphas, while brown assets have positive alphas. Due to this, investors with stronger ESG preferences earn lower expected returns. They compensate for this by earning an "investor surplus", meaning they give up less return than they are willing to forego because their demand move the market portfolio against their own portfolio. This in turn, makes their alphas less negative.

The difference in expected returns between ESG investors and non-ESG investors increases with the wealth of the ESG investors, $\lambda$, and with the maximum return they are willing to forgo when investing in a positive ESG portfolio instead of the market, $\Delta$. Figure 3 shows how alpha changes for the two types of investors due to this. Figure 3, Panel A depicts the case for the ESG investor. Firstly, alpha decreases with $\Delta$ – the more willing the investor is to forgo secure returns, the lower the alpha. Secondly, alpha follows a U-shape related to $\lambda$ (not shown). When $\lambda = 0$ and 1, these investors earn zero alpha. The reason is that when $\lambda = 0$ ESG investors do not affect prices, and in the $\lambda = 1$ case, they affect prices, but they themselves hold the market.

[2] The scale of the ESG investment industry is defined by determining the cumulative value of investments influenced by ESG factors that diverge from the market portfolio. This is then divided by the overall value of the stock market (Pástor et al., 2021).

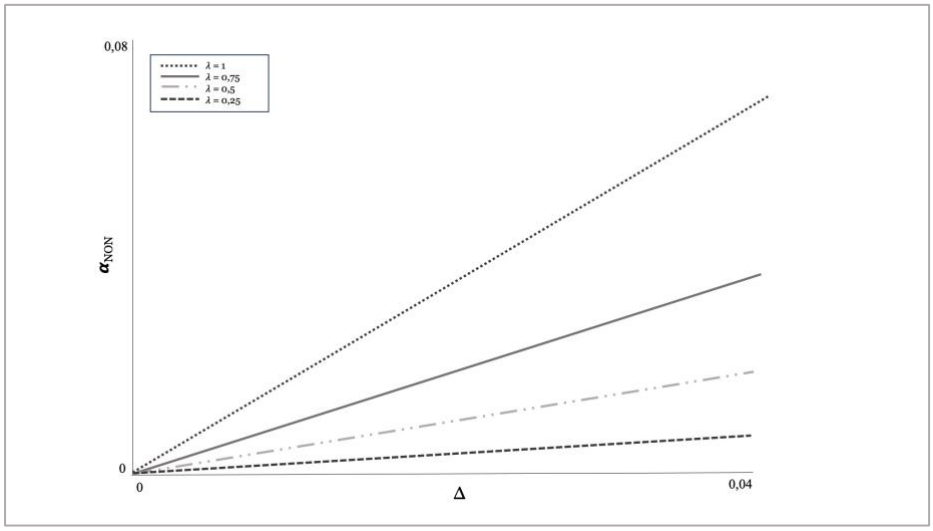
In all other cases, they earn a negative alpha. In between 0 and 1, alpha first becomes more negative, but then turns up towards zero when market prices are pushed against the portfolio of the ESG investors. The lowest alpha then occurs when $\lambda = 0.5$. In Figure 3, Panel B, the scenario for the non-ESG investor is illustrated. This investor earns zero alpha when $\lambda = 0$. Thereafter, alpha increases with $\lambda$, and it also increases with $\Delta$. The highest alpha is obtained when all other investors are ESG-investors ($\lambda = 1$) and these investors' demand for green assets is high.

Panel A: Alpha of ESG Investors




Source: Pástor et al. (2021)

Panel B: Alpha of non-ESG investors




Source: Pástor et al. (2021)

**Figure 3.** Alpha of ESG investors and non-ESG investors. The figure plots alpha as a function of $\Delta$; the maximum secure return an ESG investor is willing to forgo for investing in a preferred portfolio instead of the market portfolio. This is plotted for different levels of $\lambda$; the fraction of wealth affiliated with ESG investors. Panel A shows the case for the ESG investor, where alpha becomes more negative with $\Delta$, and first becomes more negative with $\lambda$ and then turns back against zero when the market moves against their portfolios. The distance from the line at the bottom to each of the other lines indicates the amount of investor surplus. Panel B shows the case for the non-ESG investor, in which alpha becomes more positive with both $\Delta$ and $\lambda$.

However, if ESG considerations unexpectedly intensify, assets aligned with ESG principles demonstrate superior performance (realized returns) even though they have lower expected returns. This can occur during certain specific time periods and events. The green assets thus work as a hedge against climate risk. The brown assets need to offer higher expected returns to compensate investors for the risk of an unforeseen climate effect that may lead to loss in value. This is another reason for a positive alpha for brown assets, in addition to the one mention above. The strength of ESG concerns can change through the "investor" channel, i.e., investors alter their appreciation for green investments and drive up asset prices, or through the "customer channel", i.e., customers change their demand for green products, which increases green firms' profits and thereby, their stock prices.

A final intriguing aspect that Pástor et al. (2021) mention in their article is that sustainable investing leads to a positive social impact by lowering the costs of capital for green firms, which leads them to invest more, and increasing the costs for brown firms, causing them to invest less. In total, firms become greener through the ESG investment industry.

### 2.4. Stakeholder theory -a way to assess industry differences

The Stakeholder theory emphasizes the relationship between a corporation and its customers, suppliers, employees, investors, communities, shareholders, and other groups with an interest in the organization (Freeman, 1984). The purpose of an organization is to create value for these groups of stakeholders. This value creation is, among other things, related to the actions a corporation takes in terms of sustainability, CSR, and thus ESG. The fact that CSR could be linked to stakeholder theory is considered and well described in previous research (see e.g., Dmytriyev et al., 2021; Cordeiro and Tewari, 2015). Barnett (2007) advocates that the variability in the firm's relationship with its stakeholders can affect the link between CSR and corporate financial performance (CFP). CSR seems to have various effects on CFP, both across firms and over time within the same firm. The reactions to a corporation handling, for example, an environmental issue will differ based on prior beliefs about the characteristics of the firm. Barnett (2007) argues that a firm's unique historical background plays a crucial role in transforming a CSR activity into CFP.

Nevertheless, companies within the same industry tend to follow some kind of similar pattern. Both a firm's success and problems can easily "spill over" to other firms within the same

industry due to their similarity in characteristics and processes (Barnett and King, 2008). As various industries differ in their stakeholder composition and expectations of them, the degree of distinct CSR/ESG practices tends to vary between them. However, this does not necessarily imply that CFP differs among them, as different sectors have their own optimal levels of ESG investments that are most beneficial from a cost perspective (see e.g., McWilliams and Siegel, 2001). But it can, for example, explain why the highest ESG-ranked companies within a sector exhibit higher CFP than their peers. This topic is discussed in some previous research and is a relevant approach for understanding whether and why industry differences related to ESG performance and stock returns will be observed.

The impact of ESG advertising seems to be greater for companies with customers who are individuals rather than other firms (Sahut and Pasquini-Descomps, 2015; McWilliams and Siegel, 2001). Firms that sell final products to consumers more often invest in environmentally friendly systems than those producing primary intermediate products (Khanna and Anton, 2002). Moreover, CSR tends to affect customer satisfaction and, in turn, market value as one pathway, but there exist other ways by which CSR affects market value (Luo and Bhattacharya, 2006). This connects with Feng et al.'s (2017) discussion that some pathways are more essential for specific sectors. This aspect of how different parts of the CSR perspective are more important for some sectors than others, and the relationship of this to what investors value or take note of in a firm, may lead the way to the explanation of obtained differences. Mandel and Dorr (2007) suggest four categories of CSR related to diverse stakeholders, which I present below. Feng et al. (2017) further explain how these categories are more important for some sectors and, therefore, impact CFP differently for firms within them. I also state their opinions in the next four paragraphs. Furthermore, I relate the described CSR categories to LSEG ESG categories to make them applicable for this study.

The first category is the *Employees-oriented CSR*, which encompasses internal stakeholders such as employees, labor rights, workplace health and safety, working hours and conditions, training and development, diversity, and work-life balance. Firms can benefit from this by creating value through their employees[3]. This is particularly important for sectors where employees play a significant role in creating CFP. In my sample this aligns well with the industrial sector, known for its labor-intensive manufacturing, as well as with the two other

[3] It is well known that good working conditions contribute to better employee performance (e.g., Harter et al., 2002; Ramlall et al., 2008).

sectors: healthcare and financials. These sectors are service-oriented and involve extensive interaction with customers, where employees play an essential role. The importance of this aspect depends on the proximity to the end consumers. In these types of sectors, investors seem to value firms' CSR/ESG performance related to employees. This CSR category closely corresponds to the workforce part of LSEG's S-pillar.

The second category is the *Environmental-oriented CSR,* which considers the protection of the environment, waste and pollution disposal, sustainable development, as well as efficient use of natural resources. This is an especially important part for environmentally sensitive industries, i.e., industries where business activities may damage the environment and are exposed to more risks related to this. In my sample, this belongs to the industrial sector. A positive relationship can be expected between CSR and CFP for these types of firms, i.e., when a firm performs well in an environmental CSR area, this is observed and valued by the market. The opposite may also be the case; Conar and Kohen (2001) find larger losses in value of a company with high emissions if it belongs to a traditionally considered polluting industry. In less environmentally sensitive industries, stakeholders attach less importance to the environmental impact of the firm, and thus, no CSR-CFP connection is expected. The healthcare sector relates to these types of firms. Finally, the financial sector is explained separately, assigned a positive relationship due to decreased environmental costs by investing in corporate environmental responsibility. The description of this CSR category aligns with the majority of LSEG's E-pillar.

The third category, *Society-oriented CSR*, delves into companies' relations and engagement with community, promoting social cohesion, and collaborating with local community institutions, organizations, and broader society. This category tends to enhance performance in almost all industries, including the ones I focus on here. It relates to the community part of LSEG's S-pillar.

Finally, the fourth CSR category described is *Market-oriented CSR*. It deals with fair pricing, responsible management of the supply chain, initiatives to enhance product quality and safety, innovation, and morally sound advertising. While this category generally enhances performance, its impact varies depending on the product differentiation opportunities within the industry. In the industrial sector, companies have the potential to distinguish themselves from competitors through product innovation and quality. Therefore, market-oriented CSR can positively impact performance in this sector. However, in the healthcare and financials sectors,

where differentiation opportunities are limited, no or even a negative relationship may occur. This category can also be associated with the community aspect of LSEG's S-pillar.

None of the four CSR categories presented above seems to directly connect to the G-pillar. One reason for this may be that this measure captures more of the management group themselves and less of what they do against the outside world. However, it is an important measure considered by investors. As mentioned earlier, a study by PRI (2022) indicates that governance is the most integrated part of investment processes among the pillars. Moreover, issues related to governance seem to vary more among countries than industries. Previous research suggests cross-country differences (e.g., Khan, 2019). Since LSEG assigns equal weights to governance matters for companies, regardless of their industry, I assume that the differences related to the G-pillar are more associated with country differences and vary among companies, but not significantly among sectors. Furthermore, good corporate governance is essential for the efficient allocation of capital and long-term growth; therefore, poor governance is costly for all stakeholders (Khan, 2019). Consequently, I anticipate a positive relationship between good governance and CFP in all three sectors.

Explained above is how companies' CSR activities can relate to their CFP, and most importantly, differences among sectors (see the summary in Table 1). By capturing CSR performance with an ESG score, where good CSR performance indicates a higher score, this perspective's reflection into stock prices can be further described by the models proposed by Pedersen et al. (2021) and Pástor et al. (2021), as discussed in Section 2.2 and 2.3. This stakeholder perspective contributes by underpinning the understanding of why there may be differences among sectors.

**Table 1**
This table summarizes how companies' various CSR activities (captured by an ESG score) can relate to their CFP. The question it seeks to answer is whether a high ESG score will be beneficial for a firm's CFP within each sector.

| | **Employees-oriented CSR**<br><br>**Workforce – S-pillar ESG** | **Environmental-oriented CSR**<br><br>**E-pillar ESG** | **Society-oriented CSR**<br><br>**Community – S-pillar ESG** | **Market-oriented CSR**<br><br>**Community – S-pillar ESG** | <br><br>**G-pillar ESG** |
|---|---|---|---|---|---|
| **Financials** | CSR performance /High ESG ➔ Valued by the market / Higher CFP | CSR performance /High ESG ➔ Valued by the market / Higher CFP | CSR performance /High ESG ➔ Valued by the market / Higher CFP | CSR performance /High ESG ➔ Limited product differentiation/ No or negative effect on CFP | CSR performance /High ESG ➔ Valued by the market / Higher CFP |
| **Healthcare** | CSR performance /High ESG ➔ Valued by the market / Higher CFP | CSR performance /High ESG ➔ Less considered by the market/ No effect on CFP | CSR performance /High ESG ➔ Valued by the market / Higher CFP | CSR performance /High ESG ➔ Limited product differentiation/ No or negative effect on CFP | CSR performance /High ESG ➔ Valued by the market / Higher CFP |
| **Industrials** | CSR performance /High ESG ➔ Valued by the market / Higher CFP | CSR performance /High ESG ➔ Valued by the market / Higher CFP | CSR performance /High ESG ➔ Valued by the market / Higher CFP | CSR performance /High ESG ➔ Valued by the market / Higher CFP | CSR performance /High ESG ➔ Valued by the market / Higher CFP |

## 2.5. Summary and hypothesis development

First and foremost, the theories proposed by Pedersen et al. (2021) (henceforth T1) and Pástor et al. (2021) (henceforth T2) contribute to explaining the relationship between ESG and stock returns in general, without specifically addressing any differences among sectors. Both models are based on the level of investors in the economy and their inclination towards ESG. T1 consists of three different types of investors, while T2 leans towards two. Nevertheless, both theories emphasize potential variations in the degree of investors' preference for ESG within these groups. Moreover, T1 reinforces the existence of differences between the various pillars of ESG through testing. On the other hand, T2 provides a clearer explanation of the expected outcome in the economy under the assumption of equilibrium. This implies that a high ESG ranking suggests a negative alpha (lower expected return), while lower-ranked companies would have a positive alpha (higher expected return). T1 also suggests a similar outcome when there is a greater proportion of ESG-motivated investors (type M) in the economy.

Furthermore, it is essential to consider that the opposite scenario may occur during a period when ESG investments are growing for some reason. In these cases, high ESG investments can

instead yield a positive alpha. However, since the markets should incorporate this information relatively quickly, I expect that the outcome over a slightly longer period will align more closely with the equilibrium case. Consequently, my first hypothesis is as follows:

- *H1. Portfolios with a higher ESG rating will generally exhibit negative alpha and lower expected stock returns than those with a lower rating.*

Moreover, this suggests that the Sharpe ratio, aligned with the efficient frontier of T1, will be similarly affected. This is because ESG motivated, M-investors accept lower SR on the ESG-SR efficient frontier due to their preferences against high ESG. Hence, the second hypothesis is:

- *H2. Portfolios with higher ESG ratings result in a lower Sharpe ratio.*

Finally, it is crucial to consider potential industry differences, where certain factors suggest that outcomes will vary among them. Stakeholder theory and CSR have been utilized to identify these differences. Additionally, it is worth emphasizing that T2 provides an explanation for how ESG can be reinforced through both investor and customer channels, affecting stock prices through different pathways.

In the case of the industrial sector, all aspects of ESG seem to have a positive impact on CFP for companies within the sector. This observation may suggest that significant differences in outcomes for different ESG components might not be apparent. Furthermore, based on the aforementioned assumptions about the general equilibrium situation, these effects are expected to be factored into the market, leading to expectations of negative alpha for a high ESG rating. However, given that the industrial sector is strongly tied to the E in ESG and attracts considerable attention from shareholders and other stakeholders related to that, there is a possibility that this sector may differ from the others in this study, with a higher proportion of investors motivated by environmental considerations. In T1, this would result in a portfolio choice positioned further to the right on the E-SR frontier (indicating a lower SR), while T2 suggests that non-environmental investors receive a higher positive alpha (which increases with the wealth of environmental investors and their willingness to sacrifice in return). For the environmental investor, alpha is not consistently influenced in a specific direction (following a U-shape), making it less clear whether they would experience a more or less negative alpha based on this factor. In summary, this leads to hypothesis number 3:

- *H3. For the industrial sector, it is expected that all highly-rated portfolios will have a negative alpha, while those with low ratings will have a positive alpha. The outcome regarding E is anticipated to have a stronger positive alpha for portfolios with a low E-rating than for the other two sectors.*

In the context of the financial sector, similar to the industrial sector, it can be assumed that ESG has a positive impact on companies. However, one S component stands out due to lower opportunities to differentiate products, resulting in a potentially negative or negligible effect on CFP. Nonetheless, since it constitutes only a portion of the S pillar, similar assumptions can be made as those first applied to the industrial sector. No indications suggest any specific aspect of ESG standing out in this sector. The hypothesis, therefore, is as follows:

- *H4: For the financial sector portfolios with a high rating will exhibit negative alpha and lower expected stock returns than those with a lower rating.*

Turning to the healthcare sector, one might expect outcomes slightly different from the other two sectors based on the CSR-CFP linkages within the industry. Similar to the financial sector, a portion of the S pillar does not exhibit a positive connection between CSR and CFP. However, as mentioned, this is just one component of the entire social pillar. Simultaneously, there exists a tradition emphasizing the significance of the S factor, particularly in the healthcare sector. Based on this, a similar assumption can be made for the S component as for the E component in the industrial sector – that is, S receives more attention, and investors have stronger preferences for companies with a high S rating. Consequently, portfolios with low S ratings may exhibit more clearly positive alphas, as described earlier. For the E component, a difference can also be noted, given that this pillar might not be as significant or noticed by investors in the healthcare sector. This would result in a placement not quite as far to the right on the E-efficient frontier according to T1, due to lower preferences. Similarly, according to T2, fewer E investors would mean that alpha becomes less positive for non-E investors. At the same time, if there are relatively few environmentally motivated investors, alpha for them becomes less negative. Following this reasoning, alpha can conceivably be closer to zero for both high and low-rated E portfolios. This reasoning leads to the following hypothesis:

- *H5: For the healthcare sector, it is expected that all highly-rated portfolios will have a negative alpha, while those with low ratings will have a positive alpha. The outcome regarding S is anticipated to have a stronger positive alpha for portfolios with a low S-*

*rating than for the other two sectors. The outcome regarding E will have alpha's closer to zero for both high and low-scored E portfolios than for the other two sectors.*

# 3. Literature review

## 3.1 ESG versus corporate financial performance

Numerous studies explore the connection between ESG factors and corporate financial performance (CFP) in various ways, covering different areas, time periods etc. Most of them seem to identify positive relationships (see e.g., Friede et al., 2015), indicating that good sustainability performance is associated with high financial performance but there are ambiguities and even many contrary conclusions (e.g., Brammer et al., 2006). There also appears to be diminished attention to the three pillars of ESG. Research, however, concludes that the various aspects – social, environmental, and governance – must be evaluated separately to achieve a correct view of their impact on returns (Brammer et al., 2006). Gillan et al. (2021) review financial economics research on ESG and CSR. They cover literature containing several ways of measuring performance, including short and long-run stock returns. Their findings indicate a need for further research due to inconsistent results. Even though they find evidence of a positive link between CSR/ESG scores and firm value (a relation similar to that found by Friede et al., 2015), there still exists a disagreement regarding the value reflection into stock prices (e.g., Hvidkjær, 2017). Some of the papers conclude that CSR/ESG is correctly priced, so that high-scored companies have high value today and low returns in the future, while others presume that CSR/ESG is initially mispriced, indicating low values today and high returns in the future (Gillan et al., 2021).

An earlier literature study by van Beurden and Gössling (2008) concludes a majority of positive relationships between CSR and CFP. They distinguish between market-based measures of CFP, such as stock performance, and accounting-based measures. Moreover, they emphasize the importance of carefully considering which measures of CSR and CFP that are used, as it might affect research outcomes. Papers seem to widely use different measures related to this, making comparisons of the results somewhat difficult. Gillan et al. (2021) further highlight the important aspect of various results in papers due to the differences in how CSR/ESG performance is measured, the data used, and the geographical focus of the study. Friede et al. (2015) similarly discover that studies recognize differences in ESG versus firm performance

depending on the region covered by the sample. A smaller share of positive results is found in Europe compared to the US, and emerging markets show a considerably higher proportion of positive outcomes than developed markets.

Ashwin Kumar et al. (2016) compare companies with good ESG performance in relation to a group representing the average market performance. They categorize the companies into twelve different industries, examining each separately. In all industries, companies with strong ESG ratings exhibit lower volatility in stock returns compared to the reference group, but the extent of the difference depended on the specific industry. However, the lower risk is not found to be associated with lower returns; the majority of industries in the study show higher returns for companies with high ESG ratings. Contrastingly, Gavrilakiis et al. (2023) discover no significant relationship between ESG scores and stock returns in six European countries during 2010-2020. Similarly, Sahut and Pasquinit-Descomps (2015) find no relationship in the US and Switzerland, but a slightly negative relationship in the UK. A negative relationship is also found by Vu et al. (2022) for developed markets. Sahut and Pasquinit-Descomps (2015) additionally recognize that sub-category scores and market performance depend strongly on the year and sector.

Other studies decide to concentrate on how different events and time periods impact the stock returns of companies with high versus low ESG scores. Green assets tend to outperform when positive shocks hit the ESG factor (Pástor et al., 2021). Engle et al. (2020) find that firms with high E-scores outperform those with low scores during periods of negative climate news. Moreover, Krüger (2015) shows that stock markets react strongly negatively to negative events regarding a firm's CSR and weakly negatively to positive events. Shanaev and Ghimire (2022) investigate the impact of ESG rating changes on stock returns over a five-year period for US firms. Upgrades lead to positive abnormal returns, although not always statistically significant, while downgrades result in significant negative monthly risk-adjusted returns. Drei et al. (2019) present variations in ESG investing during different periods; 2010-2013 show less favorable outcomes, whereas ESG investing outperforms during 2014 to 2019. This may explain the fact that considering ESG in investments has grown much during the recent years. It can also relate to the point covered by Godfrey and Hatch (2007), which indicates that there is a delay between a firms' actions, the response of stakeholders, and the effect of performance, meaning that a firms' sustainable actions are reflected some periods later in their financial performance.

Studies indicate that the Corona crisis strengthened the investors' reflection on ESG even more. Engelhardt et al. (2021) identify that high ESG rated European companies had higher abnormal stock returns and lower stock volatility during Corona, indicating that they were less affected by the pandemic's economic consequences. Similar results are also found by Albuquerque et al. (2020) when considering E and S for US-listed companies and by Ding et al. (2021) when they consider a global sample of companies. In contrast, Bae et al. (2021) find no evidence of relationship between ESG and stock returns during the Corona crash period. Their sample consists of US firms, and they test against two ESG ratings sources (Refinitiv and MSCI). Deng et al. (2022) examine whether ESG had an impact on stock returns during the early stages of the Russia-Ukraine war. They find no relation between ESG and stock returns in that specific period.

### 3.2. ESG and financial performance in the financial, healthcare, and industrial sectors

To the best of my knowledge, there is a lack of research directly related to ESG and different sectors. Previous papers that consider more than one sector and compare them seem to be particularly scarce. Feng et al. (2017) note that no study before had fully documented possible variations in the relation between CSR and financial performance across industries. Even though different industries face dissimilar stakeholder expectations, such as the relation between financial performance and CSR is likely to be heterogeneous. In their study, they cover large US companies in ten sectors during 1991-2011. In most of the sectors, they identify a positive relationship between CSR and CFP. This study is noteworthy because it covers all sectors relevant to my research and links the outcomes to a firm's stakeholders (indicating that this perspective could be used to describe industry differences related to CFP, see Section 2.4). It divides CSR into different parts: employees-oriented, environment, society, and market – which makes it reasonably comparable to the ESG perspective. These different components have varying impacts on CFP for firms across diverse industries. Related to the healthcare and financial sectors, Feng et al. (2017) expect that employees who have direct contact with the firms' customers play an important role in CFP. For the industrial sector, considered as an environmentally sensitive industry, the environmental part plays a crucial role in firm performance. When companies in such sectors adopt greener business processes, it is likely that both customers and stock markets show positive responses. In less environmentally sensitive industries, stakeholders react less on this. The results obtained by Feng et al. (2017) confirm these expectations.

Bae et al. (2021) study the relation between CSR and stock market returns during the Corona crash-period and post-crash recovery. Part of their paper includes an industry analysis where they analyze if this relationship varies across industries. They conclude that differences exist among industries, although the overall effect of CSR on stocks is generally insignificant. One measure of CSR used is obtained by the averaging Refinitiv ESG's S and E scores. Based on this, significant results are obtained for chemicals (negative relation), business equipment (positive relation), and healthcare, medical equipment, and drugs (positive relation) in the crash-period. A significant positive relationship is also found for the chemical industry during the post-crash period. This study only covers a shorter period but illuminates the aspect of differences in the CSR-stock return relationship among industries. It also shows that this relationship can change during periods. Baird et al. (2012) similarly conclude that the CSR-CFP relation differs among industries. Moreover, Godfrey and Hatch (2007) also suggest this and further describe that economic and technological diversity, as well as resources, underlie the differences. Due to this, companies may gain competitive advantages when implementing different types of CSR.

Other studies more specifically cover the healthcare sector. Sherman et al. (2020) review sustainability research in the environmental area and conclude that the healthcare sector is a major emitter of environmental pollutants. This is an interesting aspect, as the environmental perspective (E in ESG) seems to be less considered in relation to the healthcare sector (Hu et al., 2022). Kalia & Aggarwal (2023) study healthcare firms during 2020 and find a positive relationship between ESG scores and financial performance measured as return on assets (ROA) and return on equity (ROE) for developed economies. For developing economies, the result becomes the opposite. Ashwin Kumar et al. (2016) realize a positive impact of ESG on stock returns in the healthcare sector when comparing companies listed on Dow Jones Sustainability Index (DJSI) to companies that are not. Zhang et al. (2022) perform a study related to the healthcare sector where they use a portfolio strategy based on going long in the top 25% ESG scored companies and short in the 25% lowest scored. They control this portfolio against a portfolio that goes long in all companies and without any screening. During their studied period, 2015-2020, the ESG-selected portfolios' returns are higher 75% of the time. They especially identify a difference related to the Corona pandemic. Other studies also conclude the special effects of Corona on the healthcare sector. My study includes this specific

start year of Corona[4], so in relation to this sector, there may be some interesting aspects related to this.

Regarding the financial sector, Batae et al. (2021) cover 39 European banks in the period 2010-2019 and relate ten ESG dimensions from Refinitiv to their financial performance. Their results are versatile, the E-pillar, in total, seems not to be related to financial performance, while many constituents of it seem to be. Related to the S-pillar, the overall measure does not relate to financial performance, at the same time, many of the underlying measures show negative relationships. The G-pillar appears to be a negative predictor of stock market returns. Moreover, Buallay (2019) examines the relationship between ESG and bank's operational- (ROA), financial (return on equity, ROE), and market performance (Tobin's Q, TQ) during the ten-year period 2007-2016. The author covers 235 banks located in Europe and finds a significant positive impact of ESG on performance. Like Batae et al. (2021), differences among the ESG pillars and their relation to performance are found. The E-pillar positively affects ROA and TQ. The social part negatively affects all three measures, whereas the governance part negatively affects ROA, ROE and positively influence TQ. There are both similarities and differences among the obtained results of these two studies, indicating, among others, the importance of which periods and measures used, and also, that the pillars have different relationships to financial performance. This seems to be true for sectors generally.

Another study that reinforces variations among the pillars is conducted by Crespi and Migliavacca (2020). In their study of the financial industry, they cover 727 financial firms worldwide between 2006 and 2017, and investigate firm, country and temporal factors that can affect ESG (instead of the common opposite path of influence). The findings indicate that ESG scores grow over time within the financial industry, and this growth is enhanced by the size and profitability of the firm, as well as by the development of the country in which the firm is located. Moreover, the pillars mostly follow their own pattern related to this. The financial firms' profitability and the social development of their home country have a similar effect of total ESG and the pillars. The other characteristics differ; the E and S pillars follow an opposite trend compared to the G-pillar. Larger firms tend to prioritize E and S aspects to enhance social performance, while smaller firms tend to focus more on G.

[4] This start year of the Corona crisis stands out related to the financial markets due to the so called "crash-period" between February 18th and March 20th, 2020, when global stock markets experienced a significant downturn due to uncertainties about the pandemic's consequences.

The third sector examined in my study, the industrial sector, is less commonly studied in a broad sense; studies tend to focus more on specific sub-industries within it, such as transportation and airlines (see Section 4.2., where I provide further details about sub-industries). Naimy et al. (2021), however, consider the whole sector in their study covering 108 East Asian firms for the period 2011-2017. They find that the ESG-CFP relation depends on the ESG pillars, the type of CFP measure, and the type of industrial firm. Between ESG and the CFP measures ROA and ROE, no relationship is found, although relationships are found between ESG and stock return (concave relation) as well as Price-to-Book ratio (PB) (convex relation). The pillars have various relations to ESG, and when considering the type of firm, ESG negatively affect PB and stock returns in the transportation industry compared to no impact for the capital goods industry. Abdi et al. (2020) examine the airline industry worldwide (2013-2019) and discover a positive relationship between the E and G-pillars and CFP measured as TQ. They conclude that airlines who improve E and G will get higher market value and return on invested funds. For the S-pillar, the opposite result is found, indicating a negative relationship. Other studies also come up with mixed results when investigating the airline industry and the transportation industry generally (e.g., Shi, 2023).

In summary, previous literature generally focuses less on specific sectors and seldom covers more than one at a time. My research aims to extend this aspect by simultaneously covering specific sectors, ensuring the use of consistent measures, periods, and methodology across all. Moreover, research results vary significantly, and there seem to be various ways to explain them. Differences among the outcomes of the three sectors used in this study are apparent; however, it is challenging, based on the previous works, to precisely explain how ESG reflects into stock prices differ among them. One reason is the diverse measures used regarding CFP and differences in the data used for CSR or ESG, making comparisons difficult even during the same periods. These aspects indicate a need for more research in the area, to which this paper aims to contribute further.

## 4. Data

The majority of the data used in this study is collected from Thomson Reuters Eikon database, encompassing LSEG's ESG scores and closing prices for the firms' stocks. The Fama-French factors used in the regression models, as part of the methodology, are from the Kenneth R. French Data Library. In this section, I present a detailed overview of LSEG ESG data, also considering some limitations while using this data. I then proceed to describe how the sample is selected based on the choice of the three sectors: financials, healthcare, and industrials.

### 4.1. LSEG ESG data

This study utilizes ESG ratings from the LSEG Eikon database dating back to 2002, covering over 90% of the total market cap (LSEG, 2023). LSEG is one of the biggest and most commonly used ESG data provider in research[5] (e.g., Bae et al., 2021; Abdi et al., 2020; Bătae et al., 2021). Therefore, it is relevant for use in this study. Given the somewhat unclear definition of ESG and the varied methods and measures employed by different agencies in their rankings, it is pertinent, for a comprehensive understanding of the obtained results, to highlight certain characteristics of the data used. LSEG ESG score and its pillars' scores range between 0 and 100, where 100 is the best score a company can achieve. The rating process initiates with over 630 company-level ESG measures derived from publicly reported information such as annual reports, company websites, stock exchange filings, CSR reports, and news sources. Out of these measures, 186 (the most comparable and material per industry) are used in the scoring process. They are grouped into 10 categories that, in turn, form the three pillars (see Table 2). For the E- and S-pillars, the weights vary among the 3 and 4 underlying categories, respectively, depending on the relevance for the specific industry. For the G-pillar, all 3 underlying categories are assigned equal weight. In most cases, LSEG ESG data is updated once a year in accordance with companies' own ESG disclosure. In exceptional cases, such as changes in reporting or corporate structure during the year, the scores are updated more frequently.

[5] Other major rating agencies used frequently are: MSCI, Bloomberg, Sustainalytics, and RobecoSAM.

**Table 2**
LSEG ESG score – Pillars – Categories.
This table describes the structure of the LSEG ESG score. The ESG score consists of the three parts Environmental, Social, and Governance, which in turn are made up of a total of ten categories.

| ESG Score | | |
|---|---|---|
| *Environmental* | *Social* | *Governance* |
| Resource use | Workforce | Management |
| Emissions | Human rights | Shareholders |
| Innovation | Community | Corporate social responsibility (CSR) strategy |
| | Product responsibility | |

### 4.1.1. Challenges in using ESG data

Limitations and difficulties exist in the use of ESG data. I will mention three critical aspects regarding the data relevant to the purpose of this study (i.e., when linking ESG scores to stock returns). Firstly, ESG is a relatively undefined measure, with significant uncertainties about how its various components should be measured and defined. This can lead to companies being ranked differently by the various agencies (Billio et al., 2021; Berg et al., 2022; Kotsantonis et al., 2019; Drei et al., 2019). For example, the proportion of the ESG measure that the various main components—environmental, social, and governance—constitute differ among the agencies. This reinforces the reason to examine the different components E, S and G individually, which this study includes. Although, in doing this, there are obviously chances to come up with various results due to the choice of ESG data used.

Secondly, more specifically related to LSEG's data, it is somewhat difficult to handle an obtained zero score. The reason for this is that a zero score could mean two things: it is assigned when a company does not report on a specific category but also when they do report and perform really poorly. Ehlers et al. (2023) explain this quite thoroughly in their paper and mention that a decrease in the number of zeros between two periods could be both better reporting and a real improvement. The first does not necessarily indicate poor performance by the company from a sustainability perspective. For the ESG, G and S pillars used in my study, this was luckily not troublesome since none of the companies were assigned a zero score. Conversely, this was a bigger problem for the E scores where there are a considerable number of companies with this score, especially related to the healthcare sector[6]. The same is concluded by Ehlers et al. (2023), who find this problem to be particularly urgent for the E pillar where the underlying measures' zero scores affect the whole E score. However, if investors base

[6] For example, 22% of the companies in this sector are assigned a zero score for the year 2022.

decisions on the scores, it is likely that they choose to consider them as indicative of poor performance in that category. Therefore, I mainly choose to consider them as indicating poor performance, but also investigate the other option by excluding them from the sample.

Thirdly, LSEG implements retroactive ratings changes, which could impact the processes of relating ESG to returns (Berg et al., 2020). The scores, however, are considered definitive for all historical years except for the five most recent (LSEG, 2023). Therefore, this issue may be more evident when considering the closest periods or comparing longer longitudinal periods. However, as investors use the scores and consider them in relation to the year they invest, this can be considered to have a marginal effect on the obtained results, at least if one does not mix corrected and uncorrected scores, as in this study, which only covers the newest uncorrected period.

### 4.2. Data selection

The Thomson Reuters Business Classification (TRBC), one of the three main sector classification systems (Fidelity, 2023; ETF.com, 2015), is used to divide companies into the three sectors used in this research. TRBC comprises 13 different economic sectors. The selection of sectors for this study is primarily based on their different scopes of operations, which may be reflected differently in terms of ESG. Additionally, the broadest definition of the sectors is used to include a large number of companies with ratings over all five years (2018-2022). Table 3 provides an overview of how these three economic sectors are further divided into business sectors. These business sectors are then subdivided into industry groups, industries, and finally, specific activities.

**Table 3**
Overview of Thomson Reuters Business Classification (TRBC).
This table explains how TRBC further divides the three economic sectors into business sectors.

| Thomson Reuters Business Classification | | | |
|---|---|---|---|
| Economic Sector | Industrials | Financials | Healthcare |
| Business Sector | -Industrial Goods<br>-Industrial & Commercial Services<br>-Industrial Conglomerates<br>-Transportation | -Banking & Investment Services<br>-Real Estate<br>-Collective Investments<br>-Investment Holding Companies | -Healthcare Services & Equipment<br>-Pharmaceuticals & Medical Research |

The study is limited to covering the European area to provide the opportunity to exclude the geographic area effect and solely focus on sector differences. The chosen time period, 2018-

2022, is relatively short but is motivated by the accessibility to numerous companies with obtained ESG ratings and the fact that ESG rating firms are continuously revising their rating models to stay accurate, which may influence longitudinal comparability (Boubaker, 2018). It is also a time duration that has been applied in a lot of previous research in the field (e.g., Sahut and Pasquini-Descomps, 2015; Shanaev & Ghimire, 2022). The period includes the corona crisis and the start of the Russian-Ukraine war; I note that these two specific events may influence the obtained results, and I will discuss this further later on (Section 6.3).

All companies with an ESG rating during any of the years in the three sectors are selected for the sample. Simultaneously, while collecting ESG data, I also gather the closing prices for all the companies on a monthly basis. Another exclusion is then performed by removing companies that miss a closing price for any month during a year. The same procedure described above for ESG is also applied to the three pillars E, S, and G.

#### 4.2.1. Summary statistics of selected data

Summary statistics of the ESG data (including E, S, and G separately) for the entire period are presented in Table 4. In the Appendix, the same data are presented for each year individually. Due to the exclusion of companies lacking scores and closing prices, the number of companies differs slightly among ESG, E, S, and G. As seen in Table 4, the mean scores are relatively similar in all three industries, with the lowest mean related to the E pillar. This pillar also has the highest standard deviation and lowest score, which is related to the considerable percentage of zero scores (see section 4.1.1). For the financials and industrials sectors, the E pillar even has the highest score value. The number of scored companies increased for all sectors for the period 2018-2020; thereafter, they have remained at relatively stable levels, as seen in Figure 4, Panel A. Figure 4, Panel B, shows that for the financial sector, the mean score has increased for all four measures every year, except in the second year of ESG and the S-pillar where the mean decreased. The same pattern is not observed for the healthcare and industrials sectors, where only the G pillar has increased every year during the period. For the other three, there have even been decreases in the mean.

**Table 4**

Summary statistics of the ESG data.

This table provides summary statistics for the ESG data for the period 2018-2022. It shows the number of observations (N), mean, maximum and minimum value, standard deviation (Std. Dev), skewness, and kurtosis.

| | N | Mean | Max/Min | Std. Dev. | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| Financials: | | | | | | |
| ESG | 1628 | 49.59 | 95.74/1.28 | 21.68 | -0.01 | -0.88 |
| E | 1627 | 38.22 | 99.40/0.00 | 31.38 | 0.40 | -1.23 |
| S | 1627 | 51.87 | 97.67/0.59 | 22.85 | -0.19 | -0.76 |
| G | 1628 | 51.52 | 96.97/1-24 | 25.10 | -0.06 | -1.17 |
| Healthcare: | | | | | | |
| ESG | 810 | 50.31 | 95.91/1.59 | 22.48 | -0.06 | -0.88 |
| E | 808 | 35.77 | 94.46/0.00 | 29.18 | 0.23 | -1.20 |
| S | 808 | 54.99 | 97.71/0.78 | 27.45 | -0.26 | -1.12 |
| G | 809 | 53.22 | 98.09/1.24 | 21.61 | -0.14 | -0.76 |
| Industrials: | | | | | | |
| ESG | 1876 | 51.45 | 94.36/2.10 | 20.78 | -0.19 | -0.84 |
| E | 1876 | 45.09 | 99.14/0.00 | 26.02 | 0.06 | -1.07 |
| S | 1876 | 55.72 | 98.35/0.97 | 23.54 | -0.31 | -0.83 |
| G | 1877 | 52.21 | 96.31/2.41 | 22.48 | -0.18 | -0.97 |

For the regression models used in the methodology (see Section 5.3), risk-free rates and returns of Fama and French risk factors are collected from the website of French (2023). The returns used in creating the factors are an updated version of Fama and French (2012). I collect the factors on a monthly basis and select them for the area of this study, i.e., Europe. This dataset quite closely reflects the same area as the ESG data. Summary statistics are presented in Table 5.

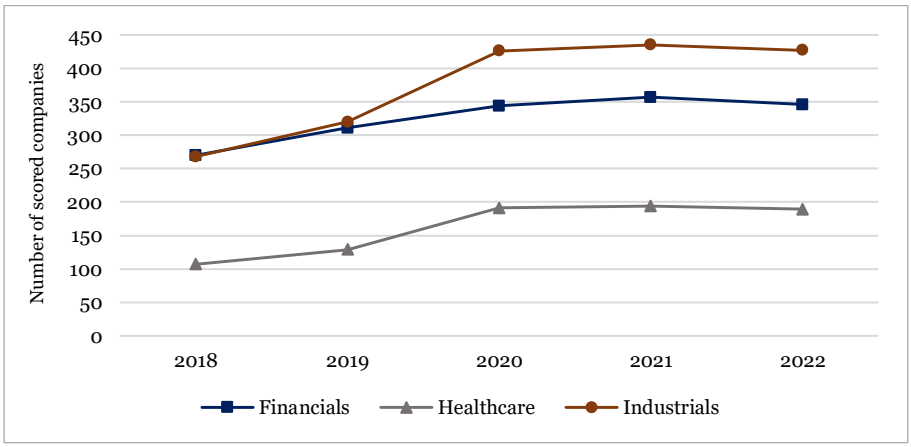
**Table 5**

Summary statistics of Fama and French risk factors.

This table reports summary statistics of the Fama and French risk factors used in the regressions over the period 2018-2022, including Mkt-Rf (market excess return), SMB (size factor), HML (value factor), RMW (profitability factor), CMA (investment factor), and MOM (momentum factor). It also incorporates the risk-free rate (Rf), which is used to obtain the excess returns of the tested portfolios. The table shows the number of observations (N), mean, maximum and minimum value, standard deviation (Std. Dev), skewness, and kurtosis.

| | N | Mean | Max/Min | Std. Dev. | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| Fama French 3-factor: | | | | | | |
| Mkt-Rf | 60 | 0.0026 | 0.1662/-0.1544 | 0.0563 | -0.0772 | 0.8354 |
| SMB | 60 | -0.0008 | 0.0503/-0.0422 | 0.0181 | 0.4237 | 0.6328 |
| HML | 60 | -0.0014 | 0.1209/-0.1130 | 0.0363 | 0.6566 | 3.1969 |
| Rf | 60 | 0.0010 | 0.0033/0.0000 | 0.0009 | 0.3678 | -0.9331 |
| Fama French 5-factor: | | | | | | |
| Mkt-Rf | 60 | 0.0026 | 0.1662/-0,1544 | 0.0563 | -0.0772 | 0.8354 |
| SMB | 60 | -0,0007 | 0.0472/-0.0506 | 0.0173 | 0.2175 | 1.1329 |
| HML | 60 | -0,0014 | 0.1209/-0.1130 | 0.0363 | 0.6566 | 3.1969 |
| RMW | 60 | 0.0028 | 0.0345/-0.0540 | 0.0167 | -0.8679 | 1.6625 |
| CMA | 60 | -0,0032 | 0.0521/-0.0439 | 0.0189 | 0.2659 | 0.6833 |
| Rf | 60 | 0.0010 | 0.0033/0.000 | 0.0009 | 0.3678 | -0.9331 |
| MOM | 60 | 0.0064 | 0.0850/-0.1839 | 0.0382 | -1.0152 | 9.5272 |

Panel A:




Panel B:

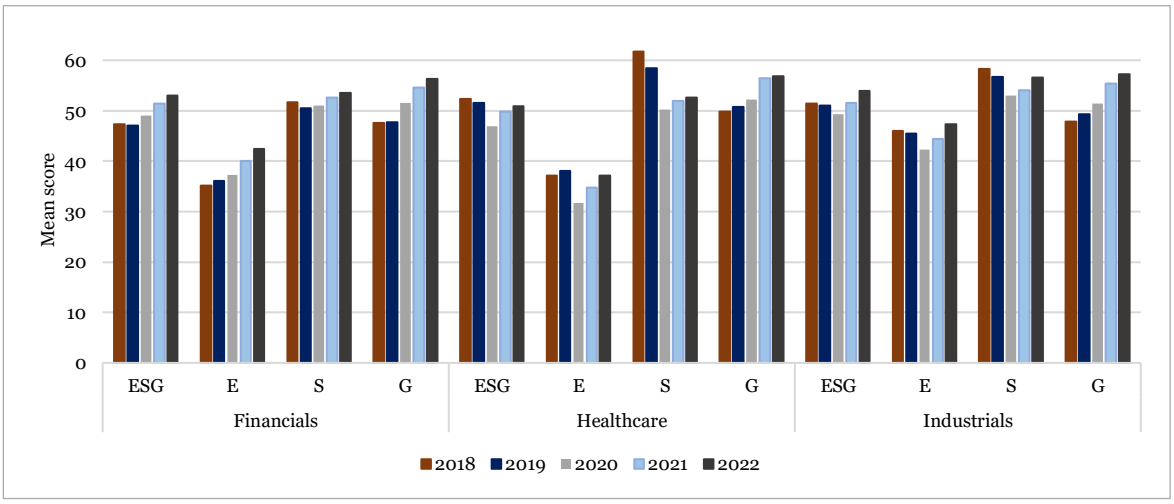



**Figure 4.** Change in the number of ESG-scored companies and mean scores. Panel A shows the number of ESG-scored companies within each sector (financials, healthcare, and industrials) during the period 2018-2022. Panel B presents the development of the mean score for ESG, E, S and G during the period 2018-2022 for each sector mentioned above. The sectors are classified according to Thomson Reuters Business Classification (TRBC), and the ESG data used are from LSEG.

# 5. Methodology

## 5.1. Portfolio construction

To study the difference in stock returns between companies with high ESG ratings compared to low ESG ratings, I employ a widely used method of constructing different portfolios (see e.g., Dorfleitner et al., 2020; Frazzini and Pedersen, 2014). This is the most direct test to discover how ESG relates to the value of portfolios (Hvidkjær, 2017). The constructed portfolios are based on the firms' ESG scores, and I create three different portfolios each year per sector, weighted as follows:

- High ESG Portfolio: companies with the 30% highest ratings within the sector.
- Medium ESG Portfolio: companies with scores in the middle, i.e., 40%.
- Low ESG Portfolio: companies with the 30% lowest ratings within the sector.

The weighting ratios are based on the method used by Fama and French (1993), where they sort book-to-market equity in a similar way. However, other sorting options are also possible. The key here is to create a clear distinction between the portfolios with high and low ESG values to enable the comparison of whether their values affect stock returns. The portfolios are rebalanced annually according to the new ratings, such that companies for every year will be placed in the portfolio which match their score. Once all portfolios are created, I calculate the monthly return $r_{i,t}$ for all companies in the portfolios according to:

$$r_{i,t} = \frac{Close\ price_{i,t}}{Close\ price_{i,t-1}} - 1 \tag{3}$$

I decide to have the portfolios equally weighted so that all companies have an equal proportion in the portfolios, and therefore the same influence on the overall portfolio performance. The portfolio return is thereby the average of the individual companies' returns. In addition to the above portfolios, a high-minus-low (HML) ESG portfolio is constructed, comprising the difference each month between the return on the High ESG Portfolio and the Low ESG Portfolio. This portfolio is synonymous with taking a long position in the high ESG portfolio and a short position in the low ESG portfolio. It is a regular method used in financial research with the purpose to test if the high-scored portfolios outperform the low-scored ones. The portfolio construction procedure is carried out for ESG and its three pillars every year between 2018 and 2022, resulting in a total of 48 different portfolios each year when considering all three sectors.

The procedure includes sorting according to ratings in all four ESG measures separately, which means that a company selected in a portfolio due to a high E may not necessarily perform to place among the highest according to one of the other measures. This provides the opportunity to study the performance related to any of the pillars without the focus on high ESG-performance overall, contributing to the purpose of the study, to have a similar focus on the three pillars as on the ESG measure as a whole. The construction is done for the three sectors in the same way; however, since I chose to include all companies with ratings and closing prices every year, the number of companies in each portfolio differs among sectors and during years. Nevertheless, by doing this, I cover the sectors carefully and obtain the broadest possible opportunity to compare them in relation to the industry classification TRBC. Due to the high number of zero scores for the E-pillar (as explained in Section 4.1.1), I decide to also create portfolios excluding them to see if it affects the outcomes.

### 5.2. Portfolio financial performance

To evaluate the performance of the portfolios in relation to their risk, I calculate the Sharpe ratio (SR) for all portfolios during the studied period according to:

$$Sharpe\ ratio\ (SR) = \frac{r_p - r_f}{\sigma_p} \quad (4)$$

where $r_p$ represents the portfolio return, $r_f$ represents the risk-free rate, and $\sigma_p$ represents the standard deviation of portfolio p. The SR is a commonly used measure in portfolio analysis and is an important aspect since it allows investors to compare the performance of different portfolios or investments on a risk-adjusted basis. It is also integral to the theory constructed by Pedersen et. al (2021), as described in Section 2.2. A high SR indicates a portfolio with a high excess return relative to risk, measured by standard deviation.

### 5.3. Regression models

To examine whether there is a difference in stock return between portfolios with high versus low ESG scores, I employ the Fama and French (1993, 2015) extensions of the CAPM, which identify additional factors explaining the returns of a security. Fama and French (1993) extend the CAPM by recognizing that companies with smaller market capitalizations outperform those with high market capitalizations, and that companies with a higher book-to-market ratio (value

stocks) outperform those with a lower book-to-market ratio (growth stocks). This extension leads to the so-called three-factor model described by:

$$R_{it} - R_{Ft} = a_i + b_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + e_{it} \quad (5)$$

where $R_{it}$ is the return of the studied ESG portfolio for month *t*, $R_{Ft}$ is the risk-free rate, $R_{Mt}$ is the return of the market. $SMB_t$ and $HML_t$ are the differences between the returns of, small versus big stocks and value versus growth stocks, respectively. The intercept $a_i$ measure the abnormal return of the tested portfolio (i.e., Jensen's alpha; see Section 2.1).

A later further extension of this model by Fama and French (2015) included two additional factors considering that companies with reported higher future earnings outperform those with lower, and firms engaged in big growth projects experience more losses than those that are not. This extended model is used in the study to include more factors that otherwise would be covered by alpha as abnormal return. Equation 6 describes the model; the two additional factors are thus the profitability factor $RMW_t$ (robust minus weak) and the investment factor $CMA_t$ (conservative minus aggressive).

$$R_{it} - R_{Ft} = a_i + b_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t + e_{it} \quad (6)$$

I begin using Equation 6, the five-factor model, to explore the presence of abnormal returns. With this model, I use the constructed portfolios minus the risk-free rate as the dependent variable. To ensure the robustness of the results, I also verify the outcomes using Equation 5, the three-factor model, and extending the five-factor model by including the momentum factor $MOM_t$ according to

$$R_{it} - R_{Ft} = a_i + b_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t + m_i MOM_t + e_{it} \quad (7)$$

This momentum factor captures the effect that positive returns of an asset tend to persist for up to a year, i.e., a momentum property.

# 6. Analysis and discussion

## 6.1. Overall expectations of ESG influence on stock returns and sector characteristics

In this section, I begin by examining outcomes specifically associated with the individual sectors. I will discuss the results in alignment with Hypothesis 1, which posits that higher ESG portfolios are anticipated to yield lower expected returns. Additionally, within the context of the financial sector, I address the outcomes for Hypothesis 4, aligning with the overarching Hypothesis 1. Thereafter, I evaluate the Sharpe ratios of the portfolios, which, according to Hypothesis 2, are expected to be higher for low-scored portfolios. The analysis of potentially observed differences between the sectors (following Hypotheses 3 and 5) is deferred to Section 6.2.

### 6.1.1. The financial sector

Table 6 presents the regression outcomes for the financial sector portfolios using the Fama and French five-factor model (FF5) over the period 2018-2022. As shown, none of the portfolios exhibit a significant sign of abnormal returns (i.e., significant alpha) during the considered period. The alpha values also appear to be low. The results remain robust when testing against both the three-factor model (FF3) and FF5 augmented with momentum (FF5-MOM), as shown in Table 7. However, in certain instances, when the values of alpha are close to zero, there is a change in sign for some portfolios when using the different models (for HML ESG, High E, HML E and HML G). Given the values' proximity to zero, and that none of these values are significant, it is not motivated for any further reflections. Furthermore, although not statistically significant, the HML portfolios (except HML E) display negative alphas, suggesting that low-scoring portfolios outperform high-scoring ones. This aligns with overall expectations, except that the high-scoring portfolios do not to show positive alphas. However, as this is not significant, one cannot reject that all portfolios perform just as the market, and there is no evidence that an ESG strategy would affect the outcome in this case.

**Table 6**

Financial sector: Fama and French five factor (FF5) regressions.

This table shows results from the FF5 regressions for the financial sector. The dependent variable is the portfolio excess returns (portfolio return - risk-free rate). The explanatory variables are alpha (the constant), Mkt-Rf (market excess return), SMB (size factor), HML (value factor), RMW (profitability factor), and CMA (investment factor). There are 60 observations in each model, and the sample period runs between January 2018 and December 2022. Standard errors are reported in parentheses, p-values are denoted as *p <0,1, **p <0,05, ***p <0,01.

| Portfolio | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Variables | High ESG | Medium ESG | Low ESG | HML ESG | High E | Medium E | Low E | HML E |
| FF5 alpha | -0.0011 | -0.0018 | -0.0019 | -0.0002 | -0.0004 | -0.0015 | -0.0024 | 0.0010 |
| | (0.0025) | (0.0016) | (0.0016) | (0.0024) | (0.0025) | (0.0015) | (0.0017) | (0.0025) |
| Mkt-Rf | 1.1890*** | 0.9338*** | 0.8677*** | 0.3191*** | 1.1685*** | 0.9720*** | 0.8487*** | 0.3177*** |
| | (0.0535) | (0.0346) | (0.0339) | (0.0529) | (0.0536) | (0.0327) | (0.0361) | (0.0534) |
| SMB | 0.1183 | 0.5253*** | 0.5723*** | -0.4403*** | 0.0680 | 0.4666*** | 0.7045*** | -0.6227*** |
| | (0.1592) | (0.1030) | (0.1009) | (0.1574) | (0.1594) | (0.0972) | (0.1076) | (0.1587) |
| HML | 0.5169*** | 0.2688** | 0.0295 | 0.4981*** | 0.5268*** | 0.2507** | 0.0818 | 0.4559*** |
| | (0.1651) | (0.1068) | (0.1046) | (0.1631) | (0.1652) | (0.1008) | (0.1115) | (0.1645) |
| RMW | -0.6872*** | -0.1328 | -0.1259 | -0.5488** | -0.7036*** | -0.1481 | -0.0537 | -0.6372** |
| | (0.2484) | (0.1607) | (0.1574) | (0.2456) | (0.2486) | (0.1517) | (0.1678) | (0.2476) |
| CMA | -0.0364 | -0.2330 | -0.1010 | 0.0563 | -0.5770 | -0.1868 | -0.0766 | -0.0933 |
| | (0.2798) | (0.1820) | (0.1774) | (0.2766) | (0.2801) | (0.1709) | (0.1891) | (0.2789) |
| $R^2$ | 0.9518 | 0.9667 | 0.9613 | 0.7988 | 0.9500 | 0.9715 | 0.9569 | 0.7794 |
| Adj. $R^2$ | 0.9473 | 0.9636 | 0.9577 | 0.7802 | 0.9454 | 0.9689 | 0.9529 | 0.7589 |
| Portfolio | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| Variables | High S | Medium S | Low S | HML S | High G | Medium G | Low G | HML G |
| FF5 alpha | -0.0014 | -0.0017 | -0.0011 | -0.0012 | -0.0011 | -0.0024 | -0.0018 | -0.0003 |
| | (0.0023) | (0.0017) | (0.0017) | (0.0025) | (0.0023) | (0.0014) | (0.0021) | (0.0026) |
| Mkt-Rf | 1.1900*** | 0.9546*** | 0.8513*** | 0.3365*** | 1.1570*** | 0.9640*** | 0.8849*** | 0.2699*** |
| | (0.0499) | (0.0363) | (0.0363) | (0.0544) | (0.0503) | (0.0309) | (0.0456) | (0.0574) |
| SMB | 0.0847 | 0.5637*** | 0.5591*** | -0.4607*** | 0.2737* | 0.4017*** | 0.5942*** | -0.3068* |
| | (0.1485) | (0.1079) | (0.1081) | (0.1619) | (0.1496) | (0.0919) | (0.1357) | (0.1708) |
| HML | 0.5517*** | 0.1754 | 0.1538 | 0.4088** | 0.4073** | 0.3150*** | 0.1289 | -0.2892 |
| | (0.1539) | (0.1119) | (0.1121) | (0.1678) | (0.1551) | (0.0953) | (0.1407) | (0.1770) |
| RMW | -0.6628*** | -0.1553 | -0.0834 | -0.5668** | -0.5647** | -0.2406* | 0.0281 | -0.5802** |
| | (0.2316) | (0.1683) | (0.1687) | (0.2526) | (0.2334) | (0.1434) | (0.2117) | (0.2664) |
| CMA | -0.1942 | -0.1059 | -0.1497 | -0.0527 | 0.0672 | -0.2777* | -0.0850 | 0.1440 |
| | (0.2609) | (0.1896) | (0.1900) | (0.2845) | (0.2629) | (0.1615) | (0,2385) | (0.3001) |
| $R^2$ | 0.9579 | 0.9639 | 0.9559 | 0.7537 | 0.9536 | 0.9745 | 0.9361 | 0.6795 |
| Adj. $R^2$ | 0.9540 | 0.9606 | 0.9518 | 0.7309 | 0.9493 | 0.9721 | 0.9302 | 0.6498 |

**Table 7**
Financial sector: robustness tests using FF3 and FF5-MOM.
This table reports the abnormal returns (alpha) for portfolios in the financial sector when testing for the Fama and French three factor model (FF3) (controlling for market excess return, size and value factors) and FF5 (see description in Table 7) including momentum factor. The dependent variable is the portfolio excess returns (portfolio return - risk-free rate). There are 60 observations in each model, and the sample period runs between January 2018 and December 2022. Standard errors are reported in parentheses, p-values are denoted as
*p <0,1, **p <0,05, ***p <0,01.

| | Portfolio | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|---|
| | | High ESG | Medium ESG | Low ESG | HML ESG | High E | Medium E | Low E | HML E |
| FF3 alpha | | -0.0024 | -0.0013 | -0.0018 | -0.0016 | -0.0014 | -0.0012 | -0.0022 | -0.0001 |
| | | (0.0024) | (0.0015) | (0.0014) | (0.0023) | (0.0024) | (0.0014) | (0.0015) | (0.0024) |
| FF5-MOM alpha | | 0.0000 | -0.0017 | -0.0021 | 0.0011 | 0.0006 | -0.0015 | -0.0024 | 0.0020 |
| | | (0.0026) | (0.0017) | (0.0017) | (0.0025) | (0.0026) | (0.0016) | (0.0018) | (0.0026) |
| | Portfolio | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| | | High S | Medium S | Low S | HML S | High G | Medium G | Low G | HML G |
| FF3 alpha | | -0.0022 | -0.0016 | -0.0007 | -0.0023 | -0.0024 | -0.0021 | -0.0014 | -0.0019 |
| | | (0.0023) | (0.0015) | (0.0015) | (0.0024) | (0.0022) | (0.0014) | (0.0019) | (0.0025) |
| FF5-MOM alpha | | -0.0003 | -0.0017 | -0.0012 | -0.0001 | -0.0000 | -0.0023 | -0.0018 | 0.0008 |
| | | (0.0024) | (0.0018) | (0.0018) | (0.0026) | (0.0024) | (0.0015) | (0.0022) | (0.0028) |

For the four portfolios based on the E-scores, I also conduct tests when excluding companies with a score value of zero in the portfolio construction, due to their high number in the sample and the uncertainty attached to them (see section 4.1.1 where I describe this more thoroughly). The results of this test reveal a weak significant alpha of 0.0092 at the 10% significance level for the HML E portfolio, as seen in Table 8. This indicates that the results may vary depending on how zero scores for LSEG ESG rating are considered, consistent with the findings of Ehlers et al. (2023). In this specific case, there is weak evidence of outperformance by the high-scored portfolios (although not robust when testing for FF3 and FF5-MOM). However, overall, it is not possible to reject that the portfolios related to the financial sector perform similarly to the market portfolio (Hypothesis H4 cannot be accepted). Therefore, an ESG investment strategy does not appear to be useful for an investor since there seems not to be any relation between ESG scores and stock returns. My results, therefore, confirm those of Batae et al. (2021) regarding the E and S pillars within the financial sector, which show no clear relation to stock return, but not in their results regarding the G pillar where they find a negative relationship. Their study considered European banks, while my study more broadly focuses on the financial sector, which makes the studies hard to compare in that sense.

**Table 8**
Financial sector: E portfolios constructed excluding zero scores.
This table reports the alphas of the Fama and French factor models (FF5, FF3, and FF5-MOM) for the environmental (E) portfolios when excluding zero-scores from the portfolio sorting. The dependent variable is the portfolio excess returns (portfolio return - risk-free rate). The explanatory variables are as in Table 7 and 8. There are 60 observations in each model, and the sample period runs between January 2018 and December 2022. Standard errors are reported in parentheses, p-values are denoted as *p <0,1, **p <0,05, ***p <0,01.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | High E | Medium E | Low E | HML E |
| FF5 alpha | 0.0080 | -0.0011 | -0.0022 | 0.0092* |
| | (0.0051) | (0.0016) | (0.0017) | (0.0051) |
| FF3 alpha | 0.0054 | -0.0007 | -0.0023 | 0.0068 |
| | (0.0048) | (0.0015) | (0.0015) | (0.0049) |
| FF5-MOM alpha | 0.0080 | -0.0014 | -0.0011 | 0.0081 |
| | (0.0054) | (0.0017) | (0.0017) | (0.0054) |

The results align with my expectations, in that none of the components of ESG stands out within the sector, as suggested by the connection of stakeholder theory and CSR. I find this reasonable since there doesn't seem to be any compelling reasons for any of the pillars to distinctly stand out in this sector. This result contradicts the findings of Bullay (2019), Crespi and Migliavacca (2020), and partly also Batae et al. (2021), which show more differences among the pillars in the financial sector. Again, circumstances such as differences in samples, data, and time periods may explain these variations in the outcomes.

When I relate my observed result of no relationship to the theory by Pedersen et al. (2021), I describe it as the scenario in which there are many ESG-aware investors in the economy, such as ESG information is already incorporated into stock prices, resulting in no clear relation between ESG and stock returns. Moreover, in the context of the theory by Pástor et al. (2021) this depicts a scenario where ESG tastes among investors can be considered equally strong, and therefore stock prices reflect their preferences, with neither ESG nor non-ESG investors earning alpha. It is exciting to see that even when the outcome does not align with expectations, the theories still effectively describe the observed results.

### 6.1.2. The healthcare sector

Table 9 shows the regression outcomes when focusing on the healthcare sector. As anticipated, the results differ somewhat from those in the financial sector. Notably, some portfolios exhibit significant abnormal returns; some of them even hold when tested by removing or excluding asset pricing factors, as shown in Table 10. For instance, the Low ESG portfolio demonstrates a slightly positive alpha of 0.0157, which is both significant and higher than the Medium- and High-ESG portfolios. This result suggests that companies with a low ESG score outperform their higher-scored counterparts. The trend is reinforced when considering the HML ESG

portfolio, which exhibits a negative alpha (-0.0159), indicating that low-scored companies outperform high-scored ones. These two findings remain significant for the FF5-MOM but lose significance for the FF3. They go in the opposite direction to those of Ashwin Kumar et al. (2016), who find a positive relationship between ESG and stock returns in this sector. As mentioned before, there are often circumstances that make outcomes of studies hard to compare. An example in this case is that they investigate companies listed on the Dow Jones Sustainable Index, which captures a more worldwide view than mine.

No significant abnormal returns are observed for any of the E- and S-portfolios when using FF5. However, when incorporating the momentum factor into the regression model, weaker signs of significant abnormal returns emerge for the Low E and S portfolios and the HML E and S portfolios. In both those cases, there is evidence suggesting that low-scored portfolios may outperform the high-scored ones. Interestingly, the most significant abnormal returns are associated with the G-pillar. The low-scored G-portfolio outperforms the high-scored one, with an HML G alpha of -0.0230. This result holds significance across all three regression models. Table 11 presents the test of excluding portfolios assigned a zero score from the E portfolios, which does not alter the results concerning the healthcare sector for FF5[7].

[7] The weaker sign of significance I find for E through FF5-MOM in the robustness test disappears when removing zero-scored companies (see Table 10 and 11). This again highlights the importance of how LSEG's zero scores are considered.

**Table 9**
Healthcare sector: Fama and French five factor (FF5) regressions.
This table shows results from the FF5 regressions for the healthcare sector. The dependent variable is the portfolio excess returns (portfolio return - risk-free rate). The explanatory variables are alpha (the constant), Mkt-Rf (market excess return), SMB (size factor), HML (value factor), RMW (profitability factor), and CMA (investment factor). There are 60 observations in each model, and the sample period runs between January 2018 and December 2022. Standard errors are reported in parentheses, p-values are denoted as *p <0,1, **p <0,05, ***p <0,01.

| Portfolio | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Variables | High ESG | Medium ESG | Low ESG | HML ESG | High E | Medium E | Low E | HML E |
| FF5 alpha | 0.0007 | 0.0009 | 0.0157* | -0.0159* | 0.0013 | 0.0028 | 0.0128 | -0.0125 |
| | (0.0026) | (0.0030) | (0.0088) | (0.0089) | (0.0022) | (0.0029) | (0.0089) | (0.0089) |
| MktRf | 0.7981*** | 0.8051*** | 0.8115*** | -0.0155 | 0.7997*** | 0.8051*** | 0.8088*** | -0.0113 |
| | (0.0568) | (0.0661) | (0.1921) | (0.1925) | (0.0487) | (0.0634) | (0.1936) | (0.1932) |
| SMB | 0.088837 | 0.7462*** | 0.3994 | -0.2969 | 0.1889 | 0.5856*** | 0.5399 | -0.3373 |
| | (0.168848) | (0.1967) | (0.5715) | (0.5725) | (0.1448) | (0.1887) | (0.5759) | (0.5747) |
| HML | -0.5941*** | -0.5133** | -1.9667*** | 1.3834** | -0.6439*** | -0.5059** | -1.9094*** | 1.2764** |
| | (0.1750) | (0.2039) | (0.5924) | (0.5935) | (0.1501) | (0.1956) | (0.5969) | (0.5957) |
| RMW | -0.5884** | -0.9766*** | -3.4874*** | 2.9116*** | -0.6047*** | -0.9244*** | -3.5295*** | 2.9375*** |
| | (0.2634) | (0.3068) | (0.8915) | (0.8930) | (0.2258) | (0.2944) | (0.8983) | (0.8964) |
| CMA | -0.3272 | -0.6455* | -0.8450 | 0.5095 | -0.2076 | -0.6715** | -0.9430 | 0.7272 |
| | (0.2967) | (0.3456) | (1.0042) | (1.0059) | (0.2544) | (0.3316) | (1.0118) | (1.0098) |
| $R^2$ | 0.8721 | 0.8716 | 0.5161 | 0.2433 | 0.9026 | 0.8755 | 0.5224 | 0.2449 |
| Adj. $R^2$ | 0.8603 | 0.8597 | 0.4713 | 0.17328 | 0.8936 | 0.8639 | 0.4782 | 0.1750 |
| Portfolio | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| Variables | High S | Medium S | Low S | HML S | High G | Medium G | Low G | HML G |
| FF5 alpha | 0.0015 | 0.0017 | 0.0141 | -0.0137 | -0.0009 | -0.0017 | 0.0211** | -0.0230** |
| | (0.0024) | (0.0028) | (0.0089) | (0.0090) | (0.0030) | (0.0029) | (0.0083) | (0.0088) |
| MktRf | 0.7867*** | 0.8302*** | 0.7877*** | -0.0031 | 0.7389*** | 0.8621*** | 0.7970*** | -0.0602 |
| | (0.0518) | (0.0618) | (0.1928) | (0.1948) | (0.0643) | (0.0623) | (0.1809) | (0.1910) |
| SMB | 0.1118 | 0.7941*** | 0.3430 | -0.2174 | 0.1611 | 0.7579*** | 0.3339 | -0.1590 |
| | (0.1540) | (0.1837) | (0.5736) | (0.5794) | (0.1912) | (0.1852) | (0.5381) | (0.5681) |
| HML | -0.6365*** | -0.5370*** | -1.876*** | 1.2499** | -0.3838* | -0.5672*** | -2.1029*** | 1.7299*** |
| | (0.1597) | (0.1904) | (0.5946) | (0.6006) | (0.1982) | (0.1920) | (0.5578) | (0.5888) |
| RMW | -0.8074*** | -0.9131*** | -3.3437*** | 2.5490*** | -0.6978** | -1.1085*** | -3.1915*** | 2.5064*** |
| | (0.2403) | (0.2865) | (0.8947) | (0.9038) | (0.2983) | (0.2889) | (0.8394) | (0.8861) |
| CMA | -0.2613 | -0.6788** | -0.8784 | 0.6089 | -0.7167** | -0.7508** | -0.3088 | -0.4161 |
| | (0.2706) | (0.3227) | (1.0078) | (1.0181) | (0.3360) | (0.3255) | (0.9455) | (0.9981) |
| $R^2$ | 0.8838 | 0.8948 | 0.4991 | 0.2190 | 0.8388 | 0.8979 | 0.5106 | 0.2322 |
| Adj. $R^2$ | 0.8730 | 0.8851 | 0.4528 | 0.1467 | 0.8238 | 0.8885 | 0.4652 | 0.1611 |

**Table 10**
Healthcare sector: robustness tests.
This table reports the abnormal returns (alpha) for portfolios in the healthcare sector when testing for the Fama and French three factor model (FF3) (controlling for market excess return, size and value factors) and FF5 (see description in Table 10) including momentum factor. The dependent variable is the portfolio excess returns (portfolio return - risk-free rate). There are 60 observations in each model, and the sample period runs between January 2018 and December 2022. Standard errors are reported in parentheses, p-values are denoted as *p <0,1, **p <0,05, ***p <0,01.

| | Portfolio | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|---|
| | | High ESG | Medium ESG | Low ESG | HML ESG | High E | Medium E | Low E | HML E |
| FF3 alpha | | 0.0004 | 0.0007 | 0.0109 | -0.0114 | 0.0007 | 0.0027 | 0.0082 | -0.0084 |
| | | (0.0025) | (0.0031) | (0.0092) | (0.0089) | (0.0022) | (0.0030) | (0.0093) | (0.0090) |
| FF5-MOM alpha | | -0.0015 | 0.0009 | 0.01746* | -0.0200** | -0.0003 | 0.0008 | 0.01651* | -0.0178* |
| | | (0.0026) | (0.0032) | (0.0094) | (0.0093) | (0.0023) | (0.0030) | (0.0094) | (0.0092) |
| | Portfolio | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| | | High S | Medium S | Low S | HML S | High G | Medium G | Low G | HML G |
| FF3 alpha | | 0.0005 | 0.0017 | 0.0097 | -0.0101 | -0.0004 | -0.0019 | 0.0155 | -0.0169* |
| | | (0.0024) | (0.0029) | (0.0092) | (0.0088) | (0.0029) | (0.0031) | (0.0086) | (0.0087) |
| FF5-MOM alpha | | -0.0006 | 0.0011 | 0.0165* | -0.0181* | -0.0022 | -0.0021 | 0.0222** | -0.0253*** |
| | | (0.0024) | (0.0030) | (0.0094) | (0.0094) | (0.0031) | (0.0031) | (0.0089) | (0.0093) |

**Table 11**
Healthcare sector: E-portfolios constructed excluding zero scores.
This table reports the alphas of the Fama and French factor models (FF5, FF3, and FF5-MOM) for the environmental (E) portfolios when excluding zero-scores from the portfolio sorting. The dependent variable is the average portfolio excess returns (portfolio return - risk-free rate). The explanatory variables are as in Table 10 and 11. There are 60 observations in each model, and the sample period runs between January 2018 and December 2022. Standard errors are reported in parentheses, p-values are denoted as *p <0,1, **p <0,05, ***p <0,01.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | High E | Medium E | Low E | HML E |
| FF5 | 0.0020 | 0.0017 | 0.0029 | -0.0019 |
| | (0.0026) | (0.0024) | (0.0039) | (0.0036) |
| FF3 | 0.0010 | 0.0024 | 0.0016 | -0.0015 |
| | (0.0025) | (0.0025) | (0.0039) | (0.0034) |
| FF5-MOM | 0.0003 | 0.0006 | 0.0006 | -0.0013 |
| | (0.0027) | (0.0025) | (0.0040) | (0.0038) |

In general, this sector tends to show that low-rated portfolios outperform high-rated ones. This is evident from the observation that HML portfolios consistently exhibit negative alphas, with this trend being particularly significant for HML G and HML ESG when considering the FF5 model. However, with the inclusion of the momentum factor, all four HML portfolios become statistically significant. This suggests a tendency for higher alphas in low-ranked portfolios compared to high-ranked ones; in many cases, these alphas also appear to be weakly positive. At the same time, there is more evidence of a negative alpha in the high scored portfolios, especially in relation to the G pillar; this tendency is particularly clear. It aligns with the sector-specific assumption and, more broadly, supports the relationship between ESG ranting and stock returns, as posited in hypotheses H1 and H5, i.e., that portfolios with high ratings exhibit a lower expected return than those with a low rating.

Finally, it is worth further consideration of the G pillar because it demonstrates the strongest abnormal returns for low-rated portfolios. The discovery of robust connections linked precisely to this pillar aligns with the findings of Pedersen et al. (2021) when they test their model against G. Intriguingly, they found the opposite relationship, with strongly scored G portfolios outperforming low-scored ones. However, my results reinforce their conclusions that the G pillar can be a valuable consideration for investors who already use many other investment factors in their portfolio decisions. The model by Pástor et al. (2021) suggests that my observed situation is a case with an existing G industry, with investors having different tastes for G. Tastes for high G in investments are reasonable, as good company performance related to governance factors influences the outcomes of E and S.

### 6.1.3. The industrial sector

The regressions in Table 12 suggest that when considering the industrial sector, there are once again different outcomes than for the other two sectors. Firstly, the HML ESG portfolio shows a slightly negative abnormal return (-0.0064), which is just significant at the 10% level and does not hold for the FF3 and FF5-MOM (see Table 13). The same pattern is found for HML E portfolio with an abnormal return of -0.0063, which is significant at the 5% level. Therefore, there is evidence that both low ESG and low E portfolios outperform their high counterparts. Removing companies with zero scores does not change the result in this sector (see Table 14). Moreover, the HML portfolios generally have negative scores, hinting at an outperformance of the low-scored portfolios, although it is not significant for the G and S portfolios, and one cannot determine if there is any relation between them and stock returns. This again relates to the scenario of no differences in tastes and many aware investors in the economy (as described before in relation to the financial sector, Section 6.1.1).

**Table 12**
Fama and French five factor (FF5) regressions: Industrial sector
This table shows results from the FF5 regressions for the industrial sector. The dependent variable is the portfolio excess returns (portfolio return - risk-free rate). The explanatory variables are alpha (the constant), Mkt-Rf (market excess return), SMB (size factor), HML (value factor), RMW (profitability factor), and CMA (investment factor). There are 60 observations in each model, and the sample period runs between January 2018 and December 2022. Standard errors are reported in parentheses, p-values are denoted as *p <0,1, **p <0,05, ***p <0,01.

| Portfolio | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Variables | High ESG | Medium ESG | Low ESG | HML ESG | High E | Medium E | Low E | HML E |
| FF5 alpha | -0.0025 | -0.0016 | 0.0028 | -0.0064* | -0.0070 | -0.0071 | -0.0017 | -0.0063** |
| | (0.0021) | (0.0016) | (0.0025) | (0.0032) | (0.0055) | (0.0056) | (0.0053) | (0.0030) |
| MktRf | 1.1409*** | 1.1508*** | 0.9603 | 0.1784** | 0.9627*** | 0.9570*** | 0.7929*** | 0.1676** |
| | (0.0467) | (0.0349) | (0.0541) | (0.0691) | (0.1193) | (0.1220) | (0.1144) | (0.065) |
| SMB | 0.6076*** | 0.6233*** | 0.8158 | -0.1945 | 0.3851 | 0.7118* | 0.7315** | -0.3326* |
| | (0.1390) | (0.1038) | (0.1611) | (0.2056) | (0.3549) | (0.3630) | (0.3404) | (0.1927) |
| HML | 0.4677*** | 0.1452 | -0.1430 | 0.6215*** | 0.4210 | 0.0739 | -0.0176 | 0.4495** |
| | (0.1440) | (0.1075) | (0.1670) | (0.2131) | (0.3678) | (0.3763) | (0.3529) | (0.1997) |
| RMW | 0.4064* | 0.2617 | -0.3174 | 0.7364** | 0.2350 | -0.1001 | -0.2068 | 0.4545 |
| | (0.2168) | (0.1618) | (0.2512) | (0.3207) | (0.5535) | (0.5662) | (0.5310) | (0.3006) |
| CMA | -0.0583 | 0.0254 | 0.1051 | -0.1716 | -0.3311 | -0.0826 | -0.0121 | -0.3272 |
| | (0.2442) | (0.1823) | (0.2830) | (0.3612) | (0.6235) | (0.6378) | (0.5982) | (0.3386) |
| $R^2$ | 0.9598 | 0.9758 | 0.9221 | 0.4171 | 0.7233 | 0.7065 | 0.6580 | 0.3323 |
| Adj. $R^2$ | 0.9561 | 0.9735 | 0.9148 | 0.3632 | 0.6977 | 0.6794 | 0.6264 | 0.2705 |
| Portfolio | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| Variables | High S | Medium S | Low S | HML S | High G | Medium G | Low G | HML G |
| FF5 alpha | -0.0013 | -0.0018 | 0.0018 | -0.0041 | -0.0030 | 0.0004 | 0.0004 | -0.0044 |
| | (0.0019) | (0.0017) | (0.0022) | (0.0028) | (0.0022) | (0.0015) | (0.0022) | (0.0029) |
| MktRf | 1.1395*** | 1.1288*** | 0.9904*** | 0.1469** | 1.1813*** | 1.1061*** | 0.9732*** | 0.2059*** |
| | (0.0423) | (0.0361) | (0.0488) | (0.0608) | (0.0481) | (0.0332) | (0.0483) | (0.0632) |
| SMB | 0.6116*** | 0.6428*** | 0.7853*** | -0.1600 | 0.7453*** | 0.5319*** | 0.7981*** | -0.0391 |
| | (0.1259) | (0.1074) | (0.1452) | (0.1808) | (0.1431) | (0.0989) | (0.1438) | (0.1880) |
| HML | 0.3694*** | 0.2645** | -0.2012 | 0.5814*** | 0.3468** | 0.1002 | 0.0502 | 0.3075 |
| | (0.1305) | (0.1114) | (0.1505) | (0.1874) | (0.1484) | (0.1024) | (0.1490) | (0.1949) |
| RMW | 0.3317* | 0.3978** | -0.4223* | 0.7666*** | 0.5324** | 0.1187 | -0.2701 | 0.8151*** |
| | (0.1964) | (0.1676) | (0.2264) | (0.2820) | (0.2233) | (0.1541) | (0.2243) | (0.2932) |
| CMA | 0.1051 | -0.1637 | 0.1922 | -0.0954 | 0.0460 | 0.0909 | -0.1342 | 0.1720 |
| | (0.2213) | (0.1888) | (0.2551) | (0.3176) | (0.2515) | (0.1736) | (0.2526) | (0.3303) |
| R2 | 0.9655 | 0.9745 | 0.9370 | 0.4291 | 0.9597 | 0.9754 | 0.9420 | 0.3761 |
| Adjusted R2 | 0.9623 | 0.9721 | 0.9312 | 0.3762 | 0.9559 | 0.9731 | 0.9367 | 0.3184 |

**Table 13**
Industrial sector: robustness tests.
This table reports the abnormal returns (alpha) for portfolios in the industrial sector when testing for the Fama and French three factor model (FF3) (controlling for market excess return, size and value factors) and FF5 (see description in Table 13) including momentum factor. The dependent variable is the portfolio excess returns (portfolio return - risk-free rate). There are 60 observations in each model, and the sample period runs between January 2018 and December 2022. Standard errors are reported in parentheses, p-values are denoted as *p <0,1, **p <0,05, ***p <0,01.

| | Portfolio | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|---|
| | | High ESG | Medium ESG | Low ESG | HML ESG | High E | Medium E | Low E | HML E |
| FF3 alpha | | -0.0015 | -0.0011 | 0.0021 | -0.0045 | -0.0056 | -0.0070 | -0.0019 | -0.0046 |
| | | (0.0021) | (0.0015) | (0.0023) | (0.0031) | (0.0051) | (0.0052) | (0.0048) | (0.0028) |
| FF5-MOM alpha | | 0.0005 | 0.0004 | 0.0013 | -0.0017 | -0.0017 | -0.0019 | 0.0004 | -0.0031 |
| | | (0.0019) | (0.0015) | (0.0026) | (0.0028) | (0.0054) | (0.0056) | (0.0056) | (0.0029) |
| | Portfolio | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| | | High S | Medium S | Low S | HML S | High G | Medium G | Low G | HML G |
| FF3 alpha | | -0.0008 | -0.0004 | 0.0005 | -0.0023 | -0.0019 | 0.0005 | 0.0003 | -0.0032 |
| | | (0.0019) | (0.0016) | (0.0021) | (0.0027) | (0.0022) | (0.0014) | (0.0021) | (0.0029) |
| FF5-MOM alpha | | 0.0015 | -0.0003 | 0.0012 | -0.0007 | 0.0006 | 0.0013 | -0.0002 | -0.0001 |
| | | (0.0017) | (0.0017) | (0.0024) | (0.0026) | (0.0018) | (0.0016) | (0.0024) | (0.0025) |

**Table 14**
Industrial sector: E-portfolios constructed excluding zero scores.
This table reports the alphas of the Fama and French factor models (FF5, FF3, and FF5-MOM) for the environmental (E) portfolios when excluding zero-scores from the portfolio sorting. The dependent variable is the portfolio excess returns (portfolio return - risk-free rate). The explanatory variables are as in Table 13 and 14. There are 60 observations in each model, and the sample period runs between January 2018 and December 2022. Standard errors are reported in parentheses, p-values are denoted as *p <0,1, **p <0,05, ***p <0,01.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | High E | Medium E | Low E | HML E |
| FF5 | -0.0071 | -0.0073 | -0.0026 | -0.0055* |
| | (0.0055) | (0.0056) | (0.0054) | (0.0029) |
| FF3 | -0.0057 | -0.0072 | -0.0024 | -0.0043 |
| | (0.0051) | (0.0051) | (0.0050) | (0.0027) |
| FF5-MOM | -0.0018 | -0.0020 | 0.0000 | -0.0028 |
| | (0.0054) | (0.0055) | (0.0057) | (0.0029) |

Moreover, for the E and ESG pillar, hypothesis H1 can partly be accepted. Low-scored portfolios seem to slightly outperform high-scored ones, while the high-scored ones tend towards a negative alpha, and the low-scored ones have a tendency towards positive values. I could not confirm this last aspect, as all values are very close to zero. Furthermore, unlike the findings of Naimy et al. (2021), my results cannot identify a concave relation for ESG in this sector. This implies that stock returns initially improve with ESG, reach an optimal level, and then decline again. In my specific case, the lowest ESG seems to relate most positively to stock returns among the three portfolios. Additionally, the noted results align with my thoughts regarding the emphasis on the E component within this sector, indicating that it receives more attention than the other components of ESG. The fact that there can be profitable portfolio

strategies related to this suggests differences in investors' preferences for E. It is logical to imagine, as the theories I use do, that those with stronger preferences for E are willing to forego returns to prioritize non-financial preferences.

### 6.1.4. Are there investors willing to accept a lower Sharpe ratio for a higher ESG score?

When calculating the annualized Sharpe ratios for all portfolios, the obtained results, as Table 15 shows, mostly confirm Hypothesis H2. Overall, it appears that the high-rated portfolios for ESG, as well as its pillars, have lower Sharpe ratios (SR) than the low-rated ones. This suggests that investors with preferences for ESG are prepared to accept lower SR in accordance with Pedersen et al. (2021) model across the ESG-SR frontier. However, I identify an exceptional case where this does not seem to be true, concerning the E pillar for the financial sector. In this case, the reverse scenario appears to apply; portfolios with a high ranking have a higher SR. A possible explanation linked to the theory could be the presence of many ESG-aware investors who incorporate ESG information and only tilt their portfolios towards ESG to the extent that it maximizes the investment outcome. With a further thought that highly rated portfolios are less risky, that could be an explanation for the outcome. The observation that this seems to specifically apply to the financial sector may be grounded in what I mentioned earlier about stakeholder theory and the sector's reduced environmental costs associated with investing in green companies. Reduced environmental costs that entail lower risk then motivate ESG-conscious investors to seek higher ESG to the level where it is cost-effective.

**Table 15.** Annualized Sharpe ratio

| Annualized Sharpe ratio: | Financials | Healthcare | Industrials |
|---|---|---|---|
| ESG | | | |
| High | -0.028 | 0.205 | 0.032 |
| Medium | 0.071 | 0.206 | 0.113 |
| Low | 0.054 | 0.557 | 0.262 |
| HML | -0.048 | -0.500 | -0.365 |
| E | | | |
| High | 0.062 | 0.287 | -0.128 |
| Medium | 0.087 | 0.344 | -0.208 |
| Low | 0.014 | 0.437 | 0.016 |
| HML | 0.109 | -0.349 | -0.407 |
| S | | | |
| High | 0.028 | 0.277 | 0.108 |
| Medium | 0.057 | 0.265 | 0.142 |
| Low | 0.106 | 0.517 | 0.180 |
| HML | -0.106 | -0.447 | -0.128 |
| G | | | |
| High | 0.015 | 0.185 | 0.061 |
| Medium | 0.033 | 0.057 | 0.192 |
| Low | 0.073 | 0.792 | 0.159 |
| HML | -0.095 | -0.804 | -0.215 |

### 6.2. Are there any sector differences?

Based on this comparative study, I observe indications that differences may exist among the three studied sectors in how ESG and its pillars relate to stock returns. There are tendencies for distinct elements to stand out in the various sectors. In accordance with hypothesis H3, which suggests that the industrial sector stands out in relation to E, the results indicate that this sector exhibits the most significant difference between portfolios with high and low E. However, even the healthcare sector tends to exhibit this connection. Nonetheless, there is no indication that a lower E would result in a greater positive alpha for the industrial sector compared to the other sectors.

Furthermore, the results show that, in accordance with hypothesis H5, there is a tendency for a higher positive alpha for the low-ranked S portfolio within the healthcare sector (an alpha of 0.0141) than for the other two sectors (an alpha of -0.0011 and 0.0018 respectively). HML S in the healthcare sector reveals that the low-ranked portfolios outperform high-ranked ones, and this is also weakly significant using FF5-MOM. However, it is difficult to ensure purely statistically, but it may suggest that the S perspective is considered more for this sector.

The partial hypothesis suggesting that the healthcare sector would have an alpha closer to zero for both high- and low-rated E portfolios does not seem to hold, as it is the financial sector that indicates this tendency. However, the alphas for the healthcare sector appear to be lower than that those of the industrial sector. The result for this partial hypothesis goes in the direction of Sherman et al. (2020), who note that the healthcare sector accounts for large emissions of environmental pollutants, which in turn can justify the presence of investors with preferences for E also within this sector and thereby alphas different from zero.

It is worth noting that the healthcare sector tends to stand out linked to G. This is unexpected, as my expectation was that there would not be any significant sector difference linked to the G pillar. An explanation could be tied to the time period studied, including the Corona crisis, where companies linked to the healthcare sector garnered substantial attention. This period constitutes a significant proportion of the selected timeframe for my study. For a deeper understanding of this, the specific period surrounding it would need to be studied separately, which is outside the scope of this study.

### 6.3. Discussion

My obtained results indicate that there are at least small differences among the sectors in how ESG and its pillar relates to stock returns, and that there are even tendencies of differences among the pillars of ESG within the sectors. This strengthens the research in the field which shows that the connection between E, S, and G to CFP (including stock returns) tends to differ (e.g., Crespi and Migliavacca, 2020), as well as those that find connections to industry differences (e.g., Ashwin Kumar et al., 2016; Shaut and Pasquinit-Descomps, 2015; Bae et al., 2021). Parts of my hypotheses are accepted or partly accepted, while others must be rejected. In many cases, the alphas, although accepted, are relatively low which indicates that there are not much extra return to earn while using the specific investment strategy during this specific period. The highest and strongest significant abnormal return I observe relates to the G-pillar of the healthcare sector (performing -0.0230 lower than the market, significant at the 5% level), it is also the one that holds best while testing for the other asset pricing models. The industrial sector shows evidence of a negative relationship related to the E-pillar (-0.0063, significant at the 5% level), while in the financial sector, no relationship is found. All these findings suggest some signs of differences among the sectors. When considering the perspective of including portfolio risk through the Sharpe ratio, I mostly observe that high-scored portfolios have lower ratios, aligning with my hypothesis related to Pedersen et al. (2021) model of the ESG-efficient frontier. This trend holds for all industries, except for E related to the financial sector, showing the opposite.

While much research has been conducted in the area of ESG-CFP, few studies specifically focus on difference among sectors. To the best of my knowledge, no previous paper has compared industries in a similar way as I do in this study. Although studies exploring the ESG-CFP connection sometimes provide a partial analysis of whether the results differ among sectors (e.g., Bae et al., 2021), they often lack a deeper discussion about it and frequently seem to use fewer companies within each industry. This study thus contributes to the previous research with another interesting aspect by more broadly covering three distinct sectors. I believe that this can be something worth further exploration, especially since it turns out that there are tendencies of differences among sectors. Understanding these differences can partly help business leaders in different industries to better comprehend how they should act based on ESG. Furthermore, it is important to identify how firms' activities related to the pillars affect different industries, so that, for example, managers are aware of the effects when engaging in activities

related to one of the fields. This is also a relevant aspect for investors, allowing them to gain a better understanding of why and how ESG's relation to stock returns differ among sectors. However, as this area and especially the rating process of ESG is relatively new, more research is clearly needed.

My study also attempts to theoretically start from the stakeholder theory based on a CSR perspective to explain differences among sectors, and then applies the two theories that explain the connection between ESG and stock returns. It seems that some of my findings regarding differences among sectors can be explained on this basis, but further investigation would be needed to determine if it is an appropriate approach to take. There are other ways to address industry differences, which, for instance, can include using other theories, such as looking more at the resource-based view of a company. Regarding ESG integration into stock returns, there are also other proposed models that can be used. Some of these models, which also consider differences in non-pecuniary preferences among investors for ESG, include Baker et al. (2018) and Avramov et al. (2022). Although, I believe many of them complement one another, as the ones I use here seem to do, more empirical work on these models is needed. My study contributes to this by applying Pedersen et al. (2021) model as well as Pástor et al. (2021) model.

As the time period I study is relatively short, the effects of the two specific events – the Corona crisis and the ongoing Ukraine war – on the obtained results cannot be ignored. Both of these events seem to affect different sectors more or less and the markets and the macro-economic situation overall. Drei et al. (2019) show that different parts of a period span can yield different outcomes. Therefore, it would be interesting to consider both another period and a longer time frame. Examining longer time periods with a broad sector view may be easier in the future given the availability of more ESG data. As of today, there exists a trade-off between a longer time period and having more ESG-ranked companies. Other limitations in these types of studies include the obscurity of the definitions related to ESG as Starks (2023) discusses; the uncertainty surrounding the meaning of these definitions can lead to misunderstandings about how they affect investors, companies and asset markets, making it difficult to interpret investor behaviors. Additionally, different scoring agencies have their own methods and measures. LSEG's zero scores are one such aspect that may be hard to handle in research. In summary, there appear to be many different areas around ESG and stock returns that research can explore further. It partly concerns the connection between the two, but also circumstances surrounding

differences based on sectors, continents, and also definitions in connection with the concept of ESG may need further investigation.

## 7. Conclusion

The world is facing major challenges related to climate change, necessitating that all businesses review and improve their processes to become more sustainable. Asset markets then play a crucial role in efficiently allocating capital to promote sustainability. The expected (required) return of a firm equals its cost of equity. One way financial markets can facilitate the transition to a green economy is by allowing investors' ESG preferences to be reflected in higher asset prices and, consequently, lower capital costs for green firms and sectors. In this paper, my objective is to examine whether this is the case by exploring how the sustainability perspective, measured as ESG rating, is reflected in stock returns. I address the fact that different sectors (i.e., financials, healthcare, and industrials) can be affected differently due to their varying conditions regarding environment, social, and governance matters. I observe signs indicating that this may be true, although the differences are minor. However, these signs suggest that further investigation may be warranted, as it may help explain the overall relationship between ESG and stock returns better, thereby assisting both investors and companies in how to navigate to promote a greener future. Further research can facilitate this integration, and I see the relevance of considering various perspectives related to this question, such as the sector perspective.

Moreover, there are theories developed to describe how ESG can be reflected in stock returns. I apply two such models, and based on them, I can expect that the effects of ESG on capital costs seem to be permanent, with firms becoming greener through the ESG industry. When this is incorporated into stock prices, there is a tendency for low-scored companies to outperform high-scored ones due to the compensation for risk that investors require to invest in them. This is thoroughly described in the theories, and my results indicate that this might be the situation. Since the theories also suggest that during transition periods, high-scored companies outperform low-scored, and I do not identify any significant alpha indicating this (i.e., no positive alpha of the HML portfolios is found), there are reasons to believe that such a transition period is already past.

Furthermore, as just described, the models seem to explain the obtained outcomes very well, but I note that it is difficult to use them to build expectations. I believe one reason for this may be the time periods used and their differing characteristics. Additionally, the unpredictability of stock market outcomes, especially during shorter time periods, adds to the challenge. Longer time periods, however, could better illustrate how the ESG perspective is valuable for firms and their stakeholders. One particular limitation of this study is thus that it covers a shorter period, indicating that specific events may have a greater impact on the results, and the effects of ESG integrations into company valuations may be challenging to discern. Further research and more available ESG data over longer periods, encompassing a broader sector perspective like this, have the potential to investigate this area more thoroughly. Then, there are also opportunities to examine more sectors and different geographical areas, which may deepen the understanding of this perspective further.

Finally, the concept I use to discover why there can be differences among sectors may also need further investigation; there may be better ways to understand if there are differences related to sectors. My results indicate that the understanding of companies' differences through the stakeholder theory can be a useful approach. Additionally, I believe that comprehending this sustainability perspective requires different research areas to work more collaboratively, as I observe throughout this study the difficulty in explaining sector differences solely based on purely finance literature. All the perspectives mentioned above are pertinent for further examination, aiming to assist society and all its actors in contributing to a green transition in their own specific ways.

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# Appendix

**Table A1.** Summary statistics of the ESG data for each year individually.
This table provides summary statistics for the ESG data annually over the period 2018-2022. It shows the number of observations (N), mean, maximum and minimum value, standard deviation (SD), skewness, and kurtosis. Notes: a. The number of observations (N) is 343 for E and S. b. The number of observations (N) is 190 for E and S. c. The number of observations (N) is 188 for E, S, and G. d. The number of observations (N) is 436 for G.

| | | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| Financials | | | | | | |
| | N | 270 | 311 | 344[a] | 357 | 346 |
| | Average score (max /min): | | | | | |
| | ESG | 47,26 (95,74/1,97) | 47,11 (94,65/1,73) | 49,03 (95,22/2,73) | 51,48 (95,16/1,28) | 53,05 (95,50/2,70) |
| | E | 35,18 (99,4/0,00) | 36,14 (98,14/0,00) | 37,31 (97,18/0,00) | 40,04 (98,05/0,00) | 42,45 (97,80/0,00) |
| | S | 51,64 (97,67/0,97) | 50,54 (96,76/0,6) | 51,03 (96,39/0,59) | 52,56 (96,61/0,59) | 53,56 (96,42/1,12) |
| | G | 47,56 (96,22/1,78) | 47,75 (96,57/3,31) | 51,49 (96,81/1,81) | 54,53 (96,93/1,26) | 56,27 (96,97/1,24) |
| | SD/Skewness/ Kurtosis: | | | | | |
| | ESG | 21,75/ 0,15/ -0,89 | 21,62/ 0,13/-0,89 | 21,70/ -0,02/-0,82 | 21,43/-0,07/ -0,87 | 21,45/ -0,17/-0,79 |
| | E | 31,73/0,56/-1,12 | 31,49/ 0,50/ -1,17 | 30,82/ 0,46/ -1,14 | 31,25/ 0,32/ -1,30 | 31,32/ 0,22/ -1,30 |
| | S | 22,40/ -0,13/ -0,67 | 22,26/ -0,03/ -0,74 | 23,02/ -0,17/ -0,79 | 23,07/ -0,29/ -0,71 | 23,33/ -0,30/ -0,78 |
| | G | 25,78/ 0,02/ -1,11 | 25,75/ 0,08/ -1,22 | 25,25/ -0,06/ -1,22 | 23,96/ -0,08/ -1,18 | 23,96/-0,15/ -1,17 |
| Healthcare | | | | | | |
| | N | 107 | 129 | 191[b] | 194 | 189[c] |
| | Average score (max /min): | | | | | |
| | ESG | 52,39 (94,8/9,42) | 51,54 (93,83/3,82) | 46,89 (95,24/1,59) | 49,86 (95,91/7,13) | 50,89 (95,82/8,46) |
| | E | 37,17 (93,5/0,00) | 38,05 (94,05/0,00) | 31,69 (94,46/0,00) | 34,76 (94,00/0,00) | 37,19 (93,66/0,00) |
| | S | 61,67 (97,25/2,25) | 58,47 (97,67/1,3) | 50,27 (97,54/1,23) | 51,91 (97,71/0,78) | 52,65 (97,54/2,53) |
| | G | 49,87 (94,39/2,08) | 50,78 (93,01/4,07) | 52,2 (95,70/1,24) | 56,39 (98,09/7,17) | 56,86 (96,05/11,92) |
| | SD/Skewness/ Kurtosis: | | | | | |
| | ESG | 20,88/ 0,07/ -0,85 | 21,52/ -0,10/ -0,68 | 23,48/ 0,02/ -0,94 | 22,82/ -0,06/ -0,97 | 22,47/ -0,13/ -0,88 |
| | E | 28,38/ 0,23/ -1,09 | 28,34/ 0,17/ -1,12 | 29,20/ 0,40/ -1,12 | 30,11/ 0,25/ -1,27 | 29,08/ 0,12/ -1,25 |
| | S | 24,07/ -0,37/ -0,90 | 24,93/ -0,43/ -0,63 | 28,87/ -0,10/ -1,27 | 28,17/ -0,19/ -1,26 | 27,72/ -0,23/ -1,19 |
| | G | 23,58/ -0,10/ -1,03 | 22,92/ -0,03/ -1,01 | 21,80/ -0,09/ -0,72 | 20,31/ -0,17/ -0,62 | 19,98/ -0,10/ -0,66 |
| Industrials | | | | | | |
| | N | 268 | 320 | 426 | 435[d] | 427 |
| | Average score (max /min): | | | | | |
| | ESG | 51,42 (92,74/6,06) | 51,04 (93,79/2,10) | 49,35 (94,06/3,77) | 51,49 (64,36/4,41) | 53,93 (91,81/5,81) |
| | E | 46,00 (97,85/0,00) | 45,42 (99,14/0,00) | 42,29 (98,96/0,00) | 44,39 (98,38/0,00) | 47,34 (98,53/0,00) |
| | S | 58,32 (96,23/3,63) | 56,69 (98,08/2,41) | 53,06 (97,98/1,04) | 54,00 (98,35/0,97) | 56,53 (97,96/1,25) |
| | G | 47,79 (93,47/2,41) | 49,25 (94,17/2,95) | 51,42 (96,31/3,55) | 55,33 (95,95/3,55) | 57,24 (94,66/3,55) |
| | SD/Skewness/ Kurtosis: | | | | | |
| | ESG | 20,15/ -0,19/ -0,84 | 20,90/ -0,21/ -0,86 | 21,42/ -0,06/ -0,87 | 20,86/ -0,17/ -0,86 | 20,19/ -0,31/ -0,71 |
| | E | 26,14/ -0,02/ -1,05 | 26,39/ 0,03/ -1,11 | 26,36/ 0,17/ -1,07 | 25,85/ 0,10/ -1,07 | 25,37/ -0,01/ -0,98 |
| | S | 22,17/ -0,42/ -0,69 | 23,45/ -0,36/ -0,79 | 24,23/ -0,20/ -0,93 | 23,99/ -0,24/ -0,90 | 23,04/ -0,38/ -0,69 |
| | G | 23,20/ -0,02/ -1,06 | 23,53/ -0,14/ -1,03 | 22,63/ -0,08/ -1,03 | 21,45/ -0,18/ -0,97 | 20,98/ -0,29/ -0,89 |