Norwegian School of Economics

Bergen, Spring 2023

ESG: The Nexus of Sustainability & Cost of Capital?

An empirical study of the relationship between ESG scores and WACC for European firms

Erik Midtkandal & Lars Fredrik Kyte

Supervisor: Roberto Ricco'

Master Thesis, Economics and Business Administration

Major: Financial Economics

NORWEGIAN SCHOOL OF ECONOMICS

Acknowledgements

This thesis is the culminating work of our studies in Economics and Business Administration at the Norwegian School of Economics (NHH), where we have both majored in Financial Economics.

The topic of sustainable business practices is highly relevant to the modern world's economic landscape and is something we find both interesting and engaging. This interest has played a large part in the selection of our topic, and we believe this thesis has furthered our understanding of the intricacies of the impacts of ESG.

We wish to extend our gratitude to our advisor Roberto Ricco' for his guidance throughout the process of writing our master's thesis. His advice and inputs have been of great help in completing this work. We would also like to thank God for giving us the strength and perseverance not only to write this thesis but also to complete five unforgettable years at NHH.

Norwegian School of Economics

Bergen, June 2023

Erik Midtkandal

Lars Fredrik Kyte

Abstract

This thesis examines the relationship between STOXX Europe 600 firms' ESG scores and their weighted average cost of capital (WACC) across the 11 Global Industry Classification Standard (GICS) sectors. To investigate this relationship, we have collected ESG scores from Sustainalytics and Refinitiv on an aggregate level, as well as individual ESG pillar scores. The ESG scores have then been averaged to create a proxy ESG score to account for divergence between the two rating agencies. Data on market capitalization, debt to total capital, and GICS sector have been gathered from Bloomberg.

We investigate the WACC-ESG score relationship through five hypotheses spanning from a general to more granular assessment. Our findings suggest that although there is a significant negative relationship between WACC and ESG scores on an aggregate level, this does not hold when delving into sector specific differences where only a few sectors show a significant relationship, and only with certain ESG pillars. This implies that we do not find convincing empirical evidence to support the causal conclusion that European firms can benefit from lower average costs of capital by improving their ESG scores without accounting for sector.

Key words: ESG scores, WACC, GICS sector, STOXX Europe 600

Contents

1.0 Introduction

In recent years, the importance of environmental, social, and governance (ESG) factors in the corporate world has grown significantly. As businesses adapt to a rapidly evolving global environment, the consideration of ESG criteria is becoming central to their strategic decisions. The growing emphasis on ESG factors has played a crucial role in the development of the United Nations' Sustainable Development Goals (SDGs) (United Nations, 2015)[1]. The SDGs, established in 2015, consist of 17 global goals designed to tackle various social, economic, and environmental challenges by 2030. The recognition of ESG factors has contributed to the mainstreaming of sustainable investment strategies and the integration of the SDGs into the investment decision-making process. According to the Global Sustainable Investment Alliance (2021)[2], the global sustainable investment market reached $35.3 trillion in 2020, accounting for 36% of all professionally managed assets worldwide. Norges Bank Investment Management (NBIM), which manages over $1.3 trillion in assets, has been at the forefront of integrating ESG considerations into its investment approach (NBIM, 2023)[3]. NBIM emphasizes responsible investment practices and actively engages with firms to promote transparency and accountability in their operations. Furthermore, the fund has also made significant strides in divesting from firms involved in activities that are not aligned with the SDGs, such as fossil fuels, deforestation, and human rights abuses.

The increased global focus on ESG criteria has inspired a greater emphasis on firms ESG disclosure practices. This trend is largely attributed to regulatory pressures such as the European Union's Non-Financial Reporting Directive (European Commission, 2021)[4], the rise in socially conscious investing, and the recognition of ESG practices as a risk mitigation tool. Furthermore, growing stakeholder expectations for corporate responsibility and the potential for competitive advantage through superior ESG reporting has led firms to invest in comprehensive ESG disclosure practices.

This thesis builds on the work of Priem and Gabellone (2022) and is the first to examine the relationship between STOXX Europe 600 firms' ESG scores and their weighted average cost

[1] https://sdgs.un.org/goals
[2] https://www.gsi-alliance.org/
[3] https://www.nbim.no/en/the-fund/responsible-investment/
[4] https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-_auditing/company-reporting/corporate-sustainability-reporting_en

of capital (WACC) while accounting for Global Industry Classification Standard (GICS)[5] sector differences. We do so while also accounting for ESG score divergence between ESG rating providers by creating our own proxy ESG score. In this way, we contribute to the current literature by providing a more granular assessment of ESG-WACC relationships in Europe, as well as exploring potential variations across the 11 GICS sectors. By doing this, we can analyze how the perception of equity investors and creditors may differ not only on the value of European firms ESG performance in general, but also on the value of ESG performance relative to the industry the firms operate in. To ensure a robust analysis, we utilize ESG data from two reputable providers, namely Sustainalytics and Refinitiv. By incorporating data from multiple sources, we can not only account for potential divergence in ESG scores but also enhance the reliability of our findings and provide a more accurate understanding of the effect ESG scores may have on European firms' WACC. We further our research by also breaking down ESG scores into its individual pillars, as well as the scores effect on the individual components of WACC (cost of equity and cost of debt).

Ultimately, we aim to answer the following research question:

Do listed European firms' ESG scores have an impact on their cost of capital across GICS sectors?

Earlier studies have investigated the relationship between ESG performance and firms' WACC across various markets. Friede et al. (2015) conducted a comprehensive meta-analysis of 2200 empirical studies, which demonstrated a generally negative relationship between ESG performance and financial performance in markets across the world, while Hoepner et al. (2019) found similar results between CSR and the cost of bank loans in 28 countries. Additionally, Goss and Roberts (2011) have provided further evidence of this when investigating US firms, suggesting a growing consensus in the academic community. Meanwhile, Dhaliwal et al. (2011) and Ng and Rezaee (2015) focused on the impact of ESG considerations on the cost of equity capital, where they reported a negative relationship between ESG performance and the equity cost. Furthermore, Priem and Gabellone (2022) examined non-financial firms in Europe and found that firms with higher ESG scores have a lower cost of capital in countries with weaker legal environments. Johnson (2020) found the same results for South African firms.

[5] The 11 GICS Sectors include Financials, Consumer Discretionary, Materials, Industrials, Communication Services, Real Estate, Consumer Staples, Utilities, Health Care, Energy, and Information Technology

Our initial analysis found no significant relationships between ESG divergence and WACC, cost of equity, and cost of debt. However, our findings propose a significant negative relationship between ESG score and WACC at a general level, suggesting firms could potentially benefit from lower average costs of capital by enhancing their ESG initiatives.

Despite these findings, the relationship was not found to be significant when the cost of equity and cost of debt were considered individually. Previous studies have identified significant relationships between ESG scores and these individual components, indicating possible differences in the use of rating agencies, datasets, and market analysis across studies. Furthermore, our analysis of the GICS sectors suggests that the WACC-ESG relationship was significant only in the Financials and Energy sectors, suggesting a more sector-specific relationship rather than a generalized one.

To understand these findings better, we deconstructed the ESG score into its pillars to identify if any individual pillars were driving the significance of the WACC-ESG relationship. While the environmental score showed a significant negative relationship with WACC, the Governance score exhibited a significant positive relationship.

When looking at the GICS sectors and the individual ESG pillars, we found evidence of interplay between the ESG pillars and WACC in different sectors. For instance, the environmental score has a significant negative relationship to the WACC in the Financials sector, while the governance score showed a significant positive relationship in the Consumer Staples and Information Technology sectors. The Health Care and Energy sectors demonstrated a significant positive relationship between the social score and WACC.

While our findings are consistent with some aspects of previous literature, it also challenges them by demonstrating that the relationship between ESG scores and the cost of capital may be more sector-specific rather than general. Thus, we propose that any analysis of the WACC-ESG score should be conducted with a more nuanced approach.

2.0 Theoretical Background & Literature Review

2.1 Theoretical Background

2.1.0 Shareholder Theory

Shareholder Theory proposes that the primary responsibility of a firm's management is to maximize shareholder value. This theory is grounded in the belief that shareholders, as the owners of the firm, should be the primary beneficiaries of a firm's actions and that their interests should take precedence over those of other stakeholders (Friedman, 1970).

Shareholder Theory emphasizes the importance of financial performance metrics, such as earnings per share, return on equity, and total shareholder return, as key indicators of a firm's success (Rappaport, 1986). Critics of Shareholder Theory argue that an excessive focus on short-term financial performance can lead to myopic decision-making and undermine a firm's long-term prospects (Porter, 1992). Proponents of the theory, however, emphasize the importance of balancing short-term gains with sustainable, long-term value creation for shareholders (Jensen, 2001).

2.1.1 Stakeholder Theory

Stakeholder Theory expands the scope of management's responsibility to include a wider range of stakeholders who can be affected by a firm's actions. Stakeholders can be classified into two categories: primary stakeholders, with a direct stake in the organization's success (e.g., shareholders, employees, and suppliers), and secondary stakeholders, who may be indirectly affected by the organization's activities (e.g., local communities, governments, and nongovernmental organizations) (Clarkson, 1995).

As stakeholders have different interests that can be economic, social, or environmental (Freeman et al., 2010), understanding and balancing these interests is crucial to managing stakeholder relationships effectively. Mitchell, Agle, and Wood (1997) suggest that three attributes determine stakeholder salience: power, legitimacy, and urgency. Power is a stakeholder’s ability to influence an organization, legitimacy refers to the perception of the stakeholders' actions as appropriate, and urgency reflects the degree to which stakeholders' claims require immediate attention. The combination of these attributes influences the priority assigned to each stakeholder group. Stakeholder Theory emphasizes that organizations should integrate stakeholder management into their strategic decision-making processes (Freeman,

1984). This involves considering stakeholders' interests when setting objectives, developing strategies, and allocating resources. By doing so, organizations can create value for all stakeholders and enhance their long-term success (Freeman et al., 2010).

2.1.2 Sustainability

The transition towards sustainability has emerged as a critical and transformative force in the global business landscape. Driven by increasing awareness of ESG issues, as well as rising stakeholder expectations for responsible corporate conduct, this shift has had significant implications for firms' strategies and business practices. Firms are seeking to adapt to the changing context and maintain their competitiveness and legitimacy in the face of evolving societal demands (Porter & Kramer, 2011).

The growing emphasis on sustainability has been fuelled by several interrelated factors, including concerns over climate change, resource depletion, and social inequality (Steffen et al., 2015). Additionally, regulatory pressures, stakeholder activism, and consumer preferences have further contributed to the increasing importance of sustainability as a key strategic consideration for firms. This has underscored the need for a more sustainable and inclusive approach to economic development (Flammer, 2013).

In response to these pressures, firms have begun to integrate sustainability considerations into their strategies and business practices through various means. These include the adoption of sustainability reporting and disclosure frameworks, the implementation of sustainability-oriented innovation and operational improvements, and the pursuit of strategic partnerships and collaborations aimed at advancing common sustainability goals (Schaltegger et al., 2016).

As a result, the transition towards sustainability has led to the reconceptualization of the role of the firm in society, challenging traditional assumptions about the primacy of shareholder value maximization and fostering a more holistic understanding of value creation that encompasses a broader array of stakeholder interests (Eccles & Serafeim, 2013). This shift has been accompanied by the development of new theoretical frameworks, such as shared value creation (Porter & Kramer, 2011) and the integrated reporting model. These frameworks emphasize the interconnectedness of financial, social, and environmental performance and the need for firms to consider the long-term implications of their actions for both stakeholders and the environment.

2.1.3 CSR & SRI

Corporate Social Responsibility (CSR) is a concept that refers to the voluntary integration of social, environmental, and ethical considerations into a firm's business practices and decision-making processes (McWilliams & Siegel, 2001). The main elements of CSR include economic, legal, ethical, and philanthropic responsibilities.. CSR acknowledges the responsibility of firms to generate profits and create value for shareholders, while emphasizing the need to balance profit maximization with broader social and environmental concerns (Carroll, 1991).

Socially Responsible Investment (SRI) refers to investment strategies that incorporate social, environmental, and ethical factors into the investment decision-making process. The main elements of SRI include screening, shareholder engagement, integration of ESG factors, and impact investing. SRI often employs positive and negative screening to select or exclude investments based on specific social, environmental, or ethical criteria (Barnett & Salomon, 2006).

Both CSR and SRI emphasize the importance of considering a broader range of stakeholders and their interests. CSR calls for firms to adhere to ethical norms and principles, such as fairness, equity, and respect for human rights (Carroll, 1991), while SRI emphasizes the importance of integrating ESG factors into the investment analysis and decision-making process (Barnett & Salomon, 2006).

2.1.4 ESG

ESG factors have emerged as vital components for assessing the sustainability and ethical impact of investments in organizations (Eccles & Serafeim, 2013). These factors have increasingly gained prominence among investors, businesses, and policymakers, as they consider the long-term value creation of firms (Friede et al., 2015).

Environmental factors refer to a firm's impact on the environment and the measures taken to minimize negative consequences. They include climate change and greenhouse gas emissions, waste management, resource depletion, deforestation, pollution, and biodiversity conservation (Bradley, 2021).

Social factors refer to a firm's impact on society, including its relationship with employees, suppliers, customers, and communities (Bradley, 2021). These factors include labor practices, employee health and safety, human rights, diversity and inclusion, consumer protection, and

community engagement. Firms are urged to uphold high ethical standards, promote fair labor practices, and foster positive relationships with stakeholders to ensure social cohesion and long-term value creation (Hawn & Ioannou, 2016).

Governance factors refer to a firm's internal management practices, board structure, and compliance with regulations (Beck et al., 2018). They include executive compensation, shareholder rights, transparency, ethical behavior, and risk management. Sound governance practices help ensure that firms are accountable to their shareholders and act in the best interests of all stakeholders, thus mitigating potential risks and enhancing the firms' long-term value.

2.1.5 Cost of Equity

A firm's cost of equity is the return required by an equity investor to hold and invest in a firm's shares. It represents the compensation investors demand for taking on the risk associated with owning a firm's stock. The cost of equity is the first component of a firm's WACC. The most common model used to estimate a firm's cost of equity is the capital asset pricing model (CAPM). The CAPM is a widely used model that describes the relationship between the expected return on an asset and its systematic risk (Sharpe, 1964). The cost of equity ER_i can be estimated using the CAPM formula:

$$\boldsymbol{ER_i = R_f + \beta_i\,(ER_m - R_f)}$$

Where:

- ER_i is the expected return of investment
- R_f is the risk-free rate (e.g., the yield on a long-term government bond)
- ER_m is the expected return on the market portfolio
- β_i (beta) is a measure of the stock's sensitivity to market risk

The CAPM assumes that investors are rational, markets are efficient, and there are no taxes or transaction costs. These assumptions are theoretical.

According to the model, there are three primary elements that constitute the cost of equity. The initial component is the risk-free rate, which signifies the minimum return required for other riskier investment opportunities. This rate indicates the expected earnings for assuming the lowest possible risk (Fama & French, 1993). The subsequent component is the market risk

premium, which represents the additional return that investors anticipate earning by investing in the stock market as opposed to allocating their funds in a risk-free manner. Lastly, the CAPM model comprises beta, a metric that gauges the risk involved in an investment relative to, for instance, the stock market (Sharpe, 1964). In this context, a value of 1 implies that the investment value fluctuates in tandem with the stock market, while a value below 1 indicates that the investment experiences less fluctuation compared to the market.

2.1.6 Cost of Debt

The cost of debt is the effective interest rate a firm pays on its outstanding debt obligations. It represents the required return for debt holders, such as bondholders and lenders, who provide capital to the firm (Brealey et al., 2017). The cost of debt is the second component of a firm's WACC. To calculate the cost of debt, there are two primary methods: Yield to Maturity (YTM) and the Credit Spread Approach.

1.YTM is the total return anticipated on a bond if it is held until maturity. It takes into account the bond's coupon payments, the face value, the current market price, and the time to maturity. YTM can be used to estimate the cost of debt (Rd) using the following formula:

$$\boldsymbol{R_d = YTM * (1 - T_C)}$$

where:

- YTM is the yield to maturity of the debt
- Tc is the corporate tax rate

The cost of debt is adjusted for taxes because interest payments on debt are tax-deductible, which reduces the effective cost of debt for the firm.

2. The credit spread approach estimates the cost of debt by considering the difference in yield between a firm’s debt and a risk-free rate (Elton et al., 2001). The cost of debt (Rd) can be calculated as:

$$\boldsymbol{R_d = R_f + C_s * (1 - T_C)}$$

where:

- Rf is the risk-free rate (e.g., the yield on a long-term government bond)
- Cs is the credit spread, which reflects the additional yield required by investors due to the firm's credit risk
- Tc is the corporate tax rate

2.1.7 Weighted Average Cost of Capital

WACC is a key financial metric that represents the average cost of financing a firm's investments through a mix of debt and equity. This metric serves as a benchmark for evaluating investment opportunities and estimating the firm's value (Modigliani & Miller, 1958).

The WACC is calculated as a weighted average of the cost of equity (Re) and the cost of debt (Rd), with the weights being the proportion of each financing source in the firm's capital structure (Brealey et al., 2017). These weights can be determined using the market values of equity and debt.

The formula for WACC is as follows:

$$\boldsymbol{WACC} = \left(\frac{\boldsymbol{E}}{\boldsymbol{E+D}}\right) * \boldsymbol{R_E} + \left(\frac{\boldsymbol{D}}{\boldsymbol{E+D}}\right) * \boldsymbol{R_D} * (\mathbf{1} - \boldsymbol{T_c})$$

where:

- E is the market value of the firm's equity
- D is the market value of the firm's debt
- E+D is the total value of the firm's capital
- Re is the cost of equity
- Rd is the cost of debt
- Tc is the corporate tax rate

2.2 Literature review

This section aims to provide an overview of the existing literature on the connection between ESG scores and firms' cost of capital. The section is divided into two subsections: a brief introduction to ESG divergence and its implications, and empirical research on the relationship between ESG scores and firms' cost of capital.

2.2.1 ESG Divergence

The increasing importance of ESG factors in investment decisions has led to a proliferation of ESG rating agencies that assess the ESG performance of firms across the world. However, different rating agencies often assign different scores to the same firms, which raises concerns about the reliability and comparability of ESG ratings (Berg et al., 2022). This divergence can be attributed to factors such as differences in rating methodologies, subjective judgments, and the quality of ESG data.

Kotsantonis and Serafeim (2019) identify four factors that lead to these discrepancies: rating agencies utilize different data sources, use different metrics and calculations in deriving ESG scores, use different benchmarks for comparison, and the increased accessibility of public information is used differently by the agencies. Several studies will apply scores from a single rating agency in their analysis, and the divergence between rating agencies could have adverse effects on the results. For instance, Avramov et al. (2020) found that divergence in ESG ratings can result in higher risk premiums, more risk aversion, and an overall lower demand for certain stocks. In addition, Christensen et al. (2021) found that increased divergence in ESG scores can cause larger price movements and higher volatility.

2.2.2 ESG Scores and Firms' Cost of Capital

A growing body of empirical literature has explored the relationship between ESG scores and firms' cost of capital. Sharfman and Fernando (2008) investigate the role of environmental risk management in determining the cost of capital, using a sample of 267 U.S. firms from 1995 to 2005. They find that firms with better environmental risk management practices have a lower cost of capital. El Ghoul et al. (2011) study a sample of 12,915 U.S. firm-year observations from 1992 to 2007, examining whether CSR affects the cost of capital. Their results indicate that firms with higher CSR scores have a lower cost of equity capital. Dhaliwal et al. (2011) explore the impact of voluntary nonfinancial disclosure on the cost of equity capital, using a

sample of 664 U.S. firms from 1993 to 2007. They find that the initiation of CSR reporting leads to a decrease in the cost of equity capital. In contrast, Richardson and Welker (2001) report mixed findings, studying the relationship between social and financial disclosure and the cost of equity capital for a sample of Canadian firms from 1991 to 1996.

Several empirical articles have studied the impact of ESG factors on financial performance and the cost of debt. Suto and Takehara (2017) examine the relationship between CSP and the cost of capital in the Japanese market from 2008 to 2013. They report that firms with higher CSR performance have a lower cost of equity capital. Liu et al. (2021) investigate the effect of CSR on the cost of debt capital for Chinese listed firms from 2015 to 2019, finding that firms with better ESG performance have a lower financial performance. Goss and Roberts (2011) examine the impact of CSR on the cost of bank loans using a sample of 3996 loans to U.S. firms. Their results reveal that firms with strong CSR performance receive bank loans with that are 7 to 18 basis points lower than firms with CSR concerns. Oikonomou et al. (2012) analyze the impact of corporate social performance on financial risk and utility, using a sample of S&P 500 firms from 1992 to 2009. They find that high CSR performance is negatively but weakly related to financial risk, while low CSR performance is strongly and positively related to financial risk. Du et al. (2017) examines the role of CSR in market reactions to debt offerings while looking at private Chinese firms. They find that firms with better CSR performance consistently experience more favorable interest rates from creditors. Erragragui (2018) conducted a study exploring the impact of ESG scores on the cost of debt for 214 American firms over a ten-year period. The study discovered a significant negative relationship between both the environmental and governance components of ESG and the cost of debt. The research simultaneously highlights that concerns associated with the environment have the most substantial influence on the cost of debt. Eliwa et al. (2021) examined listed firms in 15 EU countries and found a significant negative relationship between the environmental and social pillars and the cost of debt. However, they did not find any significant relationship between governance score and the cost of debt.

The relationship between ESG factors and financial performance has been investigated in different geographical regions. Johnson (2020) focuses on South African listed firms, examining the relationship between ESG factors, corporate financial performance, and the cost of capital using a sample of 68 firms from 2011 to 2018. The study finds that ESG factors positively influence corporate financial performance and reduce the cost of capital. Ramirez et

al. (2022) investigate the impact of ESG performance on the cost of capital for 202 Latin American firms from 2017 to 2019, reporting a negative relationship between ESG performance and the cost of capital. Furthermore, they found a negative relationship between the governance score and cost of capital, but no significance between the other individual ESG pillars and the cost of capital. Ng and Rezaee (2015) study the relationship between business sustainability performance (BSP) and the cost of equity capital, analyzing a sample of 3000 firms from 1990 to 2013. They report that firms with higher BSP scores have a lower cost of equity capital.

Atan et al. (2018) studied the impact of environmental, social, and governance pillars on firm performance by analyzing 54 publicly traded Malaysian firms over a three-year period. The study did not find any significant relationship between the individual ESG pillars and WACC. However, it demonstrated that the aggregate ESG score has a significant negative relationship with WACC. Piechocka-Kaluzna et al. (2021) conducted a study on the relationship between the ESG pillars and WACC, cost of equity and cost of debt on 6,393 firms in the US. They found a significant relationship between all ESG pillars and WACC, and between the environmental pillar and the cost of equity. However, they did not find a significant relationship between any ESG pillar and the cost of debt. Furthermore, Priem and Gabellone (2022) found that firms listed on the STOXX Europe 600 index (excluding the Financials sector) with higher ESG scores have a lower cost of capital in countries with weaker legal environments. When examining each individual ESG pillar, they found significant negative relationships between WACC and the environmental score and social score in weaker legal environments, but a significant positive relationship between WACC and the governance score regardless of the countries' legal environment.

3.0 Hypothesis

Based on the previous literature on the topic, we have developed the following research question on the WACC-ESG score relationship:

Do listed European firms' ESG scores have an impact on their cost of capital across GICS sectors?

To address the research question, we have developed five individual hypotheses. The first hypothesis seeks to determine whether the divergence between ESG scores will have an impact on our findings. Thereafter, the hypotheses are structured in a way where we first provide a more general analysis in line with previous studies on the topic (hypothesis 2 and 4), before traversing current literature with two yet to be explored hypotheses (3 and 5). This is done for two reasons: firstly, we provide similar research to previous articles in order to further solidify our own understanding of the WACC-ESG relationship in Europe. Secondly, we then provide a more granular assessment in order to uncover potential drivers that may or may not skew or adversely affect the conclusion of a more general analysis.

3.1 Is there a relationship between ESG score divergence and a firm's average cost of capital?

The goal of *Hypothesis 1* is to establish whether there is a relationship between firms with a higher spread in ESG ratings from ESG rating agencies and the firms' WACC. The purpose of testing this hypothesis is to enhance our overall analysis of our research question by accounting for potential caveats related to ESG score differences. By examining the impact of ESG score divergence on WACC, we gain insight into the implications of lacking consistency and comparability of ESG ratings across different agencies.

A significant relationship between ESG score divergence and WACC would mean discrepancies in ESG score ratings from various agencies will have implications for a firm's average cost of capital. These inconsistencies could cause increased uncertainty when evaluating a firm's actual ESG performance. A significant relationship between ESG score divergence and WACC implies that the perceived reliability of ESG scores from different agencies can affect how investors and creditors assess a firm's risk profile. Furthermore, unveiling market reactions to ESG score divergence gives insight into whether investors and creditors actively analyze changes in a firm's ESG score. If variations in ESG scores lead to differences in the cost of capital, it suggests that investors and creditors may consider the

specific ESG ratings and their consistency when making investment or lending decisions. This would highlight the importance of robust and standardized ESG rating methodologies.

To account for potential effects of ESG divergence, we have created a proxy ESG score using the average score of the rating agencies in our dataset. This is the ESG score that will be utilized for the remainder of our hypothesis tests.

3.2 Is there a relationship between a firm's ESG score and its average cost of capital?

Hypothesis 2 is aimed at establishing whether there is an existing relationship between a European firm's ESG score and its WACC. We also break WACC down into its components, allowing us to investigate whether debt and equity financiers are willing to reduce their expected return premium contingent on ESG scores.

Based on the existing literature, we find it reasonable to expect a significant relationship between the two variables, which is in accordance with both the findings from Priem and Gabellone (2022) and Johnson (2020). This anticipation is grounded in the intuition that firms with a high ESG score are deemed to be "greener" and have a lower cost of capital due to increased ESG focus from investors and regulatory pressures on creditors to incentivize firms transition towards ESG. Conversely "brown" firms with low ESG scores are associated with a higher risk of ESG controversies, leading to investors and creditors wanting a premium to compensate for the perceived risks.

3.3 Is there a relationship between a firm's ESG score and its average cost of capital across GICS sectors?

The objective of the *Hypothesis 3* is to determine if ESG scores impact firms' average cost of capital differently across the 11 GICS sectors. *Hypothesis 2* assumes that there are no differences between sectors, so by dividing the firms into their respective GICS sectors, we are able to establish whether certain sectors may skew *Hypothesis 2's* results.

By investigating the relationship across the different GICS sectors, we provide a more nuanced understanding of individual sector specific differences which could help identify whether certain sectors are more sensitive to ESG factors. In addition, if the relationship remains unanimous across various sectors, it will strengthen the legitimacy of the result presented in *Hypothesis 2*.

3.4 Is there a relationship between the score of individual ESG components and a firm's average cost of capital?

The objective of *Hypothesis 4* is to determine if the individual ESG pillar scores impact firms' average cost of capital differently in general, as well as the cost of debt and cost of equity specifically. *Hypothesis 2* on its own assumes that there are no differences between the ESG pillars, so by dividing ESG into its individual components, we can establish whether certain pillars may skew the results of *Hypothesis 2*. By disaggregating the ESG score and examining each component individually, we can understand which aspects of ESG performance may be more influential on a firm's average cost of capital.

Currently, only Priem and Gabellone (2022) have explored whether the potential impact of environmental, social and governance differs on the average cost of capital, the cost of debt and the cost of equity in Europe. In accordance with their findings, we expect ex ante potentially significant differences across the pillars, meaning we expect capital providers may attach a greater significance to particular pillars. However, these findings were only significant in countries with weaker legal environments, creating a somewhat ambiguous result. Therefore, we are reluctant to put forward a strong conviction that we will see a significant relationship, as we do not account for legal environments. This is the case for WACC, cost of debt, and cost of equity.

3.5 Is there a relationship between the score of individual ESG components and a firm's average cost of capital across GICS sectors?

Hypothesis 5 is the culminating test of our research question, where we perform the most granular analysis accounting for every factor explored in the previous hypotheses. At the current point in time, no other research article has investigated the relationship between WACC, as well as its components, and the ESG pillars across the GICS sectors in Europe. By breaking down every component of WACC and ESG, while accounting for GICS sector, we are able to uncover the exact drivers that may or may not cause a significant relationship between WACC and ESG. This will allow us to gain a more precise and thorough insight into the topic, ultimately providing us with a comprehensive answer to our research question. Furthermore, this approach enables us to legitimize the findings of the previous tests, making for a more robust research article overall.

We expect that different sectors might be more sensitive to different pillars of ESG due to the nature of their operations. For example, the energy sector might be more influenced by the environmental pillar, while the financial sector may be more affected by the governance pillar.

4.0 Data

This section provides an overview of the data utilized in our analysis, including the sources of data and descriptive statistics of the final sample employed in our study.

4.1 Data sources

We collect the ESG scores for firms listed in STOXX Europe 600 from Sustainalytics through Morningstar Direct and Refinitiv's ESG scores from Refinitiv Eikon. In addition, we obtained financial ratios and data including WACC, cost of debt, cost of equity, market cap in US dollars and GICS for these firms from Bloomberg Professional Services. The data was retrieved in April 2023.

4.1.1 Refinitiv

Refinitiv is a global provider of financial market data and infrastructure, serving more than 40,000 institutions in over 190 countries. The firm provides a range of data and analytics solutions, including ESG data and ratings. Refinitiv's ESG data covers more than 10,000 firms globally and includes over 450 ESG indicators (Refinitiv 2023)[6].

Refinitiv's ESG rating methodology is based on a comprehensive framework that evaluates a firm's environmental, social, and governance practices. The methodology involves three main steps:

1. Data Collection: Refinitiv collects ESG data from a variety of sources, including firm disclosures, regulatory filings, and news articles. The data is then reviewed for completeness and accuracy, and any gaps are filled by using external data providers.
2. Scoring: Refinitiv scores each firm based on its performance in three main categories: environmental, social, and governance. Within each category, specific ESG factors are evaluated based on their relevance to the firm's industry and operations. Refinitiv assigns weights to each factor based on its importance and relevance, and scores the firm based on its performance relative to its peers.
3. Aggregation: Once the individual factor scores are calculated, they are aggregated into an overall ESG score for the firm. The ESG score ranges from 0 to 100, with higher scores indicating better ESG performance.

[6] https://www.refinitiv.com/en

Refinitiv's methodology also incorporates additional factors, such as controversy scores and trend analysis, to provide a more nuanced assessment of a firm's ESG performance. The ratings are reviewed and updated on a regular basis to ensure that they reflect the latest ESG information and developments.

4.1.2 Sustainalytics

Sustainalytics is a leading independent provider of ESG research and ratings, with coverage of over 13,000 firms globally.

Sustainalytics' ESG rating methodology involves the following steps:

1. ESG Data Collection: Sustainalytics collects ESG data from a variety of sources, including firm disclosures, regulatory filings, and news articles. The firm also conducts independent research and engages with firms to verify and supplement the data.
2. ESG Assessment: Sustainalytics evaluates a firm's ESG performance based on a range of factors, including its management of environmental and social risks, its governance practices, and its overall sustainability strategy. The firm assigns weights to each factor based on their materiality and relevance to the firm's industry and operations.
3. ESG Rating: Sustainalytics assigns an overall ESG rating to each firm, based on its ESG assessment. The rating is on a scale from 0 to 100, with higher scores indicating better ESG performance.

Sustainalytics' methodology also incorporates a range of additional factors, such as controversies and controversies management, peer benchmarking, and trend analysis, to provide a more comprehensive assessment of a firm's ESG performance. The firm's ratings are updated on a regular basis to reflect the latest ESG information and developments (Sustainalytics, 2023)[7].

4.2 Sample selection

To test our hypotheses, we use a data sample of firms included on the STOXX Europe 600 index. The STOXX Europe 600 is a stock market index that tracks the performance of 600 large, publicly traded firms across 17 European countries[8]. The firms included in the index are selected based on their market capitalization, liquidity, and industry representation. The index

[7] https://www.sustainalytics.com/

[8] Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

covers a broad range of industries, including financial services, consumer goods, healthcare, and technology. The index is acknowledged worldwide by institutional investors and serves as the most comprehensive representation of the European economy[9].

4.2.1 Screening

To conduct a screening process of the STOXX Europe 600 firms, ESG scores from Refinitiv and Sustainalytics were collected for all firms within the index. Bloomberg was used to retrieve data on the key metrics WACC, cost of equity, cost of debt, and industry defined by GICS. The resulting dataset includes 578 firms, which provides adequate coverage for the purpose of our analysis. The ESG data and key metrics were collected in April 2023, providing a cross-sectional dataset for this specific point in time.

4.2.2 Dependent variables

In our analysis we employ WACC, cost of equity, and cost of debt as dependent variables. We have chosen these variables as they are widely used measures of capital cost in the finance literature. Capital cost is used as a dependent variable as it is an effective measure of the market's perception of a firm's risk.

Bloomberg calculates the cost of equity as a function of risk-free rate and market risk premium. The market risk premium is calculated by multiplying the firm's beta with the country's risk premium, which is determined by subtracting the risk-free rate from the expected market return. Lastly, Bloomberg calculates the cost of debt using the following formula[10]:

$$\left(\frac{\boldsymbol{SD}}{\boldsymbol{TD}} * \boldsymbol{CS} * \boldsymbol{AF} + \frac{\boldsymbol{LD}}{\boldsymbol{TD}} * \boldsymbol{CL} * \boldsymbol{AF}\right) * (\mathbf{1} - \boldsymbol{TR})$$

where:

- SD: Short-term debt
- TD: Total debt
- CS: Pre-tax cost of short-term debt
- AF: Adjustment factor debt
- LD: Long-term debt
- CL: Pre-tax cost of long-term debt
- TR: Effective tax rate

[9] https://www.stoxx.com/document/Bookmarks/CurrentFactsheets/SXXGR.pdf
[10] https://www.bloomberg.com/professional/

4.2.3 Independent variables

In the analysis data from Refinitiv and Sustainalytics is used to construct an average ESG score for each firm in our dataset. Hypothesis 1 employs the independent variable of Divergence, which is the difference between the highest and lowest ESG score for each firm. The average ESG-score is used as an independent variable in hypothesis 2 and 3. In hypothesis 4 and 5, we have used average scores for each ESG pillar as independent variables.

4.2.4 Control variables

In our analysis, we incorporate two control variables to bolster the internal validity of our regressions. One of the control variables utilized is the leverage ratio, defined as the long-term debt to total capital ratio. Debt is a component of the WACC calculation, so the proportion of debt directly impacts a firm's total cost of capital. An increase in debt results in a lower total cost of capital, as debt is regarded as a less expensive financing source than equity (Kaldestad & Møller, 2017). This is partly attributable to the tax deduction that corporations obtain for all interest paid during the financial year. As a result, we anticipate that higher leverage ratios will be associated with lower WACCs. However, an increase in debt also leads to elevated risk, resulting in higher equity and debt costs. This rise occurs because investors and creditors require a higher risk premium due to the firm's increased risk (Kaldestad & Møller, 2017).

The other control variable we employ is a firm size metric. To evaluate size, we use the firms' market value in US Dollars. Given that this variable is highly skewed, we conduct a natural logarithmic transformation before initiating our analysis.

4.3 Descriptive statistics

Table 4.3.1: Descriptive statistics

Table 4.3.1 divides our 578 observations based on country the firms are located in and the sector the firms operate in. Our observations span 17 European countries and 11 GICS sectors.

Country	# of Firms	% Observations per Country	GICS Sector	# of Firms	% per Industry
Austria	7	1 %	Communication Services	34	6 %
Belgium	16	3 %	Consumer Discretionary	64	11 %
Denmark	25	4 %	Consumer Staples	44	8 %
Finland	17	3 %	Energy	17	3 %
France	77	13 %	Financials	108	19 %
Germany	64	11 %	Health Care	50	9 %
Republic of Ireland	9	2 %	Industrials	116	20 %
Italy	34	6 %	Information Technology	27	5 %
Netherlands	29	5 %	Materials	52	9 %
Norway	18	3 %	Real Estate	33	6 %
Poland	8	1 %	Utilities	33	6 %
Portugal	4	1 %			
Spain	24	4 %			
Sweden	64	11 %			
Switzerland	52	9 %			
United Kingdom	130	22 %			
Total	578	100 %	Total	578	100 %

Table 4.3.2: Descriptive statistics

Table 4.3.2 illustrates the number of observations, mean, median, and standard deviation of each variable in the dataset. The Variables are WACC, Cost of Equity, Cost of Debt, Market Cap, Debt to Total Capital, ESG score, Environmental Score, Social Score, and Governance Score. These variables are gathered from Bloomberg, Sustainalytics, and Refinitiv.

Variable	N	Mean	Media	Std.Dev.
Bloomberg				
WACC	578	8,37	8,24	2,54
Cost of Equity	578	10,7	10,55	2,47
Cost of Debt	578	3,32	3,26	1,28
Market Cap (100' USD)		260019	104279	482392
Debt to Total Capital		31,26	31,97	56,61
Sustainalytics				
ESG Score	578	58,73	60,1	21,39
E Score	569	81,9	87,05	16,32
S Score	569	66,14	67,13	15,66
G Score	569	72,25	75,13	15,74
Refinitiv				
ESG Score	578	72,33	74,94	13,96
E Score	578	69,16	74,3	20,68
S Score	578	73,96	77,12	16,45
G Score	578	72,31	75,73	16,19
Combined				
ESG Score	578	65,53	66,87	13,22
E Score	569	75,73	76,72	12,76
S Score	569	70,17	71,6	11,49
G Score	569	72,4	73,92	11,91

4.4 ESG divergence

The absence of a universally recognized framework for evaluating the ESG performance of firms remains a challenge in ESG score assessments. Accordingly, we aim to highlight the degree of ESG score divergence in our dataset by plotting the scores from Refinitiv and Sustainalytics in Figure 1 below.

Figure 1: ESG Rating Divergence

Figure 1 illustrates the divergence in ESG scores between Refinitiv and Sustainalytics. The scores from Refinitiv are on the x-axis, while the scores from Sustainalytics are on the y-axis.

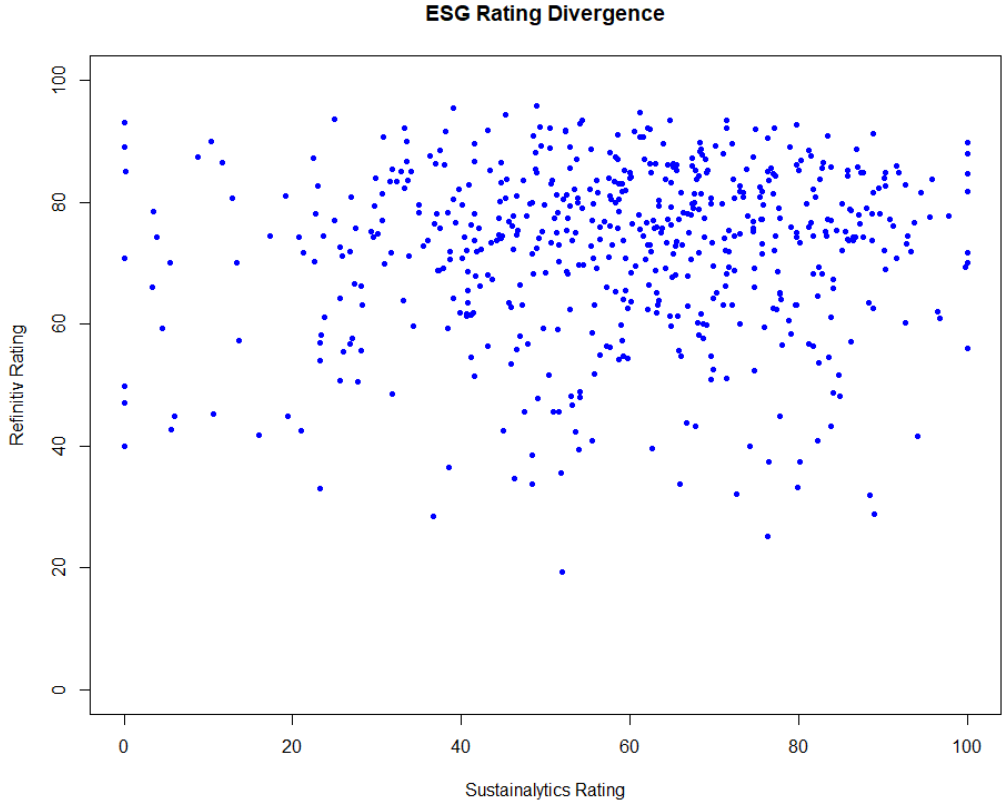

Figure 1 illustrates a significant divergence in ESG scores between the ratings from Refinitiv and Sustainalytics. These findings are consistent with Berg et al. (2022), and further illuminate the importance of a more universally consistent ESG rating methodology.

As pressure is building on firms to actively engage in ESG practices by both regulators and capital providers, firms rely more heavily on external rating agencies in evaluating their progress. However, firms investing in ESG enhancing activities may experience an increase in ratings from one agency but not necessarily another, making it challenging to stipulate which areas to prioritize. Furthermore, disagreements among providers weakens the credibility of firms' ESG ratings, leading to a less robust information basis for capital providers seeking to implement ESG based investment strategies. This in turn can lead to higher stock volatility and increased risk premiums (Avramov et al, 2020; Christensen et al., 2021). A universal standard for ESG rating providers would benefit both firms and capital providers by providing increased ESG rating credibility and more reliable information when making ESG based investment decisions.

5.0 Analysis and findings

In our analysis we have utilized linear regression analysis to test our hypotheses. Linear regression analysis allows us to examine the relationships between our dependent variables (WACC, cost of equity, and cost of debt) and our independent variables (ESG Divergence, ESG scores and ESG pillar scores) while accounting for our control variables (debt to total capital and market cap). Our regressions are designed to account for multicollinearity by using a variance inflation factor test and heteroscedasticity using heteroscedasticity-robust standard errors.

5.1 Hypothesis 1

The regressions presented under *Hypothesis 1* aim to investigate the relationship between ESG score divergence and a firm's cost of capital. The regression analysis investigates the relationships between three dependent variables—*WACC* (regression 1), *Cost of Equity* (regression 2), and *Cost of Debt* (regression 3) —and the independent variables *Divergence, Debt to Total Capital,* and *Market Cap.*

The hypothesis is tested using the following regression:

$$\boldsymbol{y = \beta_0 + \beta_1 Divergence + \beta_2 Debt\ to\ Total\ Capital + \beta_3 Market\ Cap + \varepsilon}$$

5.1.1 Hypothesis 1: Divergence and WACC, Cost of Equity and Cost of Debt

Table 5.1.1

Table 5.1.1 shows the results of three multivariate linear regressions of Divergence on WACC, Cost of Equity, and Cost of Debt. WACC refers to the weighted average cost of capital. Cost of Equity refers to the cost of equity capital derived from the CAPM. Cost of Debt refers to the firm's cost of debt capital. Divergence is the spread between the ESG ratings from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:		
	WACC	Cost of Equity	Cost of Debt
	(1)	(2)	(3)
Divergence	−0.002	0.007	0.0004
	t = −0.400	t = 1.484	t = 0.147
Debt to Total Capital	−0.008	−0.002	−0.001
	t = −0.181	t = −0.314	t = −0.219
Market Cap	−0.114	−0.180*	−0.196***
	t = −1.015	t = −1.810	t = −4.219
Constant	10.041***	12.611***	5.654***
	t = 6.697	t = 10.829	t = 9.961
Observations	578	578	578
R^2	0.038	0.010	0.032
Adjusted R^2	0.032	0.004	0.027
Note:		*p<0.1; **p<0.05; ***p<0.01	

The control variables in regressions 1-3 show mixed results. *Market Cap* has a statistically significant negative relationship with the C*ost of Debt* at the 1% significance level ($t = -3.911$, $p < 0.01$) and the C*ost of Equity* at the 10% level ($t = -1.810$, $p < 0.1$), but does not have a significant relationship with *WACC*. This suggests larger firms have more beneficial debt terms, which could be explained by factors such as greater financial strength, greater access to capital markets, or higher collateral availability which allow for more favorable borrowing terms. However, this effect does not seem to be large enough to influence the WACC. *Debt to Total Capital* does not exhibit a statistically significant relationship with any of the dependent variables. This indicates that although debt to creditors generally has a lower cost than equity, the degree of leverage does not appear to have an impact on the WACC in STOXX Europe 600 firms. Furthermore, equity investors may consider larger firms to be more mature and therefore carry less risk, lowering the required expected return.

Regression (1) shows no statistically significant relationships between *WACC* and *Divergence,* which implies that the divergence in ESG scores from Refinitiv and Sustainalytics have no impact on the *WACC* of STOXX Europe 600 firms. The same result is shown in regression (2) for C*ost of Equity* and regression (3) for C*ost of Debt.* This implies that the ESG score spread between Refinitiv and Sustainalytics do not appear to significantly impact the WACC of firms contained in our dataset. In other words, even though there is no standardized ESG rating methodology, it appears to be of no significance to capital providers and their required rates of return. This is the assumption we base our further research on.

5.2 Hypothesis 2

The regressions presented under *Hypothesis 2* aim to investigate the relationship between a firm's ESG score and its WACC, Cost of Equity, and Cost of Debt. The table reports the regression results for three models, with each model having a different dependent variable: *WACC* (regression 1), C*ost of Equity* (regression 2), and C*ost of Debt* (regression 3). The independent variables are *ESG Score*, *Debt to Total Capital* and *Market Cap*.

The hypothesis is tested using the following regression:

$$\boldsymbol{y = \beta_0 + \beta_1 ESG\ Score + \beta_2 Debt\ to\ Total\ Capital + \beta_3 Market\ Cap + \varepsilon}$$

5.2.1 Hypothesis 2: ESG Score and WACC, Cost of Equity and Cost of Debt

Table 5.2.1

Table 5.2.1 shows the results of three multivariate linear regressions of ESG score on WACC, Cost of Equity, and Cost of Debt. WACC refers to the weighted average cost of capital. Cost of Equity refers to the cost of equity capital derived from the CAPM. Cost of Debt refers to the firm's cost of debt capital. ESG Score refers to the average of ESG scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:		
	WACC	Cost of Equity	Cost of Debt
	(1)	(2)	(3)
ESG Score	−0.030***	−0.009	0.006
	t = −2.651	t = −0.961	t = 1.084
Debt to Total Capital	−0.008	−0.001	−0.001
	t = −0.188	t = −0.248	t = −0.223
Market Cap	−0.029	−0.136	−0.215***
	t = −0.261	t = −1.272	t = −3.911
Constant	10.690***	12.857***	5.514***
	t = 7.767	t = 11.196	t = 10.370
Observations	578	578	578
R^2	0.057	0.008	0.036
Adjusted R^2	0.052	0.003	0.031
Note:			*p<0.1; **p<0.05; ***p<0.01

The control variables in regressions 1-3 show mixed results. *Market Cap* has a statistically significant negative relationship with the cost of debt at the 1% significance level ($t = -3.911$, $p < 0.01$), but does not have a significant relationship with *WACC* or *Cost of Equity*. This is partially consistent with our findings in *Hypothesis 1*, where we also see a significant relationship between *Market Cap* and *Cost of Debt,* however we no longer have a significant relationship between *Market Cap* and *Cost of Equity.*

Regression (1) shows that *ESG Score* has a statistically significant negative relationship with *WACC* at the 1% significance level ($t = -2.651$, $p < 0.01$). This finding is consistent with our expectations based on the empirical findings discussed earlier, such as Atan et al. (2021), Priem and Gabellone (2022) and Piechocka-Kaluzna et al. (2021) who found a negative relationship between ESG score and WACC in Malaysia, Europe and USA respectively.

Regression (2) shows that *ESG score* has a negative, but not statistically significant relationship with C*ost of Equity* ($t = -0.961$, $p > 0.1$). This finding is not fully consistent with some of the previous studies, such as Dhaliwal et al. (2011) and El Ghoul et al. (2011), which reported a significant negative relationship between ESG performance and the cost of equity. Furthermore, Priem and Gabellone (2022) also found a statistically significant relationship between cost of equity and ESG score, but this was only the case for firms domiciled in countries with weaker legal environments. This may suggest that the majority of firms in the STOXX Europe 600 are domiciled in countries with stronger legal environments, which is consistent with our descriptive statics in Table 4.3.1 which shows a majority of observations are in countries which are generally considered to be more regulated (i.e. UK, Germany and France). However, Priem and Gabellone (2022) excluded the Financials sector from their dataset while the Financials sector makes up almost 20% of our dataset. In addition, we use a proxy ESG score which likely differs from their ESG scores. This could be contributing factors to the differences in findings.

Regression (3) reports a positive, but not statistically significant relationship between the *ESG score* and the *Cost of Debt* ($t = 1.084$, $p > 0.1$). This finding is somewhat surprising, as previous research, such as Goss and Roberts (2011) and Liu et al. (2021), has generally found a negative relationship between ESG performance and the cost of debt. Our ex ante expectation was that perhaps creditors would incentivize ESG investment through better lending terms. Furthermore, we expected firms with higher ESG scores to be viewed as less likely to carry transition and climate risk, and therefore require a lower return. However, while ESG initiatives are generally beneficial to firms, they often yield benefits over the long-term. Creditors, particularly if they

are focused on the short-term, might not consider ESG scores to be a strong factor in determining the immediate credit risk of the firm and therefore is not a strong determinant of lending terms.

From our regressions we see that although WACC does have a significant negative relationship with ESG score, this is not the case for cost of equity and cost of debt which are both not significant. This result is somewhat counterintuitive, as equity and debt are the two determinants of WACC and we would expect at least one of them to have a significant relationship to ESG scores given that WACC does. Therefore, we suspect that our regression may not fully capture all the necessary variables to be able to draw a causal conclusion. Further investigation into omitted variables is needed to better understand the real drivers of the significance found between WACC and ESG score in our regression.

5.3 Hypothesis 3

The linear regressions below test if there is a relationship between a firm's ESG score and its cost of capital across GICS sectors. We conduct the analysis with dependent variable *WACC*, *Cost of Equity* and *Cost of Debt* across all 11 GICS sectors. The independent variables are *ESG Score*, *Debt to Total Capital* and *Market Cap*.

The hypothesis is tested using the following regression:

$$\boldsymbol{y = \beta_0 + \beta_1 ESG\ Score + \beta_2 Debt\ to\ Total\ Capital + \beta_3 Market\ Cap + \varepsilon}$$

5.3.1 Hypothesis 3.1: ESG Score, GICS sectors and WACC

Table 5.3.1.A

Table 5.3.1.A shows the results of four multivariate linear regressions of ESG score on WACC, divided by the GICS sectors Financials, Consumer Discretionary, Materials, and Industrials. WACC refers to the weighted average cost of capital. ESG Score refers to the average of ESG scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:			
	WACC			
	Financials	Consumer Discretionary	Materials	Industrials
	(1)	(2)	(3)	(4)
ESG Score	−0.044**	0.034	0.014	−0.009
	t = −2.462	t = 1.442	t = 0.455	t = −0.466
Debt to Total Capital	−0.025	−0.081***	−0.048***	−0.056***
	t = −0.534	t = −4.196	t = −3.889	t = −3.781
Market Cap	0.231	−0.050	−0.182	−0.206
	t = 1.395	t = −0.189	t = −0.659	t = −0.907
Constant	9.743***	9.276***	10.936***	13.525***
	t = 4.746	t = 2.697	t = 3.196	t = 4.474
Observations	108	64	52	116
R^2	0.157	0.267	0.200	0.233
Adjusted R^2	0.133	0.230	0.150	0.213
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.3.1.B

Table 5.3.1.B shows the results of four multivariate linear regressions of ESG score on WACC, divided by the GICS sectors Communication Services, Real Estate, Consumer Staples, and Utilities. WACC refers to the weighted average cost of capital. ESG Score refers to the average of ESG scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:			
	WACC			
	Communication Services	Real Estate	Consumer Staples	Utilities
	(5)	(6)	(7)	(8)
ESG Score	−0.018	0.031	0.026	−0.001
	t = −0.509	t = 0.796	t = 0.602	t = −0.034
Debt to Total Capital	−0.030	−0.071***	−0.065***	−0.096***
	t = −1.012	t = −2.611	t = −2.872	t = −4.942
Market Cap	0.048	−0.350	0.063	0.116
	t = 0.108	t = −0.816	t = 0.281	t = 0.295
Constant	9.753*	11.968*	8.454**	10.391***
	t = 1.742	t = 1.781	t = 2.445	t = 2.948
Observations	34	33	44	33
R^2	0.081	0.347	0.145	0.456
Adjusted R^2	−0.011	0.279	0.081	0.400
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.3.1.C

Table 5.3.1.C shows the results of three multivariate linear regressions of ESG score on WACC, divided by the GICS sectors Health Care, Energy and Information Technology. WACC refers to the weighted average cost of capital. ESG Score refers to the average of ESG scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:		
	WACC		
	Health Care	Energy	Information Technology
	(9)	(10)	(11)
ESG Score	−0.022	−0.122∗	−0.019
	t = −0.653	t = −1.677	t = −0.446
Debt to Total Capital	−0.095∗∗∗	−0.003	−0.037
	t = −4.929	t = −0.039	t = −1.573
Market Cap	0.260	−1.066	0.085
	t = 0.448	t = −1.190	t = 0.175
Constant	10.118∗	26.953∗∗	8.644∗
	t = 1.661	t = 2.516	t = 1.647
Observations	50	17	27
R^2	0.347	0.479	0.108
Adjusted R^2	0.304	0.359	−0.009
Note:			∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Debt to Total Capital has a significant negative relationship with *WACC* at the 1% level in the sectors *Consumer Discretionary* ($t = -4.196$, $p < 0.01$), *Materials* ($t = -3.889$, $p < 0.01$), *Industrials* ($t = -3.781$, $p < 0.01$), *Real Estate* ($t = -2.611$, $p < 0.01$), *Consumer Staples* ($t = -2.872$, $p < 0.01$), *Utilities* ($t = -4.942$, $p < 0.01$), and *Health Care* ($t = -4.929$, $p < 0.01$). These results suggest that higher debt levels are associated with lower *WACC* in these sectors. This contradicts our findings in *Hypothesis 1* and *2* where *Debt to Total Capital* did not appear to have a significant relationship with WACC, but is more in line with the intuition that debt comes at a lower cost than equity and would therefore lead to highly leveraged firms having a lower WACC.

In addition, we believe a common factor amongst the sectors with a statistical significance is that firms within these sectors typically have a greater tangible asset base than those without statistical significance. This implies that firms within sectors with more tangible assets (i.e real estate) are considered less risky than firms in sectors with fewer tangible assets (i.e. communication services) by capital providers. This may be due to factors such as collateral value, where a real estate firm has physical assets in their balances, while communication services are more dependent on intangible assets such as intellectual property and brand reputation. However, our current dataset does not support a causal conclusion to be drawn here, and further investigations are needed to solidify this assumption.

Market Cap does not show a statistically significant relationship with *WACC* in any of the GICS sectors, indicating that it may not be a strong determinant of WACC across sectors. This is in line with our findings in *Hypothesis 2*.

For the *Financials* sector, there is a significant negative relationship between *ESG score* and *WACC* at the 5% significance level ($t = -2.462$, $p < 0.05$). Financial institutions are at the forefront of driving the transition towards a more sustainable world, and are heavily influenced by the EU taxonomy, and thereunder directives such as the Sustainable Finance Disclosure Regulation, as well as government regulations and pressure from capital providers. Financial institutions with higher ESG scores may be viewed as better managed and less likely to face controversies. Furthermore, financial institutions have a social responsibility to promote sustainable business practices through investments and funding, and may be subject to increased scrutiny in cases where the institutions are not themselves sustainable. There is also a significant negative relationship between *ESG Score* and *WACC* for the *Energy s*ector ($t = -1.677$, $p < 0.1$) at the 10% significance level, implying that firms in the Energy sector could

benefit from a lower WACC by investing in ESG performance. However, the relationship between *ESG Score* and *WACC* is not statistically significant for any of the other sectors.

Sub-conclusion Hypothesis 3.1

Based on our findings, it seems only the Financials sector and Energy sector show a significant relationship between WACC and the ESG score. Given the findings in *Hypothesis 2*, we would have expected to see a greater number of sectors with a significant relationship between ESG score and WACC. We are inclined to believe that the reason for this contradiction is that the Financials sector and Energy sector combined may weight disproportionately heavy in our data, therefore skewing the result when analyzing the WACC-ESG score relationship on an aggregate level. We also note that there are rather few observations for the Energy sector, which may cause a false positive in our regression. Although our findings in *Hypothesis 2* are consistent with previous research, our new findings in *Hypothesis 3.1* suggest that our findings in *Hypothesis 2* may not be applicable on a general basis but are rather sector specific. Nevertheless, these results create doubt about the legitimacy of our initial findings in *Hypothesis 2*.

5.3.2 Hypothesis 3.2: ESG Score, GICS sectors and Cost of Equity

Table 5.3.2.A

Table 5.3.2.A shows the results of four multivariate linear regressions of ESG score on Cost of Equity, divided by the GICS sectors Financials, Consumer Discretionary, Materials, and Industrials. Cost of Equity refers to the cost of equity capital derived from the CAPM. ESG Score refers to the average of ESG scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:			
	Cost of Equity			
	Financials	Consumer Discretionary	Materials	Industrials
	(1)	(2)	(3)	(4)
ESG Score	−0.032**	0.031	0.039	0.009
	t = −1.965	t = 1.177	t = 1.223	t = 0.467
Debt to Total Capital	0.00005	0.008	0.003	0.001
	t = 0.003	t = 0.310	t = 0.199	t = 0.055
Market Cap	0.029	0.016	−0.628**	−0.361*
	t = 0.136	t = 0.050	t = −2.168	t = −1.666
Constant	12.685***	8.292*	15.049***	14.347***
	t = 5.182	t = 1.946	t = 4.023	t = 4.868
Observations	108	64	52	116
R^2	0.031	0.037	0.112	0.030
Adjusted R^2	0.003	−0.012	0.057	0.004
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.3.2.B

Table 5.3.2.B shows the results of four multivariate linear regressions of ESG score on Cost of Equity, divided by the GICS sectors Communication Services, Real Estate, Consumer Staples, and Utilities. Cost of Equity refers to the cost of equity capital derived from the CAPM. ESG Score refers to the average of ESG scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:			
	Cost of Equity			
	Communication Services	Real Estate	Consumer Staples	Utilities
	(5)	(6)	(7)	(8)
ESG Score	−0.001	0.064	−0.012	0.014
	t = −0.039	t = 1.409	t = −0.229	t = 0.375
Debt to Total Capital	*0.068***	−0.036	0.024	0.001
	t = 2.225	t = −0.998	t = 0.993	t = 0.073
Market Cap	*−0.325*	0.119	−0.467	−0.086
	t = −0.684	t = 0.208	t = −1.432	t = −0.167
Constant	*11.880***	5.753	16.560***	11.234***
	t = 2.271	t = 0.683	t = 3.687	t = 2.609
Observations	34	33	44	33
R^2	0.224	0.082	0.071	0.005
Adjusted R^2	0.146	−0.013	0.001	−0.097
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.3.2.C

Table 5.3.2.C shows the results of three multivariate linear regressions of ESG score on Cost of Equity, divided by the GICS sectors Health Care, Energy, and Information Technology. Cost of Equity refers to the cost of equity capital derived from the CAPM. ESG Score refers to the average of ESG scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:		
	Cost of Equity		
	Health Care	Energy	Information Technology
	(9)	(10)	(11)
ESG Score	−0.010	−0.052	−0.017
	t = −0.292	t = −0.852	t = −0.384
Debt to Total Capital	−0.008	−0.002	0.017
	t = −0.336	t = −0.066	t = 0.744
Market Cap	0.170	0.705	0.458
	t = 0.277	t = 0.591	t = 0.844
Constant	9.932	5.107	5.578
	t = 1.484	t = 0.370	t = 0.834
Observations	50	17	27
R^2	0.008	0.235	0.047
Adjusted R^2	−0.056	0.058	−0.077
Note:			*p<0.1; **p<0.05; ***p<0.01

Debt to Total Capital shows a significant positive relationship with *Cost of Equity* for the *Communication Services* sector ($t = 2.225$, $p < 0.05$) at the 5% level. This implies that a higher leverage rate is seen as riskier by equity providers, leading to a higher required rate of return.

There is a significant negative relationship between *Market Cap* and *Cost of Equity* for the *Materials* sector ($t = -2.168$, $p < 0.05$) at the 5% level and a marginally significant negative relationship for the *Industrials* sector ($t = -1.666$, $p < 0.1$) at the 10% significance level. We can apply the same logic here as for our interpretation under *Hypothesis 3.1*, meaning that larger firms in sectors with a high degree of tangible assets are seen as less risky by equity investors. On the other hand, we would have expected more sectors to have a significant coefficient based on this intuition. However, *Market Cap* does not show a statistically significant relationship with *Cost of Equity* in the other sectors, indicating that it may not be a strong determinant of the cost of equity across sectors.

For the *Financials* sector ($t = -1.965$, $p < 0.05$), there is a significant negative relationship between *ESG Score* and *Cost of Equity* at the 5% significance level. This implies that firms in the Financials sector may benefit from a higher ESG score in terms of a lower cost of equity capital. A plausible explanation for this could be that financial institutions are at the forefront of driving the transition towards higher ESG focus and are also increasingly regulated. This means that financial institutions with higher ESG scores may be considered better equipped to handle rapid regulatory pressures from governments and increasing ESG demands from investors.

However, the relationship between *ESG Score* and *Cost of Equity* is not statistically significant for the other GICS sectors. As the Financials sector is the only sector showing a significant relationship, the significant relationship between ESG score and the cost of equity is likely sector specific.

Sub-conclusion Hypothesis 3.2

From our regressions we see that the Financials sector is the only sector displaying a significant negative relationship between the ESG Score and the cost of equity, implying that the significant relationship is sector specific. This is likely the driver of the significant relationship between WACC and the ESG score we found in *Hypothesis 3.1* for the Financials sector.

An explanation for this could be that perhaps equity investors generally do not actually take ESG scores into consideration to a significant extent when making sector specific investment

decisions. In other words, firms with a higher ESG performance are not necessarily seen as more or less attractive, thus not receiving a favorable equity cost. Our findings in *Hypothesis 2* support this notion, as we saw no significant relationship between the cost of equity and ESG Score when not accounting for GICS sector. Nonetheless, firms in the Financials sector are seemingly the exception to this, but this could also be caused by omitted variables captured by the ESG score when looking at this sector.

5.3.3 Hypothesis 3.3: ESG Score, GICS sectors and Cost of Debt

Table 5.3.3.A

Table 5.3.3.A shows the results of four multivariate linear regressions of ESG score on Cost of Debt, divided by the GICS sectors Financials, Consumer Discretionary, Materials, and Industrials. Cost of Debt refers to the firm's cost of debt capital. ESG Score refers to the average of ESG scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:			
	Cost of Debt			
	Financials	Consumer Discretionary	Materials	Industrials
	(1)	(2)	(3)	(4)
ESG Score	0.003	0.012	0.003	−0.013
	t = 0.266	t = 1.113	t = 0.181	t = −0.981
Debt to Total Capital	0.002	0.003	0.014	0.009
	t = 0.514	t = 0.278	t = 1.251	t = 0.827
Market Cap	−0.217**	−0.202*	−0.217**	−0.263**
	t = −2.004	t = −1.880	t = −2.030	t = −2.114
Constant	5.548***	4.790***	5.207***	7.036***
	t = 3.418	t = 3.244	t = 3.099	t = 3.810
Observations	108	64	52	116
R^2	0.038	0.087	0.163	0.082
Adjusted R^2	0.011	0.041	0.110	0.057
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.3.3.B

Table 5.3.3.B shows the results of four multivariate linear regressions of ESG score on Cost of Debt, divided by the GICS sectors Communication Services, Real Estate, Consumer Staples, and Utilities. Cost of Debt refers to the firm's cost of debt capital. ESG Score refers to the average of ESG scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:			
	Cost of Debt			
	Communication Services	Real Estate	Consumer Staples	Utilities
	(5)	(6)	(7)	(8)
ESG Score	−0.021	0.003	−0.027	0.025
	t = −1.047	t = 0.207	t = −0.815	t = 1.518
Debt to Total Capital	0.019	−0.005	−0.009	−0.003
	t = 1.077	t = −0.439	t = −0.514	t = −0.200
Market Cap	−0.088	−0.072	−0.065	−0.266
	t = −0.223	t = −0.317	t = −0.450	t = −1.021
Constant	4.831	4.270	6.391**	4.989**
	t = 1.089	t = 1.637	t = 2.099	t = 2.047
Observations	34	33	44	33
R^2	0.062	0.020	0.032	0.109
Adjusted R^2	−0.032	−0.081	−0.041	0.017
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.3.3.C

Table 5.3.3.C shows the results of three multivariate linear regressions of ESG score on Cost of Debt, divided by the GICS sectors Health Care, Energy, and Information Technology. Cost of Debt refers to the firm's cost of debt capital. ESG Score refers to the average of ESG scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:		
	Cost of Debt		
	Health Care	Energy	Information Technology
	(9)	(10)	(11)
ESG Score	0.005	0.037**	0.008
	t = 0.414	t = 2.172	t = 0.430
Debt to Total Capital	0.006	−0.002	0.005
	t = 0.657	t = −0.318	t = 0.444
Market Cap	−0.210	0.035	−0.244
	t = −1.248	t = 0.083	t = −1.106
Constant	5.286***	0.591	5.371**
	t = 3.129	t = 0.112	t = 2.074
Observations	50	17	27
R^2	0.052	0.481	0.065
Adjusted R^2	−0.010	0.362	−0.057
Note:			*p<0.1; **p<0.05; ***p<0.01

Debt to Total Capital shows no significant relationship with *Cost of Debt* in any of the sectors. We saw similar results under *Hypothesis 3.2*, where only the Communication Services sector showed a significant negative relationship at the 5% level with the cost of equity. This contradicts the findings in *Hypothesis 3.1*, and we would expect that more sectors were statistically significant given that several sectors had a significant relationship between *Debt to Total Capital* and *WACC.*

Market Cap exhibits a significant negative relationship with *Cost of Debt* in the *Financials* ($t = -2.004$, $p < 0.05$), *Consumer Discretionary* ($t = -1.880$, $p < 0.1$), *Materials* ($t = -2.030$, $p < 0.05$), and *Industrials* ($t = -2.114$, $p < 0.05$) sectors. This suggests that larger firms may benefit from lower cost of debt in several sectors, which is in line with the intuition that larger firms are often more mature and better positioned for more favorable financing.

For the *Energy* sector ($t = 2.172$, $p < 0.05$), there is a significant positive relationship between *ESG Score* and *Cost of Debt* at the 5% significance level, implying that creditors are less inclined to provide favorable lending terms to energy firms transitioning towards more sustainable means. This may seem counterintuitive as one would expect creditors to view higher ESG scores as a positive aspect, thereby lowering the cost of debt. However, less sustainable means of energy are considered to be highly profitable, and creditors may attach more uncertainty to revenue streams from more sustainable energy sources and would therefore require a higher premium.

Sub-conclusion Hypothesis 3.3

Our regressions imply that the Energy sector is the only sector displaying a significant positive relationship between the ESG score and the cost of debt, suggesting that the significant relationship is sector specific. The positive relationship is, however, contradictory when compared to our findings under *Hypothesis 3.1* where we saw a significant negative relationship between WACC and the ESG score for the Energy sector. This suggests that although a higher ESG score will overall benefit the WACC of firms in the Energy sector, creditors attribute a higher risk to ESG investing in this sector and therefore demand a premium. We do note that the discrepancy could be caused by few observations in the Energy sector, or other omitted explanatory variables, which may skew the regression results.

The fact that no other sectors had a significant relationship between the ESG score and the cost of debt could mean that perhaps creditors do not take ESG scores into consideration to a

significant extent when making sector specific funding decisions. In other words, firms with a higher ESG performance are not necessarily seen as more or less risky, thus not receiving a favorable cost of debt. These findings correspond to the findings under *Hypothesis 3.2* and *3.1* for the most part, and propose that apart from some sectors, capital providers do not attribute particularly high value to higher ESG scores. Our findings in *Hypothesis 2* again support this notion, as we saw no significant relationship between the cost of debt and ESG score when not accounting for GICS sector. Nonetheless, firms in the Energy sector are seemingly the exception to this.

5.4 Hypothesis 4

The regressions presented under *Hypothesis 4* aim to investigate the relationship between a firm's individual ESG pillar scores and its WACC, cost of equity, and cost of debt. The table reports the regression results for the dependent variables *WACC* (regression 1), *Cost of Equity* (regression 2), and *Cost of Debt* (regression 3). The independent variables are *Environmental Score, Social Score, Governance Score, Debt to Total Capital* and *Market Cap*.

The hypothesis is tested using the following regression:

$$y = \beta_0 + \beta_1 Environmental\ Score + \beta_2\ Social\ Score + \beta_3\ Governance\ Score + \beta_4 Debt\ to\ Total\ Capital + \beta_5 Market\ Cap + \varepsilon$$

5.4.1 Hypothesis 4: ESG-pillars and WACC, Cost of Equity and Cost of Debt

Table 5.4.1

Table 5.4.1 shows the results of three multivariate linear regressions of ESG score on WACC, Cost of Equity, and Cost of Debt. WACC refers to the weighted average cost of capital. Cost of Equity refers to the cost of equity capital derived from the CAPM. Cost of Debt refers to the firm's cost of debt capital. Environmental Score, Social Score, and Governance score refers to the average of the respective scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:		
	WACC	Cost of Equity	Cost of Debt
	(1)	(2)	(3)
Environmental Score	−0.052**	0.002	0.0003
	t = −2.398	t = 0.163	t = 0.034
Social Score	−0.016	0.0002	−0.009
	t = −1.383	t = 0.017	t = −1.528
Governance Score	0.029***	0.002	0.014***
	t = 2.910	t = 0.166	t = 3.073
Debt to Total Capital	−0.007	−0.001	−0.001
	t = −0.167	t = −0.316	t = −0.190
Market Cap	0.087	−0.176*	−0.187***
	t = 0.830	t = −1.649	t = −4.189
Constant	10.570***	12.551***	5.124***
	t = 7.623	t = 9.238	t = 7.330
Observations	569	569	569
R^2	0.124	0.007	0.048
Adjusted R^2	0.116	−0.002	0.039
Note:			*p<0.1; **p<0.05; ***p<0.01

The control variables in regressions 1-3 show similar results as in *Hypothesis 1 and 2*, which is expected seeing as the only difference in the regressions is the breakdown of ESG score into its individual pillars. *Market Cap* exhibits a significant negative relationship with *Cost of Equity* at the 10% significance level ($t = -1.649$, $p < 0.1$), as also seen in *Hypothesis 1*. It also has a significant relationship with the Cost of D*ebt* at the 1% level ($t = -4.189$, $p < 0.01$), while *Debt to Total Capital* has no significant relationship to *WACC, Cost of Equity,* or *Cost of Debt,* corresponding to findings in *Hypothesis 2*.

There is a significant negative relationship between *Environmental Score* and *WACC* at the 5% significance level ($t = -2.398$, $p < 0.05$), suggesting that higher environmental scores are associated with lower WACC for European firms. The findings suggest that capital providers place a notable emphasis on the environmental pillar. This meets our expectations as ESG is often used synonymously with the environmental aspect. For instance, a firm with a higher risk of environmental controversies will likely be judged harder based on their environmental impact compared to controversies arising within the less assessable social and governance factors (Howard-Grenville, 2021).

The *Governance Score*, on the other hand, shows a significant positive relationship with *WACC* at the 1% significance level ($t = 2.910$, $p < 0.01$), indicating that higher governance scores are associated with higher WACC. This contradicts Piechocka-Kaluzna et al. (2021) who found a significant negative relationship between all the ESG pillars and WACC for American firms implying that firms that exhibit higher governance scores also generally have lower average costs of capital. Priem and Gabellone (2022), however, found similar results to us, suggesting that European firms with high governance scores may be viewed as a higher risk by capital providers. Firms with higher governance scores may be investing large amounts of capital into disclosure, transparency, and reporting practices, which can be seen as a significant cost driver by capital providers. Hence, despite high governance generally being considered a positive, it may reduce a firm's ability to tend to capital costs.

The *Social Score* does not exhibit a significant relationship with *WACC*. These findings correspond to Atan et al. (2018) who found no significant relationship between a firm's social score and WACC for Malaysian firms. This discrepancy could be explained by differences in definitions, where CSR and the social score do not necessarily encapsulate all the same things. Furthermore, different markets may respond differently to a firm's CSR activities, where it may

be considered as a value creator in some markets but not highly considered by capital providers in Europe.

None of the ESG pillar scores show a statistically significant relationship with *Cost of Equity,* meaning equity investors do not take the individual pillars into account when making an investment decision. This result contradicts our expectations based on previous literature, but corresponds to our findings in *Hypothesis 2* where we saw no significance between the aggregated ESG score and the cost of equity. Although it is in line with findings in *Hypothesis 2*, the findings of El Ghoul et al. (2011) and Piechocka-Kaluzna et al. (2021) suggest there is a significant negative relationship between environmental score and the cost of equity.

The *Governance Score* exhibits a significant positive relationship with *Cost of Debt* at the 1% significance level ($t = 3.073$, $p < 0.01$), indicating that higher governance scores are associated with higher cost of debt. This corresponds to the findings in regression (1) as well as Priem and Gabellone (2022), who found a significant positive relationship between governance scores and cost of debt for firms regardless of legal environment. However, we again see contradicting findings in other literature where Erragragui (2018) finds a significant negative relationship between the cost of debt and both the environmental score and the governance score, while Eliwa et al. (2021) finds no significant relationship.

Sub-conclusion Hypothesis 4

From our regressions we see that although *WACC* has a significant negative relationship with *Environmental Score*, this is not the case for cost of equity and cost of debt which are both not significant. We saw a similar result in *Hypothesis 2*, where the relationship between *WACC* and *ESG Score* was significant, but not for cost of equity and cost of debt. This result is again somewhat counterintuitive, as we would expect at least one of them to have a significant relationship to environmental scores given that WACC does. We again suspect omitted variables may be the cause of the significance found in regression (1).

When looking at the social score, none of the independent variables have a significant relationship, suggesting that the social score is not a driver of capital providers decision making. Additionally, it implies that social score does not contribute to the significant relationship between *WACC* and *ESG Score* in *Hypothesis 2*.

Lastly, we see a significant positive relationship between both *WACC* and the *Governance Score*, as well as between the *Cost of Debt* and the *Governance Score*. We would have expected

this relationship to be negative, however our results imply that creditors consider the increased governance cost as a risk for a firm's ability to service its debt obligations.

5.5 Hypothesis 5

The regressions presented in this section aim to investigate the relationship between a firm's individual ESG pillar scores and its WACC across the GICS sectors. We conduct the analysis with dependent variables WACC, Cost of Equity, and Cost of Debt across all 11 GICS sectors. The independent variables are *Environmental Score, Social Score, Governance Score, Debt to Total Capital* and *Market Cap*.

The hypothesis is tested using the following regression:

$$y = \beta_0 + \beta_1 Environmental\ Score + \beta_2\ Social\ Score + \beta_3\ Governance\ Score + \beta_4 Debt\ to\ Total\ Capital + \beta_5 Market\ Cap + \varepsilon$$

5.5.1 Hypothesis 5.1: ESG-pillars, GICS sectors and WACC

Table 5.5.1.A

Table 5.5.1.A shows the results of four multivariate linear regressions of ESG score on WACC, divided by the GICS sectors Financials, Consumer Discretionary, Materials, and Industrials. WACC refers to the weighted average cost of capital. Environmental Score, Social Score, and Governance score refers to the average of the respective scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:			
	WACC			
	Financials	Consumer Discretionary	Materials	Industrials
	(1)	(2)	(3)	(4)
Environmental Score	−0.067**	0.022	−0.012	−0.054
	t = −2.358	t = 0.823	t = −0.416	t = −1.536
Social Score	−0.009	−0.031	−0.034	0.001
	t = −0.460	t = −0.737	t = −1.013	t = 0.026
Governance Score	0.018	0.040	0.015	0.027
	t = 0.769	t = 1.413	t = 0.570	t = 1.376
Debt to Total Capital	−0.025	−0.075***	−0.047***	−0.046***
	t = −0.523	t = −3.399	t = −3.725	t = −2.666
Market Cap	0.399**	−0.055	−0.089	−0.070
	t = 2.299	t = −0.187	t = −0.308	t = −0.292
Constant	9.059***	8.975**	12.924***	13.098***
	t = 3.591	t = 2.425	t = 3.786	t = 4.594
Observations	107	64	51	114
R^2	0.211	0.287	0.249	0.297
Adjusted R^2	0.172	0.226	0.166	0.265
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.5.1.B

Table 5.5.1.B shows the results of four multivariate linear regressions of ESG score on WACC, divided by the GICS sectors Communication Services, Real Estate, Consumer Staples, and Utilities. WACC refers to the weighted average cost of capital. Environmental Score, Social Score, and Governance score refers to the average of the respective scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:			
	WACC			
	Communication Services	Real Estate	Consumer Staples	Utilities
	(5)	(6)	(7)	(8)
Environmental Score	−0.052	0.029	−0.020	−0.038
	t = −1.217	t = 0.710	t = −0.532	t = −1.075
Social Score	0.004	−0.010	−0.012	0.017
	t = 0.095	t = −0.209	t = −0.213	t = 0.419
Governance Score	−0.003	−0.033	0.087**	0.050
	t = −0.105	t = −0.890	t = 2.220	t = 1.596
Debt to Total Capital	−0.028	−0.061***	−0.048*	−0.075***
	t = −0.960	t = −3.046	t = −1.825	t = −4.951
Market Cap	0.135	−0.536	0.266	0.080
	t = 0.270	t = −1.621	t = 0.960	t = 0.218
Constant	11.363*	16.804**	3.323	8.142**
	t = 1.753	t = 2.563	t = 0.582	t = 2.012
Observations	33	33	42	31
R^2	0.156	0.380	0.247	0.509
Adjusted R^2	−0.001	0.265	0.143	0.410
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.5.1.C

Table 5.5.1.C shows the results of three multivariate linear regressions of ESG score on WACC, divided by the GICS sectors Health Care, Energy, and Information Technology. WACC refers to the weighted average cost of capital. Environmental Score, Social Score, and Governance score refers to the average of the respective scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:		
	WACC		
	Health Care	Energy	Information Technology
	(9)	(10)	(11)
Environmental Score	0.015	−0.047	−0.024
	t = 0.460	t = −1.286	t = −0.581
Social Score	−0.077∗	−0.171∗∗	−0.110∗
	t = −1.719	t = −2.235	t = −1.938
Governance Score	0.060	0.067	0.104∗∗
	t = 1.267	t = 1.512	t = 2.218
Debt to Total Capital	−0.093∗∗∗	−0.002	−0.034
	t = −4.518	t = −0.032	t = −1.631
Market Cap	0.277	0.627	0.687
	t = 0.506	t = 0.698	t = 1.410
Constant	8.158	9.794	2.079
	t = 1.304	t = 0.870	t = 0.368
Observations	50	17	27
R^2	0.404	0.704	0.350
Adjusted R^2	0.337	0.570	0.195
Note:			∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Debt to Total Capital has a significant negative relationship with *WACC* at the 1% level in the sectors *Consumer Discretionary* ($t = -3.399$, $p < 0.01$), *Materials* ($t = -3.725$, $p < 0.01$), *Industrials* ($t = -2.666$, $p < 0.01$), *Real Estate* ($t = -3.046$, $p < 0.01$), *Utilities* ($t = -4.951$, $p < 0.01$), and *Health Care* ($t = -4.518$, $p < 0.01$), and at the 10% level for *Consumer Staples* ($t = -1.825$, $p < 0.1$). These results suggest that higher debt levels are associated with lower WACC in these sectors. This is in line with the intuition that debt comes at a lower cost than equity and would therefore lead to highly leveraged firms having a lower WACC, as we discussed under *Hypothesis 3.1*.

Market Cap shows a statistically significant positive relationship with the *Financials s*ector ($t=2.299$, $p < 0.05$) at the 5% level, implying that larger financial institutions have a higher WACC. There are no other statistically significant relationships between WACC and Market Cap in any of the other GICS sectors, indicating that it may not be a strong determinant of WACC across GICS sectors. This is largely in line with our findings in *Hypothesis 3.1*.

Environmental Score has a significant negative relationship with *WACC* for the *Financials* sector ($t = -2.358$, $p < 0.05$). This indicates that firms with better environmental performance in this sector have a lower WACC. This result may suggest that capital providers perceive environmentally responsible financial institutions as lower risk, leading to a reduced WACC. Furthering to our findings under *Hypothesis 3.1*, the environmental pillar seems to be the driver of capital providers' evaluation of financial institutions' ESG performance, thereby weighing most heavily in investment decisions. No other sectors exhibit a significant relationship between environmental score and WACC, indicating that the impact of the environmental score on the WACC may be sector specific.

Social Score exhibits a significant negative relationship with *WACC* for the *Health Care* sector ($t = -1.719$, $p < 0.1$) at the 10% level and for the *Energy* sector ($t = -2.235$, $p < 0.05$) at the 5% level. This suggests that better social performance is associated with lower WACC for firms in these sectors. The significance for the Health Care sector is rather low, but suggests that firms in this sector may benefit from investing in social activities. The result for the Energy sector is in line with our findings in *Hypothesis 3.1* where the sector showed a significant negative relationship with WACC, implying that the social pillar is the driver for the observed significance in *Hypothesis 3.1*. We again note that there are rather few observations for the energy sector, which may weaken the results of the regression. No other sectors show a significant relationship between the Social Score and WACC.

Governance Score has a significant positive relationship with *WACC* for the *Consumer Staples* sector ($t = 2.220$, $p < 0.05$) and for the *Information Technology s*ector ($t = 2.218$, $p < 0.05$). The positive relationship between WACC and the governance score may again seem counterintuitive, as good governance is often associated with lower risk, which should lead to a lower WACC. However, the result is in line with our earlier findings in *Hypothesis 4*, where we observed a significant positive coefficient for governance score without accounting for GICS sector. However, the results imply that the significant positive relationship between the governance score and WACC is sector specific.

Sub-conclusion Hypothesis 5.1

When looking at the environmental score across the GICS sectors, only the Financials sector shows a significant negative relationship with WACC. *Hypothesis 4* suggests the environmental score has a significant negative relationship with WACC on a general level, however our findings suggest that capital providers may only consider this in their decision making for the financial sector. On the other hand, it seems unlikely that the Financials sector is the one sector capital providers would pay particularly close attention the environmental score, as the sector itself is not considered especially environmentally taxing. Therefore, we again suspect there may be omitted variables captured by the environmental score in our regression that causes the significant relationship. As in *Hypothesis 2*, further investigation is needed to be able to draw a causal conclusion.

Furthermore, Consumer Staples and Information Technology are the only sectors with a significant positive relationship with WACC for the governance pillar. This again may lessen the conviction of our result from *Hypothesis 4*, which implies the WACC-governance relationship is significantly positive on a general level.

The health care and energy sectors showed a significant negative relationship between the social score and WACC. For the health care sector, capital providers seem to be solely concerned with the social pillar, as we saw no significance between WACC and the aggregate ESG score in *Hypothesis 3.1* for this sector. For the energy sector, capital providers seem to be concerned both with the aggregate ESG score and more particularly the social pillar, which may be the driver of the significance we found in *Hypothesis 3.1*. However, when compared to *Hypothesis 4* it seems the concern for the social score is specific to these two sectors as there is no significance when not accounting for GICS sector.

5.5.2 Hypothesis 5.2: ESG-pillars, GICS sectors and Cost of Equity

Table 5.5.2.A

Table 5.5.2.A shows the results of four multivariate linear regressions of ESG score on Cost of Equity, divided by the GICS sectors Financials, Consumer Discretionary, Materials, and Industrials. Cost of Equity refers to the cost of equity capital derived from the CAPM. Environmental Score, Social Score, and Governance score refers to the average of the respective scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:			
	Cost of Equity			
	Financials	Consumer Discretionary	Materials	Industrials
	(1)	(2)	(3)	(4)
Environmental Score	−0.032	0.016	−0.010	−0.028
	t = −1.142	t = 0.540	t = −0.286	t = −0.775
Social Score	0.025	−0.025	0.042	0.026
	t = 1.048	t = −0.553	t = 1.060	t = 0.860
Governance Score	−0.025	0.031	−0.025	0.008
	t = −0.767	t = 0.935	t = −0.729	t = 0.425
Debt to Total Capital	0.0003	0.015	0.002	0.007
	t = 0.021	t = 0.547	t = 0.102	t = 0.353
Market Cap	0.018	0.021	−0.615**	−0.313
	t = 0.072	t = 0.059	t = −2.032	t = −1.398
Constant	13.096***	8.352*	17.250***	13.858***
	t = 4.459	t = 1.774	t = 4.750	t = 4.791
Observations	107	64	51	114
R^2	0.031	0.042	0.114	0.055
Adjusted R^2	−0.017	−0.041	0.016	0.012
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.5.2.B

Table 5.5.2.B shows the results of four multivariate linear regressions of ESG score on Cost of Equity, divided by the GICS sectors Communication Services, Real Estate, Consumer Staples, and Utilities. Cost of Equity refers to the cost of equity capital derived from the CAPM. Environmental Score, Social Score, and Governance score refers to the average of the respective scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:			
	Cost of Equity			
	Communication Services	Real Estate	Consumer Staples	Utilities
	(5)	(6)	(7)	(8)
Environmental Score	−0.032	0.090∗∗	−0.009	0.019
	t = −0.743	t = 2.136	t = −0.190	t = 0.362
Social Score	0.024	0.014	−0.059	−0.042
	t = 0.571	t = 0.234	t = −0.956	t = −0.787
Governance Score	−0.031	−0.064	0.071	0.057
	t = −0.825	t = −1.464	t = 1.559	t = 1.361
Debt to Total Capital	0.066∗∗	−0.027	0.020	0.012
	t = 2.143	t = −1.052	t = 0.702	t = 0.537
Market Cap	−0.371	−0.279	−0.272	−0.152
	t = −0.723	t = −0.701	t = −0.686	t = −0.318
Constant	15.436∗∗	11.192	13.232∗	9.840∗∗
	t = 2.545	t = 1.398	t = 1.758	t = 1.987
Observations	33	33	42	31
R^2	0.246	0.281	0.153	0.064
Adjusted R^2	0.106	0.147	0.035	−0.123
Note:				∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Table 5.5.2.C

Table 5.5.2.C shows the results of three multivariate linear regressions of ESG score on Cost of Equity, divided by the GICS sectors Health Care, Energy, and Information Technology. Cost of Equity refers to the cost of equity capital derived from the CAPM. Environmental Score, Social Score, and Governance score refers to the average of the respective scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:		
	Cost of Equity		
	Health Care	Energy	Information Technology
	(9)	(10)	(11)
Environmental Score	0.025	0.036	0.025
	t = 0.664	t = 0.624	t = 0.691
Social Score	−0.044	−0.134	−0.054
	t = −0.827	t = −1.623	t = −0.819
Governance Score	−0.005	0.043	−0.001
	t = −0.098	t = 0.651	t = −0.011
Debt to Total Capital	−0.013	−0.001	0.016
	t = −0.477	t = −0.049	t = 0.665
Market Cap	0.142	1.566	0.415
	t = 0.225	t = 1.189	t = 0.589
Constant	11.289	−5.120	6.955
	t = 1.498	t = −0.340	t = 0.848
Observations	50	17	27
R^2	0.039	0.367	0.083
Adjusted R^2	−0.070	0.080	−0.135
Note:			*p<0.1; **p<0.05; ***p<0.01

Debt to Total Capital shows a significant positive relationship with *Cost of Equity* in the *Communication Services* sector ($t = 2.143$, $p < 0.05$) at the 5% level, implying that higher debt levels are associated with a higher cost of equity in this sector. This corresponds to our findings in *Hypothesis 3.2*.

Market Cap exhibits a significant negative relationship with *Cost of Equity* in the *Materials* sector ($t = -2.032$, $p < 0.05$), implying that larger firms in this sector have a lower *c*ost of equity. This is largely consistent with our findings in *Hypothesis 3.2* although we no longer have a significant relationship for the *Industrials* sector. No other sectors show a statistically significant relationship between *Market Cap* and *Cost of Equity*, suggesting that the impact of market cap on cost of equity is likely to be sector specific.

Environmental Score has a significant positive relationship with the *Cost of Equity* for the *Real Estate* sector ($t = 2.136$, $p < 0.05$). This implies that firms with better environmental performance in this sector have a higher *Cost of Equity*. Firms with higher ESG scores generally tend to invest in more green assets or in sustainable operations which are more cost-heavy than their conventional counterparts. There may be increased costs related to transitioning and maintaining greener operations based on the nature of the real estate sector. A perceived green premium in asset investing could also potentially suppress the yield on these assets. Given that all the firms in the real estate sector in our data sample have some degree of leverage, a lower yield means, ceteris paribus, a lower interest coverage ratio (ICR) - which is an indicator of a firm's ability to serve its debt. Equity investors would likely demand a higher return to compensate for the increased risk, hence leading to higher costs of equity. However, no other sectors show a statistically significant relationship between *Environmental Score* and *Cost of Equity*, indicating that the impact of the environmental score is not to a significant extent considered by equity investors' decision making in other sectors.

Social Score does not exhibit a statistically significant relationship with *Cost of Equity* in any of the sectors. *Governance Score* also does not demonstrate a significant relationship with *Cost of Equity* in any sector. This suggests that the social and governance scores may not be a strong determinant of *Cost of Equity* across any of the GICS sectors.

Sub-conclusion Hypothesis 5.2

The results of *Hypothesis 5.2* are generally in line with our findings in *Hypothesis 4* where no individual ESG pillar score had a significant effect on the cost of equity, not accounting for GICS Sectors. When looking at the individual ESG pillars against the GICS sectors, equity investors do not seem to attribute particular value to any one pillar when making investment decisions for any sector apart from real estate. Based on our findings under *Hypothesis 3.2*, we saw that equity investors did, however, consider the aggregate ESG score when evaluating firms in the Financials sector. This implies that investors in this sector are more concerned about the overall ESG performance of financial institutions rather than any one pillar. For real estate on the other hand, our findings imply that the overall ESG score is not an important part of investment decisions, but the potential risk associated with investments in the environmental score warrants a higher equity premium. Equity investors in any other sector do not consider either ESG score or individual pillar scores when making investment decisions based on our findings.

5.5.3 Hypothesis 5.3: ESG-pillars, GICS sectors and Cost of Debt

Table 5.5.3.A

Table 5.5.3.A shows the results of four multivariate linear regressions of ESG score on Cost of Debt, divided by the GICS sectors Financials, Consumer Discretionary, Materials, and Industrials. Cost of Debt refers to the firm's cost of debt capital. Environmental Score, Social Score, and Governance score refers to the average of the respective scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:			
	Cost of Debt			
	Financials	Consumer Discretionary	Materials	Industrials
	(1)	(2)	(3)	(4)
Environmental Score	−0.003	0.014	−0.015	−0.030
	t = −0.230	t = 1.133	t = −1.001	t = −1.009
Social Score	−0.013	−0.018	−0.018	0.003
	t = −1.460	t = −1.356	t = −1.120	t = 0.184
Governance Score	0.027∗	0.023∗∗	0.016	0.010
	t = 1.811	t = 2.096	t = 1.069	t = 0.776
Debt to Total Capital	0.001	0.003	0.016	0.014
	t = 0.246	t = 0.308	t = 1.303	t = 0.882
Market Cap	−0.160	−0.213∗∗	−0.177	−0.215∗
	t = −1.301	t = −2.005	t = −1.495	t = −1.933
Constant	4.276∗∗	4.218∗∗∗	6.223∗∗∗	6.766∗∗∗
	t = 2.033	t = 2.763	t = 3.828	t = 4.002
Observations	107	64	51	114
R^2	0.089	0.178	0.272	0.127
Adjusted R^2	0.044	0.107	0.191	0.086
Note:				∗p<0.1; ∗∗p<0.05; ∗∗∗p<0.01

Table 5.5.3.B

Table 5.5.3.B shows the results of four multivariate linear regressions of ESG score on Cost of Debt, divided by the GICS sectors Communication Services, Real Estate, Consumer Staples, and Utilities. Cost of Debt refers to the firm's cost of debt capital. Environmental Score, Social Score, and Governance score refers to the average of the respective scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:			
	Cost of Debt			
	Communication Services	Real Estate	Consumer Staples	Utilities
	(5)	(6)	(7)	(8)
Environmental Score	−0.033	0.031∗∗	−0.013	0.028
	t = −0.939	t = 2.122	t = −0.306	t = 0.997
Social Score	0.010	−0.005	−0.019	−0.034
	t = 0.301	t = −0.205	t = −0.417	t = −0.900
Governance Score	−0.023	−0.018	0.021	0.048∗
	t = −0.996	t = −1.106	t = 1.165	t = 1.659
Debt to Total Capital	0.021	−0.010	−0.013	0.003
	t = 1.320	t = −0.769	t = −0.603	t = 0.223
Market Cap	0.005	−0.129	−0.001	−0.251
	t = 0.011	t = −0.545	t = −0.008	t = −0.961
Constant	5.746	4.584∗	4.821	2.999
	t = 1.051	t = 1.695	t = 1.546	t = 1.032
Observations	33	33	42	31
R^2	0.097	0.222	0.039	0.247
Adjusted R^2	−0.070	0.078	−0.095	0.097
Note:				*p<0.1; **p<0.05; ***p<0.01

Table 5.5.3.C

Table 5.5.3.C shows the results of three multivariate linear regressions of ESG score on Cost of Debt, divided by the GICS sectors Health Care, Energy, and Information Technology. Cost of Debt refers to the firm's cost of debt capital. Environmental Score, Social Score, and Governance score refers to the average of the respective scores for STOXX Europe 600 firms gathered from Refinitiv and Sustainalytics. Debt to Total Capital is a control variable and refers to the leverage rate of the firms in the dataset. Market Cap is a control variable and is the natural logarithm of the market value of the firms in US Dollars. P-values are shown as: * p < 0.10. ** p < 0.05. *** p < 0.01.

	Dependent variable:		
	Cost of Debt		
	Health Care	Energy	Information Technology
	(9)	(10)	(11)
Environmental Score	0.004	0.030	0.009
	t = 0.210	t = 1.035	t = 0.451
Social Score	−0.014	−0.010	0.016
	t = −0.968	t = −0.201	t = 0.580
Governance Score	0.031	0.035	−0.013
	t = 1.642	t = 1.196	t = −0.484
Debt to Total Capital	0.008	−0.002	0.004
	t = 0.851	t = −1.132	t = 0.340
Market Cap	−0.190	0.091	−0.350
	t = −1.075	t = 0.137	t = −1.516
Constant	3.720*	−1.913	6.318**
	t = 1.771	t = −0.253	t = 2.009
Observations	50	17	27
R^2	0.111	0.536	0.103
Adjusted R^2	0.010	0.325	−0.110
Note:			*p<0.1; **p<0.05; ***p<0.01

Debt to Total Capital shows no significant relationship with *Cost of Debt* in any of the sectors and corresponds to the findings in *Hypothesis 3.3*. However, this contradicts the findings in *Hypothesis 3.1* and *5.1*, and we would expect that at least some sectors were statistically significant given that several sectors had a significant relationship between *Debt to Total Capital* and *WACC,* as well as *Debt to Total Capital* and *Cost of Debt.*

Market Cap shows a significant negative relationship with *Cost of Debt* in the *Consumer Discretionary* sector ($t = -2.005$, $p < 0.05$) and the *Industrials* sector ($t = -1.933$, $p < 0.1$), suggesting that larger firms in these sectors have a lower Cost of Debt. This is largely consistent with our findings in *Hypothesis 3.3* although we no longer have a significant relationship in the *Financials* and *Materials* sectors. No other sectors show a statistically significant relationship between *Market Cap* and *Cost of Debt*, suggesting that the impact of market cap on cost of debt is likely to be sector specific.

Environmental Score has a significant positive relationship with WACC for the *Real Estate* sector ($t = 2.122$, $p < 0.05$). The result is in line with the findings in *Hypothesis 5.2* and implies that firms with better environmental performance in this sector have a higher cost of debt. This strengthens the intuition in *Hypothesis 5.2* that there may be increased costs related to transitioning and maintaining greener operations and investments, which in turn may lower the yield of investments thus also lowering the ICR. This may be viewed as an increased risk, which creditors could demand a premium to compensate for. However, no other sectors show a statistically significant relationship between *Environmental Score* and *Cost of Debt*, indicating that the impact of the environmental score is not to a significant extent considered in creditors' decision making in other sectors.

Social Score does not exhibit a statistically significant relationship with *Cost of Debt* in any of the sectors implying that social score may not be a strong determinant of the cost of debt across any of the GICS sectors.

Governance Score has a significant positive relationship with WACC at the 5 % level for the *Consumer Discretionary* sector ($t = 2.096$, $p < 0.05$) and at the 10 % level for the *Financials* sector ($t = 1.811$, $p < 0.10$) and the Utilities sector ($t = 1.659$, $p < 0.10$). This implies that firms with a higher Governance Score may have a higher Cost of Debt in these sectors. The results are again in line with *Hypothesis 4*, where creditors seem to be concerned with the governance score. However, by accounting for GICS sector we see that this is only the case for specific sectors, which may be the drivers of the significance on a general level found in *Hypothesis 4*.

Sub conclusion Hypothesis 5.3

As in *Hypothesis 5.2*, the *Environmental Score* has a significant positive relationship with the *Real Estate* sector, while having no significant relationships with any other sectors. *Hypothesis 3.3* shows no significant relationship between the cost of debt and the aggregated ESG score for the real estate sector, implying that creditors are concerned particularly with the environment pillar more so than with the overall ESG score.

Governance score has a significant positive relationship with the Financials sector, the Consumer Discretionary sector and the Utilities sector, none of whom have a significant relationship between the cost of debt and the aggregated ESG score shown in *Hypothesis 3.3*. This further suggests that creditors are more concerned with individual ESG pillars rather than the aggregate score when making decisions on a sector level. However, the energy sector contradicts this as there is a significant positive relationship between the cost of debt and the aggregated ESG score in *Hypothesis 3.3*, but no significant relationship between the cost of debt and any individual ESG pillar for this sector.

The social score displayed no significant relationship to the cost of debt for any sector, which is consistent with *Hypothesis 4*. Based on this, social score seems to have no impact on the decision making of creditors for any STOXX Europe 600 firms on a general or sector specific level. These results are also consistent with *Hypothesis 5.2*, which displays no significant relationship between the cost of equity and the social score for any sector. However, when looking at the relationship between WACC and the social score in *Hypothesis 5.1* we see a significant relationship for the Health Care, Energy and Information Technology sectors. We would have expected to see a significant relationship for these sectors either when looking at the cost of debt or the cost of equity, but the discrepancy could be caused by factors such as such as too few observations or other omitted variables that may skew our regression results.

6.0 Conclusion

This thesis has examined the relationship between the ESG score and the average cost of capital of the 600 European firms that combined make up the STOXX Europe 600 index. Building on the works of other research articles across different markets, we are the first to delve into the GICS sectors to uncover potential sector specific differences in how capital providers make investment and funding decisions. Thus, we contribute new insights to the growing body of literature and deepen the academic basis on the topic.

Our analysis starts by investigating the effect of ESG divergence on WACC, cost of equity and cost of debt, where we find no significant relationships. We then examine the aggregated ESG scores on WACC, cost of equity and cost of debt both on a general level and across GICS sectors. Our findings in *Hypothesis 2* propose that WACC does have a significant negative relationship with ESG score, meaning that on a general level STOXX Europe 600 firms may benefit from lower average costs of capital by investing in ESG boosting activities. This result backs the findings of several other research articles such as Priem and Gabellone (2022), Atan et al. (2021) and Piechocka-Kaluzna et al. (2021) who have all found a significant negative relationship between ESG score and WACC. However, when breaking WACC into its components cost of equity and cost of debt, we no longer find this relationship to be significant. On the other hand, articles such as Dhaliwal et al. (2011) and Priem and Gabellone (2022) found the relationship between ESG score and cost of equity to be significant. Furthermore, Goss and Roberts (2011) and Liu et al. (2021) found a significant relationship between ESG score and the cost of debt. A plausible explanation for the difference in our findings could be that these articles used different rating agencies, different datasets and analyze different markets. In addition, it is likely that our regression is subject to omitted variable bias which may be the cause of the significance between WACC and ESG score in our regression.

To gain a better insight into the findings in *Hypothesis 2*, we divide the firms into their respective GICS sectors, thereby allowing us to investigate whether the general findings in *Hypothesis 2* hold true regardless of sector. Our regressions in *Hypothesis 3* reveal that the WACC-ESG score relationship only seems to be significant for the Financials sector and the Energy sector, implying that the previous findings may only encompass specific sectors. Additionally, we find a significant relationship between the cost of equity and ESG score for the Financials sector and a significant relationship between the cost of debt and ESG score for the Energy sector. Although our findings propose that the WACC-ESG score relationship is

sector specific, the scarcity of significant relationships causes some skepticism to the findings in *Hypothesis 2*, as well as the findings in previous literature. We suggest that perhaps this way of testing for a relationship between WACC and ESG score may be inadequate to draw a causal conclusion.

To further our understanding of the WACC-ESG score relationship, we break the ESG score into its individual pillars to establish whether certain pillars are the drivers of the significance found in *Hypothesi*s 2. From our regressions in *Hypothesis 4* we see a significant negative relationship between WACC and the environmental score, but no significance for cost of equity and cost of debt. The Governance score displays a significant positive relationship to WACC and the cost of debt, however, contradicting our previous expectations based on findings from Piechocka-Kaluzna et al. (2021). On the contrary, Priem and Gabellone (2022) found the same results as us suggesting that this relationship may be specific to European firms.

Finally, *Hypothesis 5* further divides the firms into their respective GICS sectors, allowing for an analysis of whether our findings in *Hypothesis 4* are driven by ESG pillar score relationships within specific sectors. We found a significant negative relationship between the environmental score and WACC for the Financials sector, while the Consumer Staples and Information Technology sectors display a significant positive relationship between the governance score and WACC. Furthermore, the Health Care and Energy sectors seem to have a significant positive relationship between the social score and WACC. In addition, equity investors do not seem to attribute value to any one pillar when making investment decisions for any sector apart from Real Estate, where we found a significant positive relationship between the cost of equity and the environmental score. Debt providers show a similar lack of concern for the individual ESG pillars for most sectors. When looking at the relationship between the cost of debt and the ESG pillars, our results suggest creditors consider the environmental pillar in the Real Estate sector and the governance pillar for the Financials, Consumer Discretionary, and Utilities sectors. However, these relationships are all significantly positive which implies firm investments into individual ESG pillars may be considered as an increased risk by creditors in these sectors.

Our findings in *Hypothesis 5* strengthen the proposition that a general analysis of the WACC-ESG score may be misleading, as our findings lean toward the relationships being sector specific and that certain pillars within these sectors weigh more heavily on capital providers decision making. Based on our analysis, we do not find convincing empirical evidence to

support the causal conclusion that European firms can benefit from lower average costs of capital by improving their ESG scores without accounting for sector.

Future research may benefit from further delving into the causes of sector-specific differences in the relationship between ESG scores and the cost of capital. Additionally, one could explore the drivers of the positive correlation between governance scores and WACC, as well as the cost of debt, which contradict previous expectations. More nuanced, sector-specific analyses could also be conducted to explore the potential differences in the weight given to different ESG pillars across industries. Moreover, replicating this study using different rating agencies, datasets, or markets could contribute to understanding the variations in results observed here and in the literature.

References

Atan, R., Alam, M., Said, J., & Zamri, M. (2018). The Impacts of Environmental, Social, and Governance Factors on Firm Performance: Panel Study on Malaysian Companies. *Management of Environmental Quality An International Journal*, 182-194.

Avramov, D., Cheng, S., Lioui, A., & Tarelli, A. (2020). Investment and Asset Pricing with ESG Disagreement.

Barnett, M. L., & Salomon, R. M. (2006). Beyond dichotomy: The curvilinear relationship between social responsibility and financial performance. *Strategic Management Journal*, 27(11), 1101-1122.

Beck, M., Block, J., Kober, F., & Müller, K. (2018). Corporate governance and sustainability performance: Analysis of triple bottom line performance. *Business Strategy and the Environment*, 27(8), 1231-1248.

Berg, F., Kölbel, J. F., & Rigobon, R. (2020). Aggregate confusion: The divergence of ESG ratings. *Journal of Financial Economics*, 147(2), 271-285.

Bradley, B. (2021). ESG Investing For Dummies. *John Wiley Sons Inc*.

Brealey, R. A., Myers, S. C., & Allen, F. (2017). *Fundamentals of Corporate Finance* (9th ed.). McGraw-Hill Education.

Carroll, A. B. (1991). The pyramid of corporate social responsibility: Toward the moral management of organizational stakeholders. *Business Horizons*, 34(4), 39-48.

Christensen, D., Serafeim, G., & Sikochi, A. (2021). Why is corporate virtue in the eye of the beholder? The case of ESG ratings. *The Accounting Review*.

Clarkson, M. B. (1995). A stakeholder framework for analyzing and evaluating corporate social performance. *Academy of Management Review*, 20(1), 92-117.

Dhaliwal, D., Li, Z., Tsang, A., & Yang, Y. (2011). Voluntary Nonfinancial Disclosure and the Cost of Equity Capital: The Initiation of Corporate Social Responsibility Reporting. *The Accounting Review*, 59-100.

Du, X., Weng, J., Zeng, Q., Chang, Y., & Pei, H. (2017). Do lenders applaud corporate environmental performance? Evidence from Chinese private-owned firms. *Journal of Business Ethics*, 143(1), 179-207.

Eccles, R. G., & Serafeim, G. (2013). The performance frontier: Innovating for a sustainable strategy. *Harvard Business Review*, 91(5), 50-60.

Eliwa, Y., Aboud, A., & Saleh, A. (2021). ESG practices and the cost of debt: Evidence from EU countries. *Critical Perspectives on Accounting*, 79.

El Ghoul, S., Guedhami, O., Kwok, C. C., & Mishra, D. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking and Finance*, 35(9), 2388-2406.

Elton, E. J., Gruber, M. J., Agrawal, D., & Mann, C. (2001). Explaining the rate spread on corporate bonds. *The Journal of Finance*, 56(1), 247-277.

Erragragui, E. (2018). Do creditors price firms' environmental, social and governance risks? *Research in International Business and Finance*, 45, 197-207.

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33(1), 3-56.

Flammer, C. (2013). Corporate social responsibility and shareholder reaction: The environmental awareness of investors. *Academy of Management Journal*, 56(3), 758-781.

Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Pitman.

Freeman, R. E., Harrison, J. S., Wicks, A. C., Parmar, B. L., & de Colle, S. (2010). *Stakeholder theory: The state of the art*. Cambridge University Press.

Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, 5(4), 210-233.

Friedman, M. (1970). The social responsibility of business is to increase its profits. *New York Times Magazine*, 13.

Goss, A., & Roberts, G. S. (2011). The impact of corporate social responsibility and the cost of bank loans. *Journal of Banking & Finance*, 35(7), 1794-1810.

Hawn, O., & Ioannou, I. (2016). Mind the gap: The interplay between external and internal actions in the case of corporate social responsibility. *Strategic Management Journal*, 37(13), 2569-2588.

Hoepner, A. G., Oikonomou, I., Scholtens, B., & Schröder, M. (2016). The effects of corporate and country sustainability characteristics on the cost of debt: An international investigation. *Journal of Business Finance & Accounting*.

Howard-Grenville, J. (2021). Corporate Culture and Environmental Practice: Making Change at a High-Technology Manufacturer. *Edward Elgar Publishing*.

Jensen, M. C. (2001). Value maximization, stakeholder theory, and the corporate objective function. *European Financial Management*, 7(3), 297-317.

Johnson, R. (2020). The link between environmental, social, and corporate governance disclosure and the cost of capital in South Africa. *Journal of Economic and Financial Sciences*, 3(1), a543.

Kaldestad, E., & Møller, P. (2017). Factors determining the weighted average cost of capital (WACC). Journal of Corporate Finance Research, 11(3), 154-166.

Kotsantonis, S., & Serafeim, G. (2019). Four things no-one will tell you about ESG data. *Journal of Applied Corporate Finance*, 31(2), 50-58.

Liu, H., & Ruan, L. (2021). Environmental, Social, Governance Activities and Firm Performance: Evidence from China. *Sustainability*, 13(11), 6375.

McWilliams, A., & Siegel, D. (2001). Corporate social responsibility: A theory of the firm perspective. *Academy of Management Review*, 26(1), 117-127.

Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: Defining the principle of who and what really counts. *Academy of Management Review*, 22(4), 853-886.

Modigliani, F., & Miller, M. H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *The American Economic Review*, 48(3), 261-297.

Ng, A., & Rezaee, Z. (2015). Business sustainability performance and cost of equity capital. *Journal of Corporate Finance*, 34, 128-149.

Oikonomou, I., Brooks, C., & Pavelin, S. (2012). The effects of corporate social performance on financial risk and utility: a longitudinal study. *Financial Management*, 41(2), 483-515.

Piechocka-Kaluzna, A., Thuczak, A., og Lopatka, P. (2021). The impact of CSR/ESG on the cost of capital: A case study of us companies. *European Research Studies Journal*, 24(3):536–546.

Porter, M. E. (1992). Capital disadvantage: America's failing capital investment system. *Harvard Business Review*, 70(5), 65-82.

Porter, M. E., & Kramer, M. R. (2011). Creating shared value: How to reinvent capitalism and unleash a wave of innovation and growth. *Harvard Business Review*, 89(1/2), 62-77.

Priem, R., & Gabellone, A. (2022). The impact of a firm's ESG score on its cost of capital: Can a high ESG score serve as a substitute for a weaker legal environment?. Gathered from: https://ssrn.com/abstract=4286057.

Rappaport, A. (1986). *Creating shareholder value: The new standard for business performance*. Free Press.

Ramirez, A., Monslave, J., González-Ruiz, J., Almonacid, P., & Peña, A. (2022). Relationship between the Cost of Capital and Environmental, Social, and Governance Scores: Evidence from Latin America. *Sustainability*, 14(6), 3557.

Richardson, A., & Welker, M. (2001). Social disclosure, financial disclosure, and the cost of equity capital. *Accounting, Organizations and Society*, 26(7-8), 597-616.

Schaltegger, S., Hansen, E. G., & Lüdeke-Freund, F. (2016). Business Cases for Sustainability: Business Models for Sustainability: Origins, Present Research, and Future Avenues. *Organization & Environment.*

Sharfman, M., & Fernando, C. (2008). Environmental risk management and the cost of capital. *Strategic Management Journal*, 29(6), 569-592.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance*, 19(3), 425-442.

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., ... & Folke, C. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, 347(6223), 1259855.

Suto, M., & Takehara, H. (2017). CSR and cost of capital: evidence from Japan. *Social Responsibility Journal*, 13(4), 798-816.