Maastricht University

Master Thesis

The relationship between ESG performance and cost of debt during the COVID-19 crisis - a cushion for the economic downturn

by

Hasan Duran

i6259382

Maastricht University	
School of Business & Economics	
Place & Date	**Cologne, 14.04.2022**
Student name; ID number	**Duran, Hasan; i6259382**
Degree program	**MSc International Business – Strategic Corporate Finance**
MSc Supervisor	**Bos, Jaap**
Email address	h.duran@student.maastrichtuniversity.nl
Keywords	**ESG, Sustainable Finance, Cost of Debt, Bond Market, COVID-19, United States, Europe**

Acknowledgements

I would like to take this opportunity to thank the people and institutions that have supported me during the period of completing my thesis. I am especially grateful for the time I spent at Maastricht University and the excellent education I received. A special thanks goes to my fiancée, who is a pillar of my life. I dedicate this thesis and the achievement of my academic degree to my mother and my brother.

Hasan Duran
April 2022

Abstract

This paper examines the relationship between ESG performance and the cost of debt in the context of the COVID-19 crisis and analyzes whether ESG activities impact the distress risk of companies. By studying MSCI ESG scores of 385 companies and corporate bond issue spreads of 4214 bonds, the study documents a significant and negative relationship between ESG and the cost of debt. The main analysis findings document a negative and significant relationship between a company's ESG performance and its cost of debt. In times of economic stability, this relationship follows a linear and negative course. The effect is mainly driven by top governance performers, whereas environmental performance is only rewarded to a certain extent with lower cost of debt, indicating a pronounced inverted u-shaped relationship between environmental performance and the cost of debt. For bonds issued during the COVID-19 crisis, a significant ESG premium was found. During the shock quarters, when uncertainty was highest, high ESG firms were also able to issue bonds at a lower cost of debt, although the marginal effect proved to be less pronounced than in post-shock quarters. The analysis revealed that social firms particularly exhibited lower issue spreads during the COVID-19 crisis. In addition, it was shown that environmental performance bears the potential to negatively influence distress risk, whereas social activities increase the probability of falling into financial distress. No such relationship was found for governance performance. Considering the strong efficient market hypothesis and the joint hypothesis problem, it is likely that the observed findings derived from the credit risk analysis result from the fact that ESG is capable of reducing credit risk through channels other than lower distress risk or better financial performance.

Table of Contents

LIST OF TABLES ..... **III**
LIST OF FIGURES ..... **IV**
LIST OF ABBREVIATIONS ..... **V**
1. INTRODUCTION **1**
2. THEORY AND RELATED LITERATURE **3**
2.1 ESG AND COST OF DEBT 3
2.1.1 Environmental Pillar *3*
2.1.2 Social Pillar *6*
2.1.3 Governance Pillar *8*
2.2 COVID-19 PANDEMIC, ESG AND COST OF DEBT 9
2.3 HYPOTHESIS DEVELOPMENT 11
2.3.1 Cost of Debt *11*
2.3.2 ESG-Risk Exposure *12*
2.3.3 Stable Economy *12*
2.3.4 COVID-19 ..... *13*
2.3.5 Financial Distress *14*
3. DATA AND DESCRIPTIVE STATISTICS **14**
3.1 BOND-LEVEL DATA 15
3.2 ESG DATA 16
3.3 FIRM-LEVEL DATA 17
3.4 DEALING WITH OUTLIERS 20
3.5 DESCRIPTIVE STATISTICS 21
4. METHODOLOGY AND RESULTS **24**
4.2 EMPIRICAL METHODS 24
4.2.1 ESG and Cost of Debt *24*
4.2.2 ESG and COVID-19 ..... *25*
4.2.3 ESG and Financial Distress *26*
4.3 EMPIRICAL RESULTS 26
4.3.1 ESG and Cost of Debt *26*
4.3.2 ESG and High-Risk Industries *32*
4.3.3 ESG and Stable Economy *36*
4.3.4 ESG and COVID-19 ..... *39*
4.3.5 ESG and Financial Distress *42*
5. ROBUSTNESS TESTS **46**
5.1 FIRM FIXED EFFECTS 46
5.2 ESG AND STABLE ECONOMY 49
5.3 TRUNCATION BIAS AND COVID-19 49
5.4 LAGGED ESG PERFORMANCE 50
6. CONCLUSION **51**
6.1 FINDINGS, CONTRIBUTIONS, AND IMPLICATIONS 51
6.2 LIMITATIONS 53
6.3 FURTHER RESEARCH DIRECTIONS 53

REFERENCES **55**

APPENDIX **66**

APPENDIX A – TABLES 66
APPENDIX B – FIGURES 109
APPENDIX C – OFFICIAL STATEMENT OF ORIGINAL THESIS 113
APPENDIX D – R PROGRAMMING CODE 114

List of Tables

Table 1: Variable Description 66
Table 2: Correlation Matrix 69
Table 3: VIF Test 70
Table 4: Sample Distribution 22
Table 5: Descriptive Statistics 23
Table 6: Full Sample Analysis 27
Table 7: ESG-Risk Exposure Analysis 33;71
Table 8: Stable Economy Analysis 38;74
Table 9: COVID-19 Analysis 41;76
Table 10: ESG and Distress Risk Analysis 43;78
Table 11: ESG and Distress Risk Quartile Analysis 79
Table 12: Full Sample Analysis Firm Fixed Effects 81
Table 13: ESG-Risk Exposure Analysis Firm Fixed Effects 84
Table 14: Stable Economy Analysis Firm Fixed Effects 87
Table 15: COVID-19 Analysis Firm Fixed Effects 89
Table 16: ESG and Distress Risk Analysis Firm Fixed Effects 91
Table 17: ESG and Distress Risk Quartile Analysis Firm Fixed Effects 92
Table 18: Stable Economy Analysis Robustness Test 95
Table 19: COVID-19 Analysis Robustness Test 96
Table 20: Full Sample Analysis Lagged ESG Variables 98
Table 21: ESG-Risk Exposure Analysis Lagged ESG Variables 101
Table 22: Stable Economy Analysis Lagged ESG Variables 104
Table 23: COVID-19 Analysis Lagged ESG Variables 106

List of Figures

Figure 1: MSCI ESG Ratings Key Issue Framework 17
Figure 2: Altman's Z-Score Model Classifications 19
Figure 3: Tobin's Q Distribution before truncation 109
Figure 4: Volatility distribution before truncation 109
Figure 5: Leverage distribution before truncation 109
Figure 6: Interest Coverage distribution before truncation 110
Figure 7: ROA distribution before truncation 110
Figure 8: WC Ratio distribution before truncation 110
Figure 9: Tobin's Q distribution after truncation 111
Figure 10: Volatility distribution after truncation 111
Figure 11: Leverage distribution after truncation 111
Figure 12: Interest Coverage distribution after truncation 112
Figure 13: ROA distribution after truncation 112
Figure 14: WC Ratio distribution after truncation 112

List of Abbreviations

ISO: International Organization for Standardization 4
CERCLA: Comprehensive Environmental Response, Compensation and Liability Act 4
CSR: Corporate Social Responsibility 6
VIF: Variance Inflation Factor 21
NAICS: North American Industry Classification System 21
SIC: Standard Industrial Classification 32

1. Introduction

The global outbreak of the COVID-19 pandemic differs significantly from previous economic crises resulting from supply shocks and crises originating from the financial sector (Financial Stability Board (FSB), 2021). Large-scale health measurements caused cut-offs in cash streams worldwide, resulting in an unprecedented liquidity shock (Carletti et al.; 2020; Ellul et al., 2020; Meier & Smith, 2020). In times of crisis, sustainable finance must bear fruit and prove its resilience properties. During the COVID year 2020, the global share of sustainably invested assets amounted to 18% among investors worldwide and is forecasted to reach around 37% by 2025 - in Europe, this figure is even expected to rise to 45% in 2025 (Blackrock, 2020). According to the sustainability survey conducted by HSBC (2020), in which issuers and investors were questioned on the issue of sustainable financing and investing, over 78% of the investors and issuers rated the importance of sustainable finance significantly higher in 2020 compared to the pre-COVID year.

Although some studies point out that socially responsible investors accept lower returns compared to other investors, the trend is unbroken and can be attributed to investor preferences or risk-mitigating properties regarding information asymmetries and agency costs (Riedel & Smeets, 2017; El Ghoul et al., 2014; Krüger 2014). Various studies have shown that a positive ESG performance negatively impacts a company's cost of capital due to the minimization of idiosyncratic risks resulting from corporate social activities (Giese et al., 2019; Sassen et al., 2016; Sharfman & Fernando, 2008). Furthermore, such companies benefit from a greater cushion during economic shocks due to a pronounced investor and customer loyalty and can recover more quickly (Keliuotytė-Staniulėnienė & Daunaravičiūtė, 2021; Albuquerque et al., 2020). Albeit positive ESG performance is associated with less corporate risk, there is a gap in research about the ability of ESG activities to prevent the consequences of the COVID-19 crisis on companies. Since corporate cash streams are capped due to the global economic downturn and the temporary drop in revenues, external financing through debt is considered as the first resort to bridge the liquidity gap according to the pecking order theory (García-Herrero & Ribakova, 2020). For investors and debt issuers, it is crucial to be aware of drivers that influence firm risk and the cost of additional debt capital during the liquidity crisis.

This paper analyzes the relationship between a company's ESG performance and its cost of debt in the United States and Europe and the impact of the COVID-19 pandemic on this

relationship by exploring corporate bond spreads. Furthermore, this study investigates whether a company's ESG performance directly relates to its default risk. The main problem the paper addresses is that in times of uncertainty, risk-mitigating activities of companies, such as ESG management, bear the potential to reduce the cost of debt capital, giving them a competitive advantage in the market. However, if the market develops a taste toward ESG firms, lemons could increasingly engage in ESG activities to raise favorable debt. Thus, this research aims to answer the following research question and sub-questions: Does a relationship between a company's ESG performance and cost of debt exist? How does the relationship between ESG performance and cost of debt vary across industries? Does the relationship between a company's ESG performance and cost of debt differ in times of economic stability versus during the COVID-19 crisis? Does the ESG performance directly impact the distress risk of firms?

The main analysis findings document a negative and significant relationship between a company's ESG performance and its cost of debt. In times of economic stability, this relationship follows a linear and negative course. The effect is mainly driven by top governance performers, whereas environmental performance is only rewarded to a certain extent with lower cost of debt, indicating a pronounced inverted u-shaped relationship between environmental performance and the cost of debt. For bonds issued during the COVID-19 crisis, a significant ESG premium was found. During the shock quarters, when uncertainty was highest, high ESG firms were also able to issue bonds at a lower cost of debt, although the marginal effect proved to be less pronounced than in post-shock quarters. The analysis revealed that social firms particularly exhibited lower issue spreads during the COVID-19 crisis. In addition, it was shown that environmental performance bears the potential to negatively influence distress risk, whereas social activities increase the probability of falling into financial distress. No such relationship was found for governance performance. Considering the strong efficient market hypothesis and the joint hypothesis problem, it is likely that the observed findings derived from the credit risk analysis result from the fact that ESG is capable of reducing credit risk through channels other than lower distress risk or better financial performance.

This paper contributes to the literature in many ways. First, this study contributes to the fast-growing literature concerning the relationship of ESG to the cost of debt in times of the COVID-19 crisis. Second, the findings reveal insights into differences between this

relationship during periods of economic stability and across industries. Third, the paper provides important insights into the drivers of the relationship between ESG and the cost of debt by conducting a pillar-level analysis. Finally, the study confirms that ESG mitigates credit risk through channels other than lower distress risk or better financial performance.

The paper is structured as follows: Basic theories, definitions, and underlying concepts are outlined in section two. Additionally, the related literature is reviewed, and findings are discussed to synthesize and define the research hypotheses for the analysis. Section three describes the data, sample selection process, and variables used for the analysis. Section four describes the methodology used to analyze the stated hypotheses, along with the empirical results. In the fifth section, robustness tests are performed to confirm the results of the previous analyses. The last section concludes the paper, addresses the limitations of the analysis, and points out the implications for practice and future research directions.

2. Theory and Related Literature

This section introduces the literature streams and outlines the empirical findings to which the thesis contributes: ESG performance and its influence on credit risk, especially during the ongoing COVID-19 crisis. The findings are then used to form sound hypotheses for the analytical part.

2.1 ESG and Cost of Debt

This paragraph presents the state of the literature about the influence of ESG performance on a companies' cost of debt based on empirical findings. Additionally, relevant definitions and concepts are provided together with an outline of the risks associated with the performance factors. Therefore, the ESG performance is decomposed into its individual components, the environmental, social and governance pillar.

2.1.1 Environmental Pillar

Defining environmental performance is not a straightforward task. The findings in the literature differ strongly with regard to the task and objective of corporate environmental performance (Trumpp et al., 2015). The 2021 reviewed and confirmed internationally standardized framework on environmental management systems from the International Organization for

Standardization (2015), the ISO 14001, states that the task of environmental management is to "manage environmental responsibilities in a systematic manner that contributes to the environmental pillar of sustainability" to prevent liabilities arising from environmentally irresponsible practices. Thus, successful environmental management aims to enhance the organization's environmental performance that yields benefits for the environment, the organization itself, and its various stakeholders and mitigate associated risks.

Due to information asymmetries, the uncertainty of future company activities and cash flows, credit default risks are present, meaning that although the liquidation cascade favors debt over equity claims, bondholders demand a risk premium for the provision of liquid funds that exceed the risk-free rate (Reichling & Zbandut, 2019). Environmental factors and their associated risks thus introduce additional risk factors into the cost of debt calculation, categorized under the term environmental risk (Jung et al., 2018). Environmental risks arising from violations and disregard of environmental responsibility result from legal and regulatory frameworks and bear the potential to trigger substantial environmental liabilities that are capable to subordinate claims of bondholders (Bauer & Hann, 2010; Graham & Maher, 2006; Claar, 1992). In the United States, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund, mainly regulates the consequences of environmentally unsustainable and violating behavior by organizations (United States Environmental Protection Agency (EPA), 2022). Under the Superfund, federal funds are provided for the cleanup of environmentally harmful activities, while the United States Environment Protection Agency (EPA) is entitled to identify polluters and hold them liable for their environmentally hazardous misbehavior. In addition to the actual restoration of the environmental damage, this also includes financial compensation for individuals or other affected stakeholders (Comprehensive Environmental Response, Compensation, and Liability, 2011). Within the European Union, environmental liability regulations are regulated by the Directive 2004/35/CE resolved by the European Parliament and Council (European Parliament, 2004). The directive regulates under which circumstances polluters can be held liable for hazardous environmental misbehavior. Similar to the Superfund, the enforcement of the directive is executed by various public organizations within each EU state. Unlike CERCLA, however, the EU directive does not cover civil claims for private individuals - instead, it is up to the individual public authorities in each EU country to determine how civil damages can and must be paid. In addition to regulatory risks and tail risks, which can arise from spillover effects and trigger significant litigation and remedying costs, the risk of reputational damage also exists for the respective

company, which can affect the behavior of various stakeholder groups (Cassano, 2019; Miles & Covin, 2000). Environmental questionable practices are likely to result in the curtailment of business relationships, which may negatively impact the company's cash flows, especially in environmentally sensitive industries (Sassen et al., 2016; Bauer & Hann, 2010). Taken together, the environmental performance bears the potential to directly affect the enterprise value and firm's risk, burdening bondholders with increasing monitoring and screening costs, thus affecting the demanded risk premium.

Several studies on the relationship between environmental performance and the cost of debt already exist. The most frequent data used to evaluate the influence of environmental management on the cost of corporate debt are the environmental proxies of the MSCI ESG database, formerly known as the KLD ESG database, and the Thomson Reuters Eikon/ASSET4 database.

Based on environmental measures of the KLD database, Erragragui (2018) has shown that creditors' perception of default risk is linked to news about environmental concerns and that environmental performance correlates negatively with the cost of debt for US firms. The results show that an increase in environmental strength and a decrease in environmental concerns by one score point led to a 1.2% decrease in the cost of debt. Similarly, Bauer and Hann (2010) find a negative relationship between environmental activities and the cost of debt for US firms that are predominantly related to regulatory and climate change issues. In addition, the authors found that the strength of the relationship has steadily intensified over the last ten years of the analysis, whereas companies from environmentally sensitive industries profit the most from environmental activities. Using the KLD database, Sharfman and Fernando (2008) observed that environmental performance correlates negatively with a firm's cost of capital. The authors show that, while most of the effect originates from lower cost of equity, environmentally responsible firms report significantly higher levels of debt capital than their counterparts. Sharfman and Fernando (2008) conclude that environmental firms exploit the additional financial slack to increase leverage and benefit from tax effects. In contrast, Hoepner, Oikonomou, Scholtens, and Schröder (2016) conducted an international study on the relationship between country and corporate sustainability and their impact on the cost of debt. Using the KLD database's sustainability scores, the authors found that the environmental pillar of country sustainability has the most significant and negative impact on the cost of debt, whereas firm sustainability has only a marginal effect.

Using Thomson Reuters ESG performance data, Gerwanski (2020) finds evidence that the disclosure of integrated reporting significantly impacts the cost of debt for EU companies, especially in environmentally sensitive industries. Gerwanski (2020) concluded that while companies in environmentally sensitive industries pay a premium, they are able to outweigh this premium due to better environmental performance. The author links the empirical findings to the reduction of information asymmetries resulting from strong signaling mechanisms and lower agency costs. Similarly, Eliwa, Aboud, and Sale (2021) used the Thomson Reuters ESG database to study the relationship between ESG disclosure and the cost of debt within the EU and discovered that environmental performance has the most significant impact on the cost of debt of all ESG factors. The authors also found evidence that the observed impact is highest in stakeholder-oriented countries.

To conclude, previous studies have found a negative correlation between a company's environmental performance and its cost of debt and credit risk. However, the findings indicate that varying results were found across industries, time periods, and regions and that the reduced perception of firm risk can also be exploited to increase company debt levels.

2.1.2 Social Pillar

According to Sprinkle and Maines (2010), the social pillar of ESG "comprises a number of corporate activities that focus on the welfare of stakeholder groups other than investors, such as charitable and community organizations, employees, suppliers, customers, and future generations." Important drivers of social responsibility encompass the fields of human capital, customer relation, stakeholder management, and the seizing of social projects (Sprinkle & Maines, 2010; Wood, 2010). Given the implication and practices of social performance, the risks associated with social activities are idiosyncratic in nature and attributable to reputational and regulatory risk factors. Employee disputes, lawsuits, strikes, fines, and customer boycotts may occur due to neglected social management and lead to higher risks, for which the market demands a risk premium for debt finance. Thus, stakeholders' perceptions of the proactivity and authenticity of CSR activities directly impact a company's reputation and their behavior towards the company (Magnelli & Izzo, 2016; Mazutis & Slawinski, 2015; Bouslah et al., 2012).

The objective of social management is to establish processes for stakeholder and issues management at the institutional, organizational, and individual levels, which manifest themselves as positive social outcomes and policies (Wood, 1991). Corporate social responsibility restricts the extend of shareholder value maximization at the expense of other stakeholders and leads to a more holistic and sustainable management approach that also fulfills responsibilities to other stakeholders (Clarkson, 1995). Collectively, improved social performance leads to a better financial and reputational bottom line for the company, while poor performance tends to have the opposite effect (Wood, 2010).

Most studies concerning the relationship between social performance and credit risk use the social proxies of the MSCI ESG/KLD database for their analyses. In their study on corporate social performance and firm litigation risks, Koh, Qian, and Wang (2013) show that social activities positively impact firm value. In particular, the effect is highest in high litigation risk industries, where a standard deviation increase in social performance increases the equity value of a company by 6.78%. By performing a difference-in-difference approach, the authors also found evidence that an increase in social performance negatively impacts a company's default risk, as measured by the Altman-Z score, thus also influencing a company's creditworthiness.

Magnanelli and Izzo (2017) reported conflicting results when studying the relationship between social activities and the cost of debt of 332 global companies in the period before the subprime mortgage crisis. Contrary to the assumption that social performance negatively affects credit risk, the authors found no robust evidence of a negative relationship between social performance and the cost of debt. Instead, the authors found that social firms exhibit higher spreads across the market, which is in line with the findings of Goss and Roberts (2011), who analyzed 3996 US corporate loans from 1991 to 2006. Goss and Roberts observed that socially responsible firms pay between 7 and 18 basis points more than their counterparts. Nevertheless, the authors concede that the relevance of social performance may be significantly higher in the post-crisis period than before.

La Rosa, Liberatore, Mazzi, and Terzani (2018) used a sample of listed European non-financial firms from 2005 to 2012 to test the relevance of social performance and its relationship with the cost of corporate debt. The authors found that in times of crisis, the market did reward social factors only to a certain extent, but in times of subsequent stability with significantly lower cost of debt. These findings are supported by more recent studies, which argue that social

activities strengthen the financial bottom line, enhance a company's reputation and media coverage, and result in improved customer and investor loyalty (Gao et al., 2022, Amiraslani et al., 2021; Maloul et al., 2021, Lins et al., 2019).

To conclude, previous studies have shown that a company's social performance has the potential to reduce risks that are mainly reputational and idiosyncratic in nature, which in turn has a negative influence on the cost of corporate debt. However, mixed results have been found, especially during the last economic crisis, suggesting that social performance may provide a bonus in times of stability but does not act as a cushion in times of crisis.

2.1.3 Governance Pillar

It is undisputed in the literature that corporate governance has a significant influence on the financial performance of a company (Rossi et al., 2015; Rani et al., 2014; Grove et al., 2011; Brown & Caylor, 2009). According to Claessens (2006), two strands of definitions can be identified when it comes to corporate governance. The first deals with the normative framework, i.e., the company's environment. Normative conditions result from frameworks issued by the legal system, the judicial system, and the financial and factor markets – regulations the company has to adapt to and thus has no direct influence on. The second stream focuses on the corporate behavior of a company, which is determined by a collection of complex contracts and their interaction with each other. These include the KPIs under which a company is managed, its capital and financing structure, and the interests of its shareholders and other stakeholders (Claessens, 2006).

The theory underlying corporate governance and behavior issues is the principal agency theory. In their work "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure", Jensen and Meckling (1976) argue that information asymmetries result in welfare-damaging agency costs that vary depending on the behavior of the agent and the degree of informational mismatch compared to the principal. Gerwanski (2020) summarizes that hidden intentions and actions lead to frictions on the market and thus increase the risk for contractual partners. In the context of corporate debt, Gerwanski states that agency risks arise for the creditor when information and intentions are not disclosed ex-ante that are fundamental to the lending decision or important ex-post information that entails substantial information about the bond performance. Hidden actions of the issuer toward the lenders may manifest themselves

when the issuer does not adhere to agreements or exploits the means to pursue the interests of its shareholders or private benefits to the extent that its discretionary powers permit (Gerwanski, 2020). These agency risks can be minimized by costly screening and monitoring activities or contractual covenants (Whitehead, 2009).

The literature findings show that companies with a high disclosure quality and companies that provide timely disclosures face a lower agency cost of debt. This effect is explained by the fact that information asymmetries are smoothed out through the signaling mechanism, which reduces the perception of investors and creditors about the default risk (Gerwanski, 2020; Ghouma et al., 2018; Piot, 2001; Sengupta, 1998). In their study on the relationship between firm disclosure, monitoring, and the cost of debt, Dhaliwal, Hogan, Trezevant, and Wilkins (2011) found evidence that disclosures about weaknesses are positively correlated with the bond spread of firms. The authors found that the observed effect is more substantial for firms with infrequent firm disclosures that banks have not intensively monitored and for companies that did not have a previous credit rating. According to the authors, the explanation is that firms with a low ex-ante probability of firm disclosures need to be monitored more intensively, which results in higher agency costs for investors. Similarly, the presence of incentives has the potential to influence the risk of welfare harming corporate behavior. Shuto and Kitagawa (2011) found in their research on Japanese bond issues that investors perceive managerial ownership as a reliable proxy to predict the future agency cost of debt. These findings are supported by Lorca, Sánchez-Ballesta, and García-Meca (2011), who argue that the spread's decrease is related to the reduction of information asymmetry and agency costs, as incentives are considered to be a valuable tool to mitigate conflicts of interest.

To conclude, improved corporate governance and corporate behavior require fewer investors' monitoring and screening activities, thus lowering the agency costs of debt. However, when companies lack transparency with respect to information disclosure, negative information about the company is likely to result in significantly higher premiums required.

2.2 COVID-19 Pandemic, ESG and Cost of Debt

Despite the global impact of the COVID-19 health crisis and its high academic relevance, the literature on the impact of ESG on the cost of debt during the pandemic is fast-growing but still scarce. The global outbreak of the COVID-19 pandemic differs significantly from previous

economic crises resulting from supply shocks and crises originating from the financial sector (Financial Stability Board (FSB), 2021). Governmental fiscal responses of an unprecedented scale were launched in the US to counteract the economic decline and overcome the health crisis until vaccines were available for the mass (Meier & Smith, 2020). Also, in the EU, monetary stimulus measures were launched to prevent a chain reaction leading to large-scale insolvencies and unemployment (European Central Bank, 2021). Especially in the context of the COVID-19 crisis, which led to widespread shutdowns of the economy due to quarantine measures and thus also cut off the cash streams for many businesses at the beginning of 2020, external capital is essential for the survival of companies (García-Herrero & Ribakova, 2020). By implementing strict measures to prevent infections from spreading, the risk of default for a large majority of companies was implicitly increased by the exogenous liquidity shock (Acharya & Steffen, 2020). Thus, the uncertainty associated with the health crisis puts severe pressure on creditors and bondholders to accurately assess risks in their portfolios, leading to tighter loan access and conditions (Gourinchas et al., 2021).

Although creditors recognized cash holdings during the subprime mortgage crisis, a "dash for cash" during periods of stability is perceived as an indication of increased credit and default risk (Acharya et al., 2011). In their working paper on the behavior of firms with respect to their cash levels during the COVID-19 shock, Acharya and Steffen (2020) find evidence that significant credit-line drawdowns were made at the time of the shock to secure the firm's liquidity in the short term. Consistent with the findings, Liu et al. (2020) document that credit default swap spreads increased significantly due to the adverse cash flow shock for non-financial firms, with a particularly large impact on firms with immediate refinancing needs. Especially capital-intensive and undiversified industries and regions with high COVID-19 exposure are strongly affected by increased credit risk, leading to significant extensions of maturities for newly issued bonds (Almaghrabi, 2021; Kragar et al., 2021; Halling et al., 2020; Liu et al., 2020).

During periods of uncertainty, risk-mitigating activities are of particular importance to ensure access to favorable debt capital. Initial studies show that the COVID-19 crisis has brought ESG activities to prominence. In his paper about corporate bond issuances during the COVID-19 pandemic, Ferriani (2022) finds evidence that ESG activities negatively affect credit risk. The author found evidence that high ESG firms exhibit approximately 13 to 16 basis points lower bond spreads, whereas this effect only holds for firms in advanced economies, where socially

responsible investors have their largest base. Halling, Yu, and Zechner (2020) confirm the findings and document strong supply effects, meaning that bond issues of environmentally and socially responsible companies have increased substantially compared to underperformers. Even after governments started to intervene in the corporate bond market to limit large scale outflows, the premium drops of high ESG bonds turned out to be lower than for low ESG issuers, indicating a reduced credit risk during the crisis and high investors' loyalty (Kragar, 2021; Falato et al., 2020).

To conclude, the liquidity shortfall triggered by the economic downturn as a result of the COVID-19 crisis is pushing companies to increase their cash holdings, while companies with high capital intensity and high COVID-19 exposure are particularly affected by the crisis. In addition, ESG activities seem to bear fruit during the crisis period, opening up the debt capital market for companies that are closed to others.

2.3 Hypothesis Development

This section determines the hypotheses for the subsequent analysis. The paper represents the basic theory that a higher ESG performance correlates negatively with credit risk. The hypotheses are derived by considering the research questions and the sub-questions.

2.3.1 Cost of Debt

The literature findings indicate that exceptional ESG performance has the potential to mitigate credit risk through various channels. Preventive measures through effective environmental management are capable of minimizing the risk that substantial environmental liabilities or reputational damage will occur. Proactive and authentic social management, in turn, reduces the risk of friction with stakeholder groups other than investors, such as activists, employees, and customers, and strengthens the company's reputation, especially in times of economic stability. Efficient and responsible corporate governance, for its part, reduces information asymmetries and the associated agency costs of debt for creditors. Taken together, this paper formulates the following hypothesis about the relationship between ESG performance and the cost of debt by exploring corporate bond issue spreads:

H1*: ESG performance negatively affects the cost of corporate debt.*

2.3.2 ESG-Risk Exposure

The previous hypothesis predicts a negative relationship between ESG performance and credit risk regardless of the industry. Since some industries differ in their implicit exposure to environmental, social, and governance-related risks, such industries possess more open flanks for frictions (Gerwanski, 2020; Oh et al., 2017; Sassen et al., 2016; Jo & Na, 2012; El Gouhl et al., 2011; Miles & Covin, 2000). In their study on the relationship between environmental management and credit risk, Bauer and Hann (2010) show that firms operating in industries with severe environmental concerns, such as the paper industry and other allied industries, incur a statistically lower cost of debt than firms in low-risk industries if they demonstrate high environmental performance. In Gerwanski's (2020) paper on the effect of integrated reporting on the cost of debt, he finds evidence that a company's marginal cost of debt is only negatively affected by ESG if the company belongs to a sin industry. He finds that the offset is substantial enough to fully compensate for the industry-specific risk premium and, in certain cases, even leads to a lower total cost of debt compared to companies from industries with low ESG risk exposure. Gerwanski also finds evidence that discretionary reporting does not have a statistically significant impact on the cost of debt for companies in low-risk industries. Similarly, Koh, Qian, and Wang (2014) found evidence that corporate social activities of firms from high litigation risk industries show an impact on the firm value that is more than 50% higher than for firms from low litigation risk industries. This supports the notion that good news from firms operating in high-risk industries tends to have a more significant impact on the cost of corporate debt compared to their counterparts. Taken together, this paper formulates the following hypothesis about the relationship between ESG performance and the cost of debt in industries with high ESG risk exposure:

H2*: The relationship between ESG performance and the cost of debt is stronger for firms in industries with high ESG risk exposure.*

2.3.3 Stable Economy

Prior to the subprime mortgage crisis, corporate social responsible activities seemed to be not at the center of corporate attention. In their study on the relationship between social activities and the cost of debt of 332 global firms before the financial crisis, Magnelli and Izzo (2017) found that social firms reported higher bond spreads than their peers. The findings of Goss and Roberts (2011), who analyzed 3996 US corporate bonds from 1991 to 2006, also found a

positive relationship between socially responsible firms and the cost of debt. In contrast, the authors concluded that the relevance of social performance could be significantly higher in the post-crisis period than before. Amiraslani, Lins, Servaes, and Tamayo (2021) found evidence that environmental and social responsibility gained prominence during the financial crisis as a result of the formation of trust capital. The authors found evidence that, during the crisis, high social capital firms exhibited lower spreads and raised more debt capital at longer maturities than their counterparts. Furthermore, the authors document the phenomenon that the pre-crisis bottom tercile distribution of environmental and social firms learned about the benefits of social activities, leading them to undertake significant adjustments in their corporate socially responsible activities in the post-crisis period. La Rosa, Liberatore, Mazzi, and Terzani (2018) also found evidence that compared to the subprime mortgage crisis, in times of subsequent economic stability, bondholders tend to perceive social firms as synonymous with high reputation, increased financial performance, and lower credit risk, which results in lower bond spreads. In summary, this paper formulates the following hypothesis about the relationship between ESG performance and the cost of debt in times of economic stability:

H3: *The relationship between ESG performance and the cost of corporate debt is more pronounced in times of economic stability.*

2.3.4 COVID-19

The COVID-19 crisis affects the liquidity situation of companies significantly as a result of the global economic downturn. With sales collapsing, companies resort to external debt financing to bridge liquidity gaps following the traditional pecking order (García-Herrero & Ribakova, 2020). Since the consequences of the crisis are uncertain and vary depending on the operational diversification, industry, and region in which the companies are located, it is crucial for both bondholders and issuers to communicate and mitigate risks through ESG activities transparently (Almaghrabi, 2021; Kragar et al., 2021; Halling et al., 2020; Liu et al., 2020). Initial studies indicate that an economically significant ESG premium could exist for high ESG firms during the COVID-19 crisis, although the findings may differ among advanced economies versus emerging markets (Ferriani, 2022). Given that ESG activities are superior in mitigating information asymmetries and that high ESG performance is recognized with reduced idiosyncratic risk and greater financial performance among investors, the following hypothesis is proposed:

***H4**: ESG performance acts as a cushion for a company's credit risk during the economic downturn induced by COVID-19.*

2.3.5 Financial Distress

ESG engagement provides the market with valuable information about idiosyncratic risks originating from the ESG activities of a company and has the potential to reduce information asymmetries. However, from a bondholder's perspective, it is critical to identify whether high ESG companies are indeed financially stable companies or whether these companies engage in ESG activities to obtain favorable market treatment. If bondholders develop a taste for ESG firms by associating positive ESG performance with lower default risk, unprofitable firms may anticipate this and engage in window dressing, leading to an economically inefficient capital allocation. Moreover, based on their financial performance, low-ESG companies may have to pay a higher risk premium than they should. This raises the question of whether high ESG performance is a statistically accurate indicator of lower distress risk or whether a market bias towards socially responsible companies exists. Statistical inefficiency would be economically harmful to bondholders, issuers, and other stakeholders. The outlined rationale is directly related to the economic efficiency theories of discrimination - welfare harming taste-based (Becker, 1957) and efficient statistical discrimination (Phelps, 1972) and thus bears increased economic relevance. To conclude, taking into account the literature about the relationship between ESG performance and its risk-mitigating characteristics, the following hypothesis is put forward:

***H5**: High ESG firms are less likely to enter financial distress.*

3. Data and Descriptive Statistics

This section explains the data sources used for the analysis and defines the variables applied to test the prior stated hypotheses. The dependent variables (credit and distress risk measures), the main explanatory variables (ESG measures), and the control variables are specified in the respective sections. All variables, their description, and the expected correlation with the credit risk measures are listed in Table 1 in Appendix A.

3.1 Bond-Level Data

Bond-level data were obtained through debt screening from FactSet Research Systems. FactSet Research Systems is a database open for financial professionals and researchers. The main advantage of FactSet is that it contains daily updated fixed income data on corporate debt capital structures or individual securities. For the underlying analysis, quarterly data of corporate bonds issued and circulated by companies listed in the S&P 500 and Stoxx Europe 600 indices from 2014 to 2021 were retrieved. The sample includes credit data from five years prior to the COVID-19 crisis (2014 to 2019) and quarterly data for the shock year 2020 and the subsequent post-shock year 2021.

The sample was selected as follows: The bonds considered are those issued between January 1st, 2014, and December 31st, 2021. First, corporate bonds issued by non-financial companies were selected. Then, all bonds that did not have a fixed coupon type were removed, given the equity-like characteristics they contain. Concerning the time to maturity, bonds with negative issue years to maturity were excluded. The cap for the years to maturity was set for bonds with a maximum (remaining) lifetime of fifty years. The issue amount for all bonds, whether from S&P 500 or Stoxx Europe 600 listed companies, was pulled in millions in the respective US dollar exchange rate. With regard to seniority, only senior and subordinated senior bonds were used for the sample, while convertible bonds were excluded. In addition, all callable or putable bonds have been flagged to account for redemption agreements and embedded options.

The dependent variable of interest in the analysis is the bond yield spread, which is used as a proxy for the risk premium the market demands to provide debt financing for a respective company. The spreads are determined by the difference between the yield to maturity of the corporate bond and the corresponding government bond yield by using linear interpolation. To account for the right skewness of the spreads, the natural logarithm of the issue spreads is applied. Also, the natural logarithm was applied for the control variable issue amount due to its natural right skewness. In addition, the control variables years to maturity and the flags for puttable and callable bonds are used to account for bond level differences. A high issue amount, long maturities, and callable bonds are expected to correlate negatively with credit risk, while puttable bonds are expected to show a positive correlation. All data with incomplete information or missing values regarding the issue spread, the time to maturity, or the issue

amount were removed from the sample to ensure a qualitative assessment of the research findings.

3.2 ESG Data

The ESG data were obtained from the MSCI ESG database. MSCI, which has been recognized as a "gold standard data provider" and awarded as the best company for corporate governance research, is particularly well suited for the performed analysis due to its comprehensive coverage of more than 8.500 companies and 680.000 securities and fixed-income bonds worldwide (MSCI, 2020a). MSCI ESG Ratings (2020b) measure a company's resilience to long-term risks that emerge from its ESG management compared to its leading industry peers. Their rule-based methodology relies on publicly available information such as press releases, media news, or a companies' obligatory ESG reporting.

Figure 1 illustrates the ESG Ratings Key Issue Framework of MSCI (2022). MSCI evaluates companies' ESG scores based on ten key themes depending on their industry: climate change, natural capital, pollution and waste, environmental opportunities, human capital, product liability, stakeholder opposition, social opportunities, corporate governance, and corporate behavior. The various themes collectively cover 35 further sub-issues, enabling a detailed performance evaluation. One important point to note is that different key themes and issues are used to determine the respective score for certain industries. For example, in the soft drinks sub-industry, the performance of the key issues *Product Carbon Footprint*, *Water Stress*, and *Packaging Material and Waste* are used to determine the environmental score. The performance of the key issues *Health and Safety*, *Product Safety and Quality*, and *Opportunities in Nutrition and Health* are used to measure the social score of that sub-industry. However, the key issues of the governance pillars apply to all industries. Given the different methodologies for assessing the ESG performance of individual sub-industries, the analysis makes use of the ESG overall ratings and the scores of the individual pillars as main explanatory variables.

For the analysis, quarterly ESG data from 2014 to 2021 for companies listed in the S&P 500 and Stoxx Europe 600 indices were retrieved from the MSCI database. Using weights for each theme, MSCI ESG assigns a seven-level overall ESG performance score, which can be divided into three categories, namely the *Leader* (AAA; AA), *Average* (A; BBB; BB), and *Laggard* (B; CCC) classification. In order to standardize and quantify the main explanatory

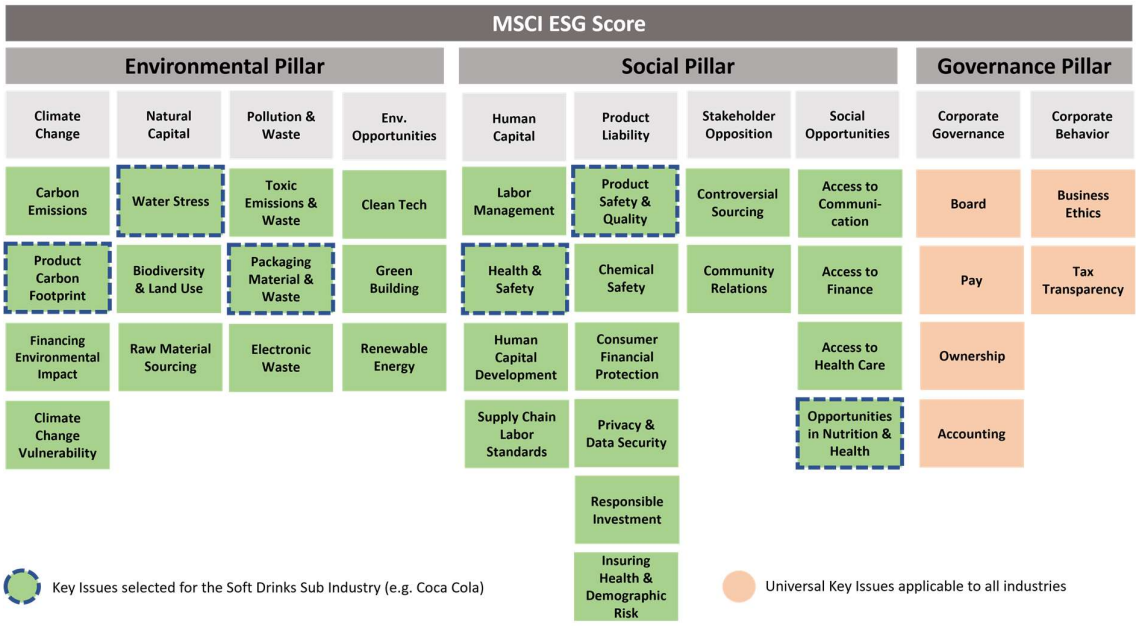


Figure 1 MSCI ESG Ratings Key Issue Framework. From: "ESG ratings key issue framework", by MSCI, 2022, Copyright 2022 by MSCI. Reprinted with permission.

variable, the ESG overall score, for the statistical analysis, ascending numbers from one to seven were assigned to the scores. Thus, CCC is assigned a value of one, B is assigned a value of two, and finally, AAA is assigned a value of seven. The respective values of the ESG overall scores were then divided by seven to account for the right skewness and the absolute distance between the values of CCC and AAA-rated companies. MSCI ESG assigns scores from one to ten to each of its three pillars, environmental score, social score, and governance score. A high ESG overall score and high scores in the individual pillars are expected to correlate negatively with credit risk. Incomplete datasets with respect to missing values for the ESG overall score or the scores of its pillar's environmental performance, social performance, and governance performance were removed from the sample to ensure a qualitative assessment of the research findings.

3.3 Firm-Level Data

Firm-level data were obtained through equity screening from FactSet Research Systems. Apart from daily updated fixed income data on corporate debt capital structures or individual securities, FactSet also provides real-time market data on private and public companies and their financials for analytical purposes. For the underlying analysis, quarterly financial data from 2014 to 2021 of companies listed in the S&P 500 and Stoxx Europe 600 were retrieved to account for firm-specific variations in their fundamentals.

The following fundamental data at the firm-level were retrieved from the database to build financial control variables: The five-year price volatility adjusted for splits and spin-offs was drawn to control the security trading risk. Interest expenses on debt and the total liabilities of the companies have been retrieved from the database, as they are of special interest for the company's current debt situation. The listed companies' market capitalization and total assets were obtained to account for size effects. Sales data, the net income, retained earnings, data on depreciation and amortization, and the earnings before interests and taxes were considered to measure the profitability and free funds of the companies. Quarterly working capital data were retrieved to account for the high liquid assets of each company.

Since one objective of the paper is to analyze whether a high ESG performance also has implications for a company's distress risk, the *Altman Z-Score* is used in the literature as a proxy for distress risk and creditworthiness (Brogi et al., 2022; DeBoskey et al., 2021; Hoepner, 2016; Koh et al., 2013; Boulatoff & Boyer, 2009). The Altman Z-Score results from a discriminant function consisting of financial ratios to precisely determine whether companies face the acute risk of bankruptcy (Altman, 1968). It is composed of the five financial ratios working capital to total assets (1), retained earnings to total assets (2), EBIT to total assets (3), the market value of equity to total liabilities (4), and total sales to total assets (5). A total score is calculated by attributing weights to the individual financial ratios, which is considered a proxy for distress risk (6).

$$A = \frac{Working\ Capital}{Total\ Assets} \quad (1)$$

$$B = \frac{Retained\ Earnings}{Total\ Assets} \quad (2)$$

$$C = \frac{EBIT}{Total\ Assets} \quad (3)$$

$$D = \frac{Market\ Value\ of\ Equity}{Total\ Liabilities} \quad (4)$$

$$E = \frac{Total\ Sales}{Total\ Assets} \quad (5)$$

$$Altman\ Z - Score = 1.2 * A + 1.4 * B + 3.3 * C + 0.6 * D + E \quad (6)$$

Altman cites three classifications as thresholds for a company's financial stability, namely the "bankrupt zone", "gray zone", and the "non-bankrupt sector", while more recent paper use different terms (Brogi et al., 2022). As shown in Figure 2, companies with a Z-Score of less

than 1.8 are classified in the distress zone. Companies with Z-Scores above 1.8 and below three fall into the gray zone, and companies with scores above three are classified within the safe zone. The Altman classifications are used as dummy variables for estimating the cost of debt models. In addition, the individual classifications are used as a dependent variable for the analysis of whether ESG performance also influences a companies' distress risk to determine the probability of falling into financial distress or being financially stable when engaging in ESG activities. A high Altman Z-Score is expected to correlate with credit risk negatively.

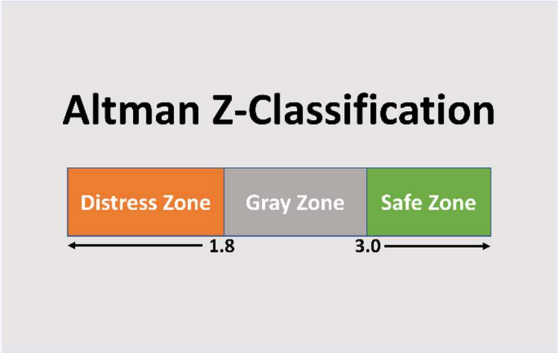


Figure 2 Altman's Z-Score Model Classifications

Additional financial control variables are extracted to account for firm-level characteristics. The selection of control variables is oriented on existing literature on the influence of ESG management on the cost of debt and distress risk of companies, also in times of economic crisis. *Tobin's Q* is used to measure overpricing risks and the market's attitude towards the company. The Q-value is defined as the ratio between the company's market value over the replacement costs of its assets, i.e., the book value of total assets. High market-to-book companies are more vulnerable to economic shocks and experience significantly higher return reversals than low market-to-book companies (Griffin & Lemon, 2002). However, Nason and Patel (2016) find that high Tobin's Q companies show considerably less variance and are more resilient to market changes. Therefore, a high Tobins' Q is expected to negatively correlate with credit risk in times of stability but to have a weaker or positive correlation with credit risk during the COVID-19 pandemic. The five-year price *Volatility* adjusted for splits and spin-offs serves as an additional control variable to proxy firm risk. In their study on factors influencing credit default swap pricing, Augustin, Izhakian, and Van Nieuwerburgh (2020) showed that, in addition to a company's leverage, the volatility of its assets is one of the key determinants of credit risk. *Leverage* and the *Interest Coverage Ratio* of a company are considered as financial control variables to account for the capital structure effects and the company's debt capacity.

Leverage is defined as the ratio of total liabilities over total assets, and high leverage is expected to correlate positively with credit and distress risk. The interest coverage ratio is defined as the ratio of EBITDA over the interest expenses on debt. Hence, the larger the interest coverage ratio, the smaller the risk for bondholders that the company will default. Therefore, a negative and significant relationship between the interest coverage ratio and credit risk is expected. *Loss* is a binary variable that takes a value of 1 if a company has a negative net income and 0 otherwise. The binary variable is expected to correlate positively with credit and distress risk. Together with *ROA*, defined as the net income over total assets, these financial controls account for the firm-specific profitability of the companies. The relationship between ROA and the risk measures is expected to be negative and significant. *Size* is defined as the natural logarithm of total assets and controls for firm-specific size effects such as overall resilience to economic changes, the market power of firms, and reputational attributes. The firm size is expected to negatively correlate with the risk measures, especially during the economic downturn, where predominantly smaller firms were affected. The *Working Capital Ratio* is the ratio of working capital over total assets and reflects the proportion of assets that can be liquidated in the short term. Nason and Patel (2016) show that cash holdings are rewarded by the market with lower risk premiums, especially in recessions. On the other hand, other papers point out that a "dash for cash" in times of economic stability is perceived as synonymous with increased distress risk (Acharya et al., 2011). For this reason, the working capital ratio is expected to correlate negatively with the risk measures during the COVID-19 crisis and positively before. The dummy variables *Europe* and *US* control for region-specific characteristics, such as the overall economic situation, the companies' legal and regulatory environment, and capital market properties. Incomplete data sets with regard to missing values in the control variables are removed from the sample for quality purposes.

3.4 Dealing with Outliers

It is standard practice in the literature to manipulate the first, second, or fifth percentile of the distribution of the explanatory variables to avoid extreme values in the dataset that bias the statistical result (Ferriani, 2022; Liu et al., 2021; Gerwanski, 2020; Goss & Roberts, 2010; Bauer & Hann; 2010). The rationale behind this approach is that the attention of the analyses is focused on the normally distributed part of the observations to provide generalizable and robust results. However, the disadvantage of this method is that valuable data at the lower and

upper end of the normal distribution are also likely to be manipulated, depending on the chosen threshold.

Financial variables have the potential to be subject to noise due to managerial short-term goals and myopia (Merchant, 1990). For this reason, the non logarithmized or factorized quarterly variables *Tobin's Q*, *Volatility*, *Leverage*, *Interest Coverage*, *ROA*, and *WC* of the raw dataset are first screened visually for significant outliers. Deliberately, this method is not applied to the final sample, as the raw dataset comprises all quarterly financial data across the time series. Thus, the detection of extreme values becomes more sophisticated. Figures 3 to 8 in Appendix A plot the distribution of the variables before manipulation. Since outliers are present, the observations of the first and last percentiles are removed from the dataset. Figures 9 to 14 in Appendix A show the distribution of the variables after manipulation.

3.5 Descriptive Statistics

After slicing out all records whose issue quarter does not match the respective year quarter, the final sample consists of 4214 bonds issued by 385 companies from January 1st, 2014, to December 31st, 2021. Table 2 in Appendix A reports the correlation matrix of the variables used in the analysis. The highest values are -1.00 (between US and Europe) and -0.708 (between Distress Zone and Gray Zone). For this reason, a VIF test is performed to rule out biases resulting from multicollinearity. All variables show a variance inflation factor (VIF) below the critical value of five, so that multicollinearity can be ruled out with a high probability. The results of the VIF test are provided in Table 3 in Appendix A.

Table 4 shows the distribution of bond issues across industries and over time, classified according to the NAICS sector classification. Among all bond issues, the *Manufacturing* (39.68%), *Information* (17.25%), and *Utilities* (16.61%) sectors have the largest shares and thus account for almost three-quarters of the total sample. The *Construction* (0.83%), *Agriculture, Forestry Fishing & Hunting* (0.19%), *Real Estate & Rental & Leasing* (0.14%), and *Management of Companies & Enterprises* (0.10%) sectors account for a comparatively small share of the sample. Within the period under review, the highest number of fixed coupon bonds (837) was issued in the COVID year 2020, indicating that bridge financing of liquidity shortfalls was increasingly required due to the economic downturn induced by the COVID-19 crisis. In 2020, over 50% of all bonds issued corresponded to the *Manufacturing* industry.

Table 4

This table presents the distribution of bonds issued between January 1st, 2014 and December 31st, 2021 across the various NAICS industry classifications and years.

NAICS Industries	Total (%)	2014 (%)	2015 (%)	2016 (%)	2017 (%)	2018 (%)	2019 (%)	2020 (%)	2021 (%)
Accommodation & Food Services	1.23%	0.26%	0.80%	2.56%	1.58%	2.08%	1.34%	1.08%	-
Administrative & Support & Waste Management & Remediation	1.54%	1.58%	0.99%	1.28%	0.79%	2.32%	0.89%	1.91%	2.90%
Agriculture, Forestry Fishing & Hunting	0.19%	-	-	-	-	1.39%	-	0.12%	0.24%
Arts, Entertainment & Recreation	1.50%	2.38%	6.36%	1.28%	0.99%	0.46%	1.04%	-	0.48%
Construction	0.83%	0.53%	0.60%	0.64%	0.59%	0.23%	0.59%	1.55%	1.45%
Health Care & Social Assistance	1.42%	1.32%	3.98%	0.64%	0.59%	0.69%	1.63%	1.31%	0.97%
Information	17.25%	15.57%	9.74%	13.65%	19.76%	23.84%	24.78%	13.02%	18.36%
Management of Companies & Enterprises	0.10%	1.06%	-	-	-	-	-	-	-
Manufacturing	39.68%	34.04%	43.94%	40.73%	36.96%	27.32%	38.58%	50.66%	36.72%
Mining, Quarrying & Oil & Gas Extraction	4.65%	4.49%	4.18%	6.40%	3.95%	1.16%	5.94%	4.66%	5.80%
Professional, Scientific & Technical Services	1.88%	2.64%	1.79%	3.63%	1.19%	1.39%	1.48%	2.03%	0.97%
Real Estate & Rental & Leasing	0.14%	0.79%	-	-	-	0.69%	-	-	-
Retail Trade	5.48%	5.28%	4.57%	4.69%	8.10%	6.94%	2.97%	5.74%	6.52%
Transportation & Warehousing	6.17%	11.61%	7.56%	3.84%	6.13%	7.64%	4.90%	4.18%	6.76%
Utilities	16.61%	15.57%	15.31%	19.40%	17.59%	21.76%	15.73%	13.26%	17.63%
Wholesale Trade	1.33%	2.90%	2.19%	1.28%	1.78%	2.08%	0.15%	0.48%	1.21%
Total Bond Issues	4214	379	503	469	506	432	674	837	414

Table 5 provides the descriptive statistics of the dependent and explanatory variables. As of issuance, the average bond spread amounts to 146.90 basis points, with a noticeable standard deviation of 116.41. Given the wide range of the issue spreads ranging from 2.40 to 1478.99 basis points, this suggests that some companies have fallen into financial distress, causing the market to demand compensation to offset the credit default risk. This is also consistent with the observations of the Altman Z classification distribution, according to which 60% of the sample observations are located within the distress zone, 25% in the gray zone, and 15% in the safe zone. The average issue amount is $792.2M, with an average maturity of 13.45 years. 94%

of the issued bonds carry an embedded call option, whereas no bonds contain a put option for the bondholder. Therefore, putable bonds are not included in the statistical models. The average overall ESG rating is BBB. Regarding the individual pillars of ESG, environmental performance seems to receive the greatest average score of 6.19, whereas social performance is rated at an average of 4.42 and governance performance at 5.22. The companies in the sample are leveraged at 69% and can cover their interest burden 12.26 times out of their EBITDA. The company's average size in terms of total assets is $101.62B, whereas on average, only 6% are employed in working capital. Finally, one should note that the sample consists of 92% U.S. bonds, with the remainder consisting of European observations.

Table 5

This table lists the descriptive statistics on the dependent variables and the explanatory variables of the sample. The sample contains 4214 bonds issued and circulated between January 1, 2014 and December 31, 2021 by 385 companies.

Variable	N	Mean	Median	Std. dev	Minimum	Maximum
Bond Level Data						
Issue Spread (in bps)	4213	146.90	116.41	116.57	2.40	1478.99
Issue Amount	4213	792.20	601.00	810.30	1.00	9.001
Issue Years to Maturity	4213	13.45	10.01	10.11	0.52	47.54
Call Flag	4213	0.94	1.00	0.24	0.00	1.00
Put Flag	4213	0.00	0.00	0.00	0.00	0.00
ESG Data						
ESG Rating	4213	0.59	0.57	0.20	0.14	1.00
Environmental Performance	4213	6.19	5.90	2.35	0.30	10.00
Social Performance	4213	4.42	4.40	1.53	0.00	10.00
Governance Performance	4213	5.22	5.20	1.54	0.00	10.00
Firm Level Data						
Safe Zone	4213	0.15	0.00	0.36	0.00	1.00
Gray Zone	4213	0.25	0.00	0.43	0.00	1.00
Distress Zone	4213	0.60	1.00	0.49	0.00	1.00
Tobin’s Q	4213	1.93	1.59	1.04	0.87	7.73
Volatility	4213	6.91	6.23	2.69	3.68	18.36
Leverage	4213	0.69	0.69	0.15	0.37	1.21
Interest Coverage	4213	12.26	8.60	12.05	-2.36	100.67
Loss	4213	0.15	0.00	0.35	0.00	1.00
ROA	4213	0.01	0.01	0.02	-0.05	0.07
Size (Total Assets)	4213	101615	52197	127486.5	1648	920758
WC Ratio	4213	0.06	0.04	0.11	-0.12	0.50
US	4213	0.92	1.00	0.27	0.00	1.00
Europe	4213	0.08	0.00	0.27	0.00	1.00

4. Methodology and Results

4.2 Empirical Methods

This section outlines the methodology used to test the formulated hypotheses. The empirical models for estimating the relationship between ESG factors and the dependent variables, cost of debt and distress risk, are explained within the individual subsections.

4.2.1 ESG and Cost of Debt

To assess the impact of a company's ESG performance on its cost of debt, fixed effects regressions are performed. Therefore, various ESG performance measures are introduced into the models to analyze the incremental effect of ESG score changes on the cost of debt. As a dependent variable, the natural logarithm of the issue spread is used as a proxy for the initial cost of debt, which is defined as the difference between the issue yield to maturity of the corporate bond and the yield of the corresponding government bond. The explanatory variables of interest are the ESG overall score and the decomposed ESG pillars (E, S, and G). To avoid an overly narrow definition of the scores, the measures are additionally divided into above and below mean, respectively median, performer dummies, as well as into quartiles along their distribution. In line with the literature, all regressions include time and industry-fixed effects to control for invariant characteristics. The regression is set up as follows:

$$\ln(Issue\ Spread) = \alpha + ESG\ Performance\ Measures + X_i + \gamma_t + \delta_i + \varepsilon \quad (8)$$

The control variables X_i include a series of bond and firm characteristics, γ_t are the time fixed effects controlling for the year of issuance, δ_i are the industry fixed effects, and ε is the error term.

The advantage of the setup is that the effects of the overall ESG performance and the incremental effects of the pillars (E, S, and G) on the credit risk measure can be analyzed. This allows a precise determination of whether the market recognizes ESG performance as a whole or whether there are individual drivers that influence the issue spreads. The division into above and below mean performers and a narrower division into quartiles also allows for changes and nonlinear relationships between the ESG scores cost of debt, which potentially would not show significant effects when viewed as numerical coefficients (Barth et al., 2022; El Ghoul et al., 2011). Moreover, such thresholds could also exist for bondholder preferences, which is why

the breakdown of the performance measures into clusters may provide insight into whether investors frame their ESG considerations.

4.2.2 ESG and COVID-19

To analyze the relationship between a company's ESG performance and its cost of debt during the COVID-19 crisis, fixed effects regressions are performed. For this purpose, the period under consideration is limited to the COVID period 2020/2021. Like in the previous section, the natural logarithm of the issue spread is used as a dependent variable. Again, the ESG performance is introduced as main explanatory variable, both as an overall score and in its decomposed form. As an additional explanatory variable, the binary variable *Shock* is introduced, which takes the value 1 for the first quarter of 2020, which is defined as the start of the exogenous economic shock, and 0 for the post-shock period, to control for the influence of the COVID-19 outbreak on the fixed income markets. To capture the effect of the relationship between ESG performance and issue bond spreads during the shock quarter, the interaction variable *ESG Overall Score * Shock* is introduced. The regression is set up as follows:

$$\ln(Issue\ Spread_{COVID}) = \alpha + ESG\ Performance\ Measure + Shock + (ESG\ Overall\ Score * Shock) + X_i + \gamma_t + \delta_i + \varepsilon \quad (10)$$

Since it was uncertain how long COVID-19 would last at the beginning of the economic downturn, the shock was most significant in the first quarter. However, this approach has weaknesses for which alternative definitions of *Shock* are needed. First, after the first quarter, the uncertainty in the economy remained high, as nationwide quarantine restrictions were introduced across the United States and European nations during the second quarter, forcing many companies to suspend their operations and thus further exacerbating the impact of the liquidity crisis. Second, a milestone in crisis management was not reached until the first people worldwide were vaccinated in the fourth quarter of 2020, and the vaccine became available for the mass. For robustness purposes, the regression is also performed with alternative definitions of the shock periods to address these concerns. Besides the first quarter of 2020, the model alternatively considers the first two quarters and the first three quarters as shock periods, in which the uncertainty of the COVID-19 crisis was most pronounced.

4.2.3 ESG and Financial Distress

To measure the effect of ESG management on its ability to enhance financial performance and mitigate distress risk, probit regressions are performed. As dependent variables, the three Altman Z classifications, *Distress Zone*, *Gray Zone*, and *Safe Zone*, are used as binary variables to proxy distress risk, respectively financial stability. The explanatory variable of interest, ESG performance, is used both as an overall score and in its decomposed and grouped forms to determine how likely it is that a certain ESG performance measure will influence the probability of entering financial distress. Again, time and industry-fixed effects are considered in this model. The regression is set up as follows:

$$Altman\ Z\ Classification_{1,0} = \alpha + ESG\ Performance\ Measure + X_i + \gamma_t + \delta_i + \varepsilon \quad (12)$$

The advantage of this analysis is that it allows to precisely identify whether ESG activities have an impact on the financial stability of a company. If ESG activities are positively correlated with the company's financial performance, the negative relationship between ESG performance and credit risk not only results from the risk mitigating characteristics of ESG activities, but also from the associated positive financial performance. Together with the results of the previous analyses, conclusions can be drawn about whether any form of discrimination exists with regard to the market treatment of ESG firms. To the best of my knowledge, this approach has not been performed before.

4.3 Empirical Results

4.3.1 ESG and Cost of Debt

This section analyzes the impact of ESG performance on a company's cost of debt by applying the models from section 4.2.1. All models include control variables, industry, and time fixed effects. Table 6 reports the findings on the relationship between a company's ESG performance and its cost of debt. Only this section lists all variables in the tables, whereas only the explanatory variables of interest are reported in the following sections. A complete report of all tables is provided in Appendix A.

Column 1 regresses the overall ESG score on the dependent variable. As predicted, the coefficient of the overall ESG score is statistically significant and negative. AAA-rated companies face a 43.03% lower issue spread than CCC-rated companies. This is consistent

Table 6

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt. The sample contains 4214 bonds issued between January 1, 2014 and December 31, 2021 by 385 companies. The dependent variable is the natural logarithm of the yield to maturity of the corporate bond as of issuance and the corresponding government bond yield using linear interpolation. The main explanatory variable in column (1) is the ESG overall score, in (2) the environmental, social and governance scores, in (3) the breakdown into above and below mean performers, in (4) the breakdown into above and below median performers, in (5) the breakdown into ESG overall score quartiles and in (6) the breakdown into environmental, social and governance score quartiles. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESGOverall	-0.502***							
	(0.092)							
E		-0.005						
		(0.007)						
S		-0.018						
		(0.015)						
G		-0.020						
		(0.012)						
ESGOverallAboveMean			-0.208***					
			(0.039)					
ESGOverallAboveMedian				-0.214***				
				(0.033)				
ESGOverallQ2					-0.012			
					(0.038)			
ESGOverallQ3					-0.280***			
					(0.042)			
ESGOverallQ4					-0.259***			
					(0.060)			
EAboveMean						0.007		
						(0.039)		
SAboveMean						-0.060		
						(0.044)		
GAboveMean						-0.059		
						(0.040)		

EAboveMedian							0.005	
							(0.036)	
SAboveMedian							-0.086	
							(0.051)	
GAboveMedian							-0.056	
							(0.044)	
EQ2								-0.123***
								(0.026)
EQ3								-0.075
								(0.045)
EQ4								-0.013
								(0.062)
SQ2								0.001
								(0.053)
SQ3								-0.076
								(0.047)
SQ4								-0.073
								(0.053)
GQ2								-0.106***
								(0.022)
GQ3								-0.074
								(0.047)
GQ4								-0.143***
								(0.030)
lnIssueAmount	-0.003	-0.001	0.000	-0.004	0.000	0.001	0.000	0.001
	(0.014)	(0.016)	(0.013)	(0.014)	(0.012)	(0.015)	(0.016)	(0.015)
IssueYearsToMaturity	0.025***	0.025***	0.025***	0.025***	0.025***	0.025***	0.025***	0.025***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Call_Flag	-0.160**	-0.135**	-0.148*	-0.169*	-0.174**	-0.141**	-0.135*	-0.150**
	(0.073)	(0.061)	(0.075)	(0.068)	(0.074)	(0.064)	(0.064)	(0.064)
GrayZone	-0.132**	-0.153***	-0.143**	-0.146***	-0.132**	-0.153**	-0.155**	-0.159***
	(0.054)	(0.052)	(0.054)	(0.045)	(0.049)	(0.056)	(0.055)	(0.050)

SafeZone	-0.059	-0.073	-0.062	-0.069	-0.054	-0.070	-0.072	-0.076
	(0.052)	(0.055)	(0.059)	(0.053)	(0.057)	(0.057)	(0.056)	(0.063)
TobinsQ	-0.119***	-0.138***	-0.121***	-0.132***	-0.122***	-0.139***	-0.137***	-0.134***
	(0.014)	(0.011)	(0.014)	(0.012)	(0.014)	(0.011)	(0.012)	(0.012)
Volatility	0.063***	0.065***	0.062***	0.063***	0.062***	0.065***	0.064***	0.064***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)
Leverage	0.465**	0.449**	0.492***	0.438**	0.471***	0.457**	0.443**	0.460**
	(0.163)	(0.190)	(0.162)	(0.158)	(0.158)	(0.165)	(0.175)	(0.180)
InterestCoverage	-0.006**	-0.006**	-0.006**	-0.005*	-0.006*	-0.006**	-0.006**	-0.006**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Loss	0.117	0.110	0.124*	0.121	0.129*	0.115	0.122	0.121
	(0.070)	(0.079)	(0.065)	(0.069)	(0.061)	(0.080)	(0.076)	(0.079)
ROA	1.078	1.394	1.149	1.416	1.020	1.358	1.481	0.154
	(1.937)	(1.821)	(1.956)	(1.796)	(1.808)	(1.755)	(1.711)	(1.754)
Size	-0.167***	-0.174***	-0.167***	-0.172***	-0.165***	-0.175***	-0.175***	-0.176***
	(0.041)	(0.038)	(0.037)	(0.037)	(0.036)	(0.037)	(0.035)	(0.034)
WCRatio	-0.056	0.037	0.064	-0.011	0.074	0.044	0.042	0.063
	(0.158)	(0.200)	(0.163)	(0.159)	(0.149)	(0.197)	(0.193)	(0.182)
Europe	-0.013	-0.074*	-0.023	-0.051	0.006	-0.085**	-0.081*	-0.059
	(0.037)	(0.038)	(0.036)	(0.031)	(0.050)	(0.038)	(0.038)	(0.034)
Observations	4214	4214	4214	4214	4214	4214	4214	4214
R^2	0.450	0.437	0.451	0.452	0.460	0.437	0.439	0.445
$R^2 Adj.$	0.445	0.432	0.446	0.447	0.455	0.432	0.433	0.439
$R^2 Within$	0.389	0.375	0.391	0.391	0.401	0.375	0.377	0.384
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y

with the findings of the literature analysis on the relationship between a company's ESG performance and its cost of debt and provides initial support for hypothesis 1. However, since a high ESG score implies superior ESG performance across all pillars, the overall ESG score may be too narrowly defined and bias the results, as an AAA rating is likely to represent the industry leaders in these positions. In addition, the individual ESG components could drive the observed negative relationship, thus a pillar-level analysis could provide insights into which factor has the most significant impact on credit risk.

Column 2 regresses the individual pillars (E, S, and G) on the dependent variable. Although the coefficients of interest possess the predicted sign, they are not statistically significant. One reason for this could be that unobservable characteristics are associated with high environmental, social, and governance scores, which precludes a statistically significant effect. For example, as Sharfman and Fernando (2008) have shown, although environmental activities negatively affect the cost of capital, most of the effect is attributable to the cost of equity, as environmentally responsible firms report significantly higher debt levels than their counterparts, meaning that such firms exploit additional financial slack efficiently. What is true for the environmental performance may also apply to the social and governance pillar. However, a narrow definition of the performance measures or pronounced inverted u-shaped relationships with the cost of debt could also account for the lack of significance.

To allow for changes in the score and define companies' ESG performance more broadly, columns (3) and (4) divide the companies into above and below mean, respectively median, performers. The results are statistically significant and exhibit the predicted sign. The coefficients indicate that above-average performers have between 20.8% and 21.4% lower issue spreads than their counterparts. Based on the average sample issue spread, this corresponds to a difference of 30.56 to 31.44 basis points. This significant difference supports the argument that companies with better ESG performance face a lower cost of debt than companies with poor performance.

Column (5) breaks down the companies into quartile dummies to analyze whether any u-shaped relationship exists between a company's ESG rating and its cost of debt. The coefficients of the main explanatory variables are all negative, whereas only the coefficients of the third and fourth quartile are statistically significant. If a company belongs to the third quartile, issue spreads are on average 28% lower. Notably, the negative effect for the top quartile stagnates compared

to the third quartile, even falling by 2.1%. Once again, Sharfman's and Fernando's (2008) argument that high ESG firms benefit from favorable market conditions and thus exploit the potential of their capital structure more efficiently may apply here as well. However, higher costs for maintaining the ESG performance, such as investments in climate-neutral processes, employee benefits, or increased administrative expenses for higher report standards, could also be a reason for the inverted u-shaped relationship between ESG and the cost of debt.

In order to find out whether the findings also hold for the individual ESG pillars, the performance measures in columns (6) and (7) are divided into above and below mean, respectively median, performers. Similar to regression (2), the coefficients are not statistically significant, indicating that the classification of above and below-average performers may be too broad to identify any relationship.

Column (8) breaks down the individual pillars into quartiles to show the strength of the relationships across the distributions. The coefficients of the second quartile of the environmental performance and the second and fourth quartiles of the governance performance are significant and negative. Although the coefficients of the environmental performers in the third and fourth quartiles also show the predicted sign, the findings suggest that only environmental performers of the second quartile report 12.3% lower issue spreads. Again, Sharfman's and Fernando's (2008) findings could apply here, that above-average environmental performers exploit their capital structure potential more efficiently, leading to insignificant coefficients. In terms of governance quartiles, a non-linear relationship seems to exist in which either second or fourth quartile performers report lower spreads, whereas top performers report 3.7% lower spreads than second quartile performer.

The majority of the control variables exhibit the predicted signs. The issue years to maturity have a statistically significant positive effect on the issue spread, indicating that financing long-term bonds is positively correlated with credit risk. The volatility and leverage of a company also correlate positively with its debt cost. A one standard deviation increase in the volatility and leverage of a company alone corresponds to an average increase in the issue spread of 23.25% to 24.55%. The variable Loss exhibits a positive relationship with the issue spread, which is statistically significant in only two models at the 10% level. On the other hand, carrying an embedded call option, belonging to the gray zone classification according to Altman, Tobin's Q, interest coverage, and the size variable correlate negatively with the issue

spread, indicating that bonds of companies that are callable, not in financial distress, bonds of high market-to-book companies, bonds of companies that can cover their interest burdens, as well as large issuers, exhibit lower issue spreads. In three cases, the European dummy is also statistically significant and negatively related to the issue spreads. Considering the sample size, the models show sufficient fit and validity with a within R squared ranging from 37.5% to 40.1%.

To briefly review the full sample analysis about the relationship between a company's ESG performance and its cost of debt, evidence on a negative correlation was found and thus provides strong support for hypothesis 1. The analysis revealed that an inverted u-shaped relationship may exist between the overall ESG performance and the cost of debt. The results of the analysis of the pillar quartiles indicate that this may be attributable to the fact that non-linear relationships exist, as environmental and governance performers of the second quartile exhibit lower spreads than top performers in the respective pillars.

4.3.2 ESG and High-Risk Industries

As some industries are explicitly exposed to higher ESG risks, the results of the full sample analysis may be biased with respect to the strength of the relationship. Industries with high ESG risk exposure possess more open flanks for frictions and scandals due to greater media attention and higher market scrutiny, suggesting that better ESG performance may be of particular relevance (Gerwanski, 2020; Koh et al., 2014; Jo & Na, 2012; El Gouhl et al., 2011; Bauer & Hann, 2010). The sample is split into two subsamples to test whether the impact of high ESG performance is more pronounced for industries with high ESG risk exposure and whether the observed inverted u-shaped relationship also holds for them. By following the approach of Bauer and Hann (2010), the first subsample is defined as high-risk industry sample. Using the SIC industry classification, Bauer and Hann classify the paper and allied products (2600), chemicals and allied products (2800, 5160, 5161, 5169), petroleum refining (2910, 2911, 2900), primary metal (3300), and mining industry (1000, 1200) as environmentally sensitive industries. A total of 172 issued bonds from the sample are assigned to these high-risk industries. The remaining 4042 bonds are thus assigned to the low-risk sample. Since it is of particular interest which ESG pillars are the drivers for lower cost of debt and whether inverted u-shaped relationships also exist for high-risk industries, the broadly defined above and below mean, respectively median, classifications are excluded from the following analyses. Table 7 reports the results of the analysis.

Table 7

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt, by dividing the sample into high and low ESG risk exposure industries. The sample contains 4214 bonds issued between January 1, 2014 and December 31, 2021 by 385 companies. The dependent variable is the natural logarithm of the yield to maturity of the corporate bond as of issuance and the corresponding government bond yield using linear interpolation. The main explanatory variable in column (1) and (2) is the ESG overall score, in (3) and (4) the environmental, social and governance scores, in (5) and (6) the breakdown into ESG overall score quartiles and in (7) and (8) the breakdown into environmental, social and governance score quartiles. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High Risk	*Low Risk*	*High Risk*	*Low Risk*	*High Risk*	*Low Risk*	*High Risk*	*Low Risk*
ESGOverall	-0.662	-0.531***						
	(0.908)	(0.088)						
E			-0.160	-0.002				
			(0.073)	(0.008)				
S			0.062	-0.024				
			(0.039)	(0.015)				
G			-0.048***	-0.019				
			(0.006)	(0.012)				
ESGOverallQ2					-0.0153	-0.043		
					(0.101)	(0.035)		
ESGOverallQ3					-0.117	-0.283***		
					(0.190)	(0.042)		
ESGOverallQ4					-0.089	-0.276***		
					(0.227)	(0.053)		
EQ2							-0.344	-0.090***
							(0.367)	(0.016)
EQ3							-0.410	-0.070
							(0.306)	(0.050)
EQ4							-0.250	0.031
							(0.474)	(0.068)
SQ2							0.117***	0.007
							(0.019)	(0.051)

SQ3							0.198	-0.121**
							(0.132)	(0.055)
SQ4							-0.127**	-0.080
							(0.035)	(0.053)
GQ2							0.374	-0.113***
							(0.245)	(0.021)
GQ3							-0.164	-0.083*
							(0.192)	(0.046)
GQ4							0.113	-0.130***
							(0.208)	(0.029)
Observations	172	4042	172	4042	172	4042	172	4042
R^2	0.708	0.452	0.713	0.438	0.707	0.460	0.734	0.448
$R^2 Adj.$	0.658	0.447	0.659	0.432	0.652	0.454	0.671	0.442
$R^2 Within$	0.517	0.378	0.524	0.361	0.515	0.386	0.560	0.373
Control Variables	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y

The regression results of the ESG overall score on the cost of debt for the high-risk subsample (1) show no significant relationship for high-risk industries, although the coefficient possesses the predicted sign. For the low-risk subsample (2), the coefficient is negative and significant. Compared to the full sample regression in section 4.3.1, the impact of the ESG overall score is up to 2.9% stronger for the low-risk subsample, indicating that, contrary to the predicted hypothesis 2, ESG performance is particularly beneficial for companies in low-risk industries. Possible drivers of this observation could be that the effects of individual ESG activities in high-risk industries may cancel each other out and that the overall score is defined too narrowly.

Columns (3) and (4) provide insights into the relationship of the individual pillars with the cost of debt. As in the previous analysis, the individual pillars for the low-risk subsample show the predicted sign but are statistically insignificant. Contrary to the regression results in model (1), the governance score of the high-risk industry sample certainly affects the cost of debt negatively and statistically significant. The governance score possesses a negative relationship with the cost of debt to a magnitude that is more than 2.5 times as strong as the governance score coefficient of the low-risk sample, which indicates that the market particularly rewards superior governance mechanisms for environmentally sensitive industries.

Columns (5) and (6) confirm the observations from regression (1) by showing that the overall ESG score has no significant influence on the bond issue spread of high-risk industries across the quartiles. However, belonging to the third and fourth quartile within the low-risk sample shows a negative and statistically significant relationship. Similar to the full sample analysis of section 4.3.1, an inverted u-shaped relationship can be observed, which is 1.4% less pronounced, indicating that high-risk industries have biased the full sample regression outcome.

Columns (7) and (8) report the outcomes regarding the relationship of the individual ESG pillar quartiles with the issue spread. Contrary to the findings from regression (3), where the governance performance exhibited a negative relationship to the cost of debt of high-risk firms, only the social performance coefficients of the second and fourth quartiles are significant. If a company within the high-risk industry belongs to the second quartile, bonds of these companies exhibit 11.7% higher spreads. In comparison, top performers of the fourth quartile show 12.7% lower spreads, keeping all variables constant. Thus, the offset between low and high performers

of the social pillar amounts to 24.4%, which explains the insignificant social performance coefficient in regression (3) due to a pronounced inverted u-shaped relationship. Compared to model (3), the governance quartiles do not show statistically significant values. One reason for this phenomenon could be that the quartile distribution does not accurately separate the quality of governance performance given the low sample size of high-risk industry bonds. The results of the low-risk subsample in model (8) differ somewhat from the findings of the full sample regression in section 4.3.1. As before, the coefficients of the second environmental and governance quartiles are negative and significant. In addition, the coefficients for the third social and governance performance quartile are negative and significant, indicating that observations of high-risk firms have influenced the results of the full sample analysis. The fact that the social performance quartiles of the previous regressions were insignificant suggests that the presence of a pronounced inverted u-shaped relationship within the high-risk sample biased previous findings. Hence, it appears that within high-risk industries, top social performers exhibit a negative relationship with the cost of debt, whereas below-average social performers are significantly penalized by the market with higher spreads. Accordingly, the findings show that a substantial relationship between social performance and the cost of debt among industries with high ESG risk exposure exists, which partially supports hypothesis 2.

To conclude the findings, the results show weak support for hypothesis 2. Contrary to the assumption that the negative relationship between ESG performance and the cost of debt is more pronounced in industries with higher ESG risk exposure, no clear evidence could be provided. However, the governance and social pillars are found to have a significant and negative relationship with the cost of debt for companies belonging to high-risk industries. Nevertheless, the analysis of the social performance quartiles revealed that below-average social performers are even penalized with higher cost of debt, which is why the offset to the top performers has an economically relevant impact. Furthermore, the findings show that the results of the full sample analysis are biased by bonds from high-risk industries and that sample size issues may be present.

4.3.3 ESG and Stable Economy

So far, the previous analyses also included observations from the COVID period 2020/2021. Overall, 29.69% of the bonds from the entire sample were issued within the COVID-19 years, reflecting the extent of the global crisis on the financial market. Since the crisis is

unprecedented and the economy is affected significantly by the subsequently introduced health measurements, the results from the previous analyses may be biased in terms of the magnitude of the coefficients. To test whether the results of the previous analyses also hold for the period of economic stability, a subsample is created for the years 2014 to 2019 to perform the regressions described in Section 4.2.1. Table 8 reports the regression results.

Column (1) regresses the ESG overall score on the cost of debt. As predicted, the coefficient is negative and significant. Compared to the full sample regression, the relationship of the overall score with the issue spread is 4.1% lower. Contrary to the stated hypothesis 3 that ESG performance has a stronger relationship with the cost of debt in times of economic stability, it appears that the magnitude of the coefficient from the full sample analysis is driven by observations of the COVID-19 period. However, this phenomenon could indicate that individual pillars have a larger impact on the cost of debt in times of crisis than in times of financial stability, so that the analysis of environmental, social, and governance performance can provide further insights into their relationship.

Column (2) performs the regression with the individual pillars. As in the full sample analysis, the coefficients exhibit the predicted sign but are not statistically insignificant. A potential explanation could be that the individual pillars are defined too narrowly, or that non-linear relationships with the cost of debt are present.

To test whether the inverted u-shaped relationship between the ESG overall score and the cost of debt is driven by observations from the COVID-19 period, model (3) regresses the quartile ESG overall score dummies on the cost of debt in periods of economic stability. As in the regressions of the full and the low ESG risk exposure sample, the coefficients of the third and fourth quartiles are significant and negative. Notably, the coefficient of the third quartile is only half as high as in previous regressions. In addition, the relationship doubles for companies belonging to the fourth quartile of the ESG score distribution instead of stagnating or decreasing as observed so far, thus indicating a linear relationship in times of economic stability. The results suggest that top ESG performers show a stronger negative relationship to the cost of debt in times of financial stability, which provides initial support for hypothesis 3.

To give insights into whether the individual pillars of ESG did not exhibit statistically significant coefficients caused by pronounced non-linear relationships, column (4) regresses

Table 8

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt. The sample contains 2963 bonds issued between January 1, 2014 and December 31, 2019 by 335 companies. The dependent variable is the natural logarithm of the yield to maturity of the corporate bond as of issuance and the corresponding government bond yield using linear interpolation. The main explanatory variable in column (1) is the ESG overall score, in (2) the environmental, social and governance scores, in (3) the breakdown into ESG overall score quartiles and in (4) the breakdown into environmental, social and governance score quartiles. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)
ESGOverall	-0.461***			
	(0.123)			
E		-0.004		
		(0.010)		
S		-0.006		
		(0.018)		
G		-0.018		
		(0.015)		
ESGOverallQ2			-0.018	
			(0.061)	
ESGOverallQ3			-0.141***	
			(0.040)	
ESGOverallQ4			-0.283***	
			(0.067)	
EQ2				-0.157***
				(0.026)
EQ3				-0.119**
				(0.043)
EQ4				-0.009
				(0.095)
SQ2				0.057
				(0.047)
SQ3				-0.069
				(0.070)
SQ4				-0.022
				(0.058)
GQ2				-0.011
				(0.036)
GQ3				-0.047
				(0.052)
GQ4				-0.121***
				(0.039)
Observations	2963	2963	2963	2963
R^2	0.440	0.429	0.450	0.443
$R^2 Adj.$	0.434	0.421	0.443	0.435
$R^2 Within$	0.384	0.371	0.394	0.386

Control Variables	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y

the quartile dummies of the individual pillars on the cost of debt. The coefficients of the second and third environmental performance quartiles show a negative and significant relationship with the cost of debt. Contrary to previous results, a pronounced inverted u-shaped relationship between environmental performance and the cost of debt is found. The strength of the relationship decreases from quartile two to quartile three by 3.8%, which may account for the absence of an insignificant environmental performance coefficient in model (2). However, compared to the previous findings of sections 4.3.1 and 4.3.2, environmental performers of the third quartile experience a lower cost of debt in times of financial stability, which could indicate that environmental performance is recognized more in times of stability than in times of crisis. Consistent with previous findings, top governance performers of the fourth quartile exhibit a negative relationship with the cost of debt.

To conclude, ESG performance in times of economic stability reveals a more moderate relationship with the cost of debt compared to the full sample findings. However, the relationship is linear and more substantial, indicating that top ESG performers benefit from lower cost of debt than their peers in times of economic stability, in line with the notion of hypothesis 3. Furthermore, it was found that environmental performance in the pre COVID-19 period also exhibits a negative relationship with the cost of debt even for performers of the third quartile, whereas the relationship follows a pronounced inverted u-shaped relationship. In line with previous findings, top governance performers report a negative relationship with the cost of debt, also in times of economic stability. However, further analysis is needed to provide full support for hypothesis 3.

4.3.4 ESG and COVID-19

This section investigates the impact of ESG performance on the cost of debt during the COVID-19 crisis. This paper argues that high ESG firms are more resilient to consequences arising from economic shocks compared to their counterparts. To test this, a subsample was formed that includes bond issues from the COVID years 2020 and 2021. The binary variable *Shock* is introduced as an additional explanatory variable in the model and takes the value of 1 for the first quarter of 2020 when COVID has caused the economic downturn and 0 for the post-shock

period. For robustness purposes, the regressions alternatively consider the first two quarters and the first three quarters as shock periods, in which the uncertainty of the COVID crisis was most pronounced. Furthermore, the interaction term *ESG overall score * Shock* is introduced to capture the risk mitigating effect of ESG on bond issuances during the shock quarters. Table 9 reports the results for the analysis.

Columns (1), (2), and (3) regress the ESG overall score on the cost of debt. Across the regressions, all ESG coefficients are significant and negative, as predicted. When controlling for the shock periods, the negative relationship between the ESG overall score and bond spreads is 0.87% to 1.92% higher per rating class achieved compared to the regressions of the stable economy subsample. This finding contradicts with hypothesis 3 that ESG has a stronger relationship with the cost of debt in times of economic stability. Nevertheless, this supports hypothesis 4, that ESG acts as a cushion during the COVID-19 crisis.

Concerning the shock variable and the interaction terms, both coefficients in model (1) are significant, with *Shock1* exhibiting a negative and the interaction term a positive effect on the cost of debt. Taking the average ESG rating score of BBB into account, the issue spreads for bonds issued after the first quarter are 35.83% lower, whereas bonds of the same issuer issued in the shock quarter exhibit only 31.94% lower spreads. Also, the incremental effect per rating score increase amounts to 6.27% in the post-shock period, whereas the incremental effect per rating score increase falls to 1.89% within the shock quarter. One reason for this could be that creditworthiness is at the forefront of creditors' minds during the economic shock (Ferriani, 2022). However, immediate refinancing needs arising from the adverse cash flow shock could also drive this effect (Liu et al., 2020). In model (2), besides the ESG coefficient, the interaction term ESG overall score * Shock2 is significant but positive. Compared to model (1), the effect of the interaction term is halved, which may be explained by the fact that the interaction term entirely captures the impact of the shock. Although the incremental effect per rating score increase for bonds issued in the first two quarters rises to 6%, bonds issued by BBB-rated companies show only 24% lower issue spreads, meaning that the effect of ESG on the cost of debt is significantly lower than bonds from the same ESG rating class issued during the first quarter. This shows that the effect of the shock was still pronounced in the second quarter and that the pressure on the fixed income market remained high. With regard to model (3), both the shock variable and the interaction term are not statistically significant.

Table 9

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt during the COVID years 2020 and 2021. The sample contains 1251 bonds issued by 271 companies between January 1, 2020 and December 31, 2021. The dependent variable is the natural logarithm of the issue yield to maturity of the corporate bond and the corresponding government bond yield using linear interpolation. The main explanatory variables for regression (1), (2) and (3) is the ESG overall score and for regression (4), (5) and (6) the environmental score, social score and governance score. The analysis makes use of the binary variable Shock, which takes the value of 1 for shock quarters and 0 for the post-crisis period. Shock1 takes the value of 1 for the first quarter of 2020. Shock2 takes the value of 1 for the first two quarters of 2020. Shock 3 takes the value of 1 for the first three quarters of 2020. Treatment variables are included in all models. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)
ESGOverall	-0.627***	-0.653***	-0.548***			
	(0.090)	(0.116)	(0.155)			
E				-0.004	-0.001	0.001
				(0.007)	(0.006)	(0.007)
S				-0.049***	-0.041***	-0.035***
				(0.010)	(0.009)	(0.009)
G				-0.018	-0.017	-0.010
				(0.029)	(0.030)	(0.033)
Shock1	-0.244*			-0.027		
	(0.118)			(0.095)		
Shock2		-0.084			0.188**	
		(0.080)			(0.079)	
Shock3			0.068			0.302**
			(0.131)			(0.101)
ESGOverall *	0.495***			0.159		
Shock1	(0.133)			(0.106)		
ESGOverall *		0.233**			-0.174**	
Shock2		(0.086)			(0.071)	
ESGOverall *			0.017			-0.340**
Shock3			(0.154)			(0.125)
Observations	1251	1251	1251	1251	1251	1251
R^2	0.500	0.498	0.496	0.490	0.491	0.493
$R^2 Adj.$	0.487	0.485	0.484	0.476	0.477	0.479
$R^2 Within$	0.450	0.448	0.446	0.439	0.440	0.442
Control Variables	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y

In order to explore which ESG pillar drives the negative relationship, the results of the decomposed ESG performance measures are presented in columns (4), (5), and (6) of Table 9. The social performance coefficient is negative and significant in all models. When controlling for the shock quarters, the incremental effect of one social score point increase ranges between 3.5% and 4.9%. In line with the literature findings, this observation may suggest that investors

perceive social firms as less volatile, which benefits their financial bottom line during the crisis (Gao et al., 2022; Amiraslani et al. 2021; Maloul et al., 2021; Lins et al., 2019; La Rosa et al. 2018). This supports hypothesis 4, whereas the negative effect is attributable to socially responsible activities that provide a cushion during the COVID-19 crisis.

To summarize, the analysis of the relationship between ESG performance and the cost of debt during the COVID-19 crisis reveals that high ESG firms in fact experience lower issue spreads. Especially the social performance shows the most significant effect in times of crisis, which contradicts with previous findings. Furthermore, high ESG firms did benefit from lower borrowing costs during the shock quarters, when the uncertainty was most pronounced, although the impact of ESG was marginally smaller. Collectively, this provides strong support for hypothesis 4, that high ESG performance acts as a cushion for companies in times of crisis with regard to their access to favorable debt.

4.3.5 ESG and Financial Distress

So far, the ESG performance of a company has been found to correlate negatively with the cost of debt. In particular, being a top governance performer led to favorable bond conditions. In addition, it has been shown that pronounced inverted u-shaped relationships between environmental performance and issue bond spreads exist in times of stability. In times of crisis, social activities are rewarded by the market. However, no robust conclusion has yet been drawn whether the lower spreads are related to the existence of a bondholder's taste towards ESG firms or whether high ESG is correlated with improved economic performance. If the latter is the case, lower spreads are statistically sound, thus proving that the market discriminates ESG offenders statistically accurately.

In this section, probit regressions are performed to determine whether a company's ESG performance is related to the probability of running into financial distress. For this purpose, the methodology from section 4.2.3 is applied, using the Altman Z-score classifications distress zone, gray zone, and safe zone as proxies for financial distress respectively for financial stability. Table 10 reports the results of the analysis of the relationship between the ESG overall performance, respectively its decomposed pillars, and the Altman Z classifications.

Table 10

This table provides the results of the probit regression analysis on the relationship between a company's ESG performance and its likelihood of running into financial distress. The sample contains 4214 bonds issued between January 1, 2014 and December 31, 2021 by 385 companies. The dependent variables are the Altman Z classifications, defined as binary variables. In regression (1) and (2), the explanatory variables are regressed on the Distress Zone classification, (3) and (4) use the Gray Zone as a dependent variable and regression (5) and (6) the Safe Zone classification. The main explanatory variables for regression (1), (3) and (4) is the ESG overall score and for regression (2), (4) and (6) the environmental score, social score and governance score. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1) *Distress Zone*	(2) *Distress Zone*	(3) *Gray Zone*	(4) *Gray Zone*	(5) *Safe Zone*	(6) *Safe Zone*
ESGOverall	-0.116		0.145		-0.029	
	(0.096)		(0.104)		(0.023)	
E		-0.015*		0.020**		-0.005
		(0.007)		(0.007)		(0.004)
S		0.005		-0.008		0.003
		(0.012)		(0.011)		(0.003)
G		0.007		-0.004		-0.003
		(0.011)		(0.013)		(0.005)
Observations	4214	4214	4214	4214	4214	4214
R^2	0.589	0.591	0.189	0.193	0.519	0.520
$R^2 Adj.$	0.585	0.587	0.182	0.186	0.515	0.515
$R^2 Within$	0.487	0.490	0.086	0.090	0.457	0.458
Control Variables	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y

First, the distress zone probit regressions are performed. Regression (1) regresses the ESG overall score on the dependent variable. Although the coefficient exhibits the predicted sign, it is statistically insignificant. To investigate further whether the individual pillars possess contrary relationships to the probability of entering the distress zone, model (2) regresses the decomposed ESG measures on the dependent variable. Contrary to the observations from the previous analyses, where environmental performance was rewarded only to a certain extent with lower issue spreads, the environmental coefficient negatively affects the probability of being classified in the distress zone at the 10% significance level by a 1.5% decrease per score point achieved. This finding suggests that the environmental efforts strengthen the financial bottom line.

Models (3) and (4) use the gray zone classification as a dependent variable. Considering the ESG overall score as the main explanatory variable, again no significant relationship can be observed. Similar to the previous model, the environmental score is the only significant coefficient among the decomposed ESG pillars but increases the probability of being classified within the gray zone by 2% per score point achieved, suggesting that environmental performance directly relates to a company's financial performance. This reinforces the assumption that environmental firms are a proxy for a better financial bottom line, although it's only rewarded with lower issue spreads to a certain extend. However, these results should be evaluated somewhat more cautiously, as models (3) and (4) show a relatively lower within R squared compared to previous analyses, ranging between 8.6% and 9.0%. Moreover, according to Altman (1968), the gray zone is suspected of misclassifying bankruptcy risk to a certain extent.

The probability of being classified in the safe zone is analyzed in models (5) and (6). With the ESG overall score as the main explanatory variable, the coefficient reports no statistically significant result. In order to identify whether the overall score is defined too narrowly, model (6) uses the individual ESG pillars as main explanatory variables. Again, the coefficients report no statistically robust results. A potential explanation for this phenomenon could be that companies that report high E, S, and G performance take advantage of the additional slack they have gained and increase their debt levels to utilize leverage and tax effects to increase overall economic performance (Sharfman & Fernando, 2008). Since the derivation of the Altman Z-score incorporates, among other measures, the ratio of the market value of equity to total liabilities, the proposed notion may also apply to this sample.

For robustness purposes, the regressions are performed again using the ESG overall and the environmental, social, and governance quartile dummy variables to test whether the negative influence of environmental performance on the distress risk follows a linear relationship or whether the negative impact on distress risk occurs only above a certain threshold. The findings are reported in Table 11 in Appendix A. According to the results, belonging to the environmental performers of the top quartile reduces the probability of being classified as a distress zone firm by 9.6%. In contrast, the environmental coefficients of the same quartile show a positive and significant influence on the probability of being classified as a gray zone firm by 14.2%. These findings indicate support that environmental activities strengthen the financial bottom line of companies. Contrary to the observation that social performance is rewarded with lower issue spreads in times of crisis, the probability of being classified within the distress zone increases for social performers of the second and third quartile between 8.7% and 9.8%, whereas the probability of being classified within the gray zone decreases by 9.3% if companies belong to the second quartile of social performers. This indicates a contradicting phenomenon: companies exposed to distress risk are treated favorably by the market in times of crisis. With regard to the safe zone classification, the analysis failed to provide statistically robust relationships with ESG measures.

Considering the strong efficient market hypothesis that the market accurately reflects all information regarding the pricing of an asset, this implies that there is no free lunch or welfare harming discrimination on the market (Malkiel, 2003). Thus, the analysis exhibits shortcomings with respect to the joint hypothesis problem, which states that market efficiency per se is not testable due to imperfect models (Fama, 1991). Findings in the literature suggest that high ESG performance mitigates credit risks by increased corporate reputation, investor preferences, and the reduction of information asymmetries and agency costs (Azmi et al., 2021; Yang et al., 2021; Gerard, 2018; Riedel & Smeets, 2017; Polbennikov et al., 2016; Krüger 2014; Bauer & Hann, 2010). As a result, conclusions about possible welfare harming discrimination or market frictions may be inappropriate. The findings of the credit risk analysis about the negative relationship between ESG, top governance performers in times of financial stability, and social performers in times of crisis with the cost of debt thus allow to conclude that corporate socially responsible activities mitigate credit risk through channels, other than lower distress risk.

To summarize this section, the analysis failed to provide support for hypothesis 5, that ESG has a negative impact on a company's distress risk. However, it was found that top environmental performers reduce the probability of falling into financial distress, whereas social performance bears a positive relationship with distress risk. No robust coefficients could be identified regarding governance performance, the influence of ESG, or the probability of being classified in the safe zone. With regard to the previous findings, it appears that the market accurately rewards environmental performance in times of stability, but governance performance has no effect on the financial bottom line. In addition, a contradictory pattern emerges that companies exposed to higher distress risk are treated favorably by the market in times of crisis. Considering the strong efficient market hypothesis and joint hypothesis problem, it is likely that the observed findings derived from the credit risk analysis result from the fact that ESG reduces credit risk through channels other than lower distress risk or better financial performance.

5. Robustness Tests

In this section, additional robustness tests are performed to support the validity of the main analysis. For this purpose, shortcomings derived from the main analysis are addressed and analyzed.

5.1 Firm Fixed Effects

The main analysis revealed that the ESG performance of a company has a negative relationship with its cost of debt. In particular, being a top governance performer results in favorable market treatment, whereas environmental performance is only rewarded to a certain extent with lower issue spreads. Further, during the COVID-19 crisis, social performance is brought into prominence. However, the findings may be biased by unobservable firm-specific factors that drive the impact of ESG activities on the cost of debt. To ensure robust results, the regressions of the main analysis are conducted again with the inclusion of firm fixed effects to control for time-invariant effects within firms that could influence firm risk, i.e., the diversification of operations, country of operations, and the management (Sassen et al., 2016). Tables 12 to 17 in Appendix A report the regression outcomes.

The full sample analysis concerning the influence of ESG performance on the cost of debt indicates that the negative and non-linear relationship between the governance performance across the quartile distribution persists after controlling for unobservable firm-specific effects. Although the effect is weakened for top quartiles, above-average performers receive favorable market treatment. Compared to the main analysis, the stand-alone coefficient of the environmental pillar shows a negative and significant relationship with the cost of debt, although the effect fails to hold when examining the quartile dummies. The same is true for above-average social performers, whose coefficients show a negative relationship with the cost of debt, which does not hold across quartiles. The influence of the ESG overall score shows the predicted sign but is insignificant compared to the findings of the main analysis. Nevertheless, the results must be evaluated cautiously since, compared to the results from section 4.3.1, the within estimator sensitive R squared drops between 7.8% and 10.2% across the models, indicating that the introduction of firm fixed effects negatively affects the models' explanatory power.

After dividing the sample into high and low ESG risk exposure industries, the findings of the main analysis hold that no robust support can be found that ESG performance has a more significant impact on the cost of debt for high-risk firms. Furthermore, collinearity issues are present within the high-risk sample with respect to the region variables when introducing firm fixed effects.

When analyzing the impact of ESG on the cost of debt in times of economic stability, the coefficients regarding the ESG overall score are no longer significant, even though the coefficients possess the predicted sign. About the findings of the inverse u-shaped relationship between environmental performance and cost of debt, the same effect could not be demonstrated after the introduction of firm fixed effects. Instead, the stand-alone coefficient of environmental performance is negative and significant at the 10% level, which supports the finding, that an influence of environmental performance on the cost of debt exists. The negative relationship between top governance performers and the cost of debt holds even after introducing firm fixed effects. Compared to the results from section 4.3.3, the explanatory power of the models, measured by the within R squared, drops between 10.9% and 13.5% when including firm fixed effects, indicating that the introduction of the additional within estimator does not improve the statistical power across the models.

Regarding the COVID sample, collinearity issues arise within the region variables, similar to the high-risk sample. One reason for this could be that the sample size is insufficient to introduce an additional within-estimator. Thus, it appears that the use of firm fixed effects may not be appropriate for the underlying sample.

Concerning the analysis of the influence of ESG on financial performance, the findings of the main analysis hold, after the introduction of firm fixed effects, that environmental performance strengthens the financial bottom line, while social performance shows a contrary effect. With regard to the safe zone classification, the introduction of firm fixed effects shows that top environmental performers reduce the probability of being classified in the safe zone. Thus, while environmental performance strengthens the financial bottom line, it has a negative impact on firms being classified in the safe zone. Sharman's and Fernando's (2008) findings may apply here, that environmentally responsible firms take advantage of the additional slack they have gained and increase their debt levels to exploit benefits resulting from the leverage effect. Since the derivation of the Altman Z-score incorporates, among other measures, the ratio of the market value of equity over total liabilities, this could potentially explain the observation. In addition, governance performance is found to positively impact the probability of being classified within the safe zone, which is in line with the findings of the main analysis that top governance performers also experience lower issue spreads. However, with regard to the validity and explanatory power of the models, drops in the within R squared of up to 20.3% compared to the results from section 4.3.5 can be observed, indicating that the results must be interpreted with caution.

To conclude, the findings hold to a certain extent after introducing firm fixed effects, whereby great shifts in the significance and explanatory power of the models can be observed. Concerning the influence of the ESG overall score on the issue spread, no significant influences were found within specific firms, industries, and time, indicating that the findings of the main analysis did not apply to all firms and were driven by cross-sectional differences within the units. However, the results should be evaluated with caution, as the explanatory power measured by the within R squared of the models dropped by up to 20.3% across the regressions compared to the main analyses results. This could indicate that the main findings hold within industry and time, while at firm-level, unobservable variables additionally affect the relationship between ESG performance and issue spread.

5.2 ESG and Stable Economy

The analysis findings on the relationship between ESG and the cost of debt in times of economic stability revealed that the impact of corporate socially responsible activities is less pronounced compared to the full and the COVID sample analysis. However, as the observation period for the stable economy subsample considers bonds issued between 2014 and 2019, adverse cross-year effects of ESG on the cost of debt may have biased the findings. In addition, literature findings seem to suggest that the impact of ESG on firm risk has increased over time. For example, Berkan, Leonardo, and Stefano (2021) show that the market's punishment for corporate social irresponsibility has increased from 2007 to 2018. The findings of Bauer and Hann (2010), who observed a stronger correlation between environmental performance and the cost of debt over a period of ten years, also support the notion. For robustness purposes, annual subsamples are formed for the years 2014 to 2019, for which the ESG overall score is regressed on the issue spreads. The results are reported in Table 18 in Appendix A.

In line with the findings of Bauer and Hann (2010), the analysis demonstrates an increasingly negative relationship between ESG and the cost of debt from year to year. The ESG coefficients possess the predicted sign in all years, whereas only the years 2015, 2016, 2017, and 2019 show a statistically significant and steadily increasing negative correlation. Within the 2017 subsample, the magnitude of the coefficient exceeds the magnitude of the coefficients of the full sample findings and aligns with the findings of the COVID-19 analysis. In the 2019 subsample, the ESG coefficient exhibits the most significant negative relationship with the cost of debt, with a decrease in issue spread of 10.27% per increase in rating class, surpassing previous findings.

To briefly conclude, the robustness test indicates that the findings of the stable economy analysis are subject to a downward bias, which is attributable to the steadily increasing relevance of ESG over time.

5.3 Truncation Bias and COVID-19

The analysis of the relationship between ESG performance and the cost of debt during the COVID-19 crisis revealed strong support for hypothesis 4 that high ESG performance acts as a cushion for companies in times of crisis. These results were valid for both bond issues during the shock quarters and the post-crisis period and were primarily driven by the social performance of the issuers.

As part of the sample selection and data preparation process, the raw sample's non-logarithmized and non-factorized financial data were trimmed after screening them for outliers. The rationale behind this approach was that financial variables have the potential to be subject to noise due to managerial short-term goals and myopia (Merchant, 1990). However, since it is likely that the outliers occurred during the economic shock induced by COVID-19, it is reasonable that observations within the COVID-19 period were affected. The ex-post trimming of outliers could thus have led to a downward truncation bias of the findings (Teoh & Zhang, 2011). For this reason, the analysis of the COVID subsample is performed again by adding truncated observations to the subsample. The results are presented in Table 19 in Appendix A.

In total, the subsample increased by 166 bonds issued during the COVID-19 crisis. Overall, the results of the main analysis hold. In line with the notion, the results show larger coefficients. This is true for the ESG measures, shock variables, as well as for the treatment variables. This implies that the main analysis results were most likely understated and that ESG, respectively the social performance, appears to have an even greater impact on the cost of debt of firms in times of crisis.

5.4 Lagged ESG Performance

Since the analysis relies on the most recent quarterly ESG performance measures within the issue quarter, the conclusions may be biased due to timing discrepancies between the preliminary underwriting processes and pricing decisions. In addition, companies could use obtained funds to invest in their ESG management in order to secure their favorable access to debt, leading to possible bias in the coefficients of the main analysis. Thus, the ESG performance from previous periods might be decisive for the initial bond pricing. For this reason, the cost of debt models are performed with lagged ESG variables by one quarter to test whether endogeneity issues are present. The regression results are reported in Tables 20 to 23 in Appendix A.

Regarding the analysis of the models with the one-quarter lagged ESG variables, the relationships of the findings from the main analysis hold. Only for the high-risk industry subsample, the substantial effect of social performance across the quartiles could not be demonstrated, which is most likely attributable to sample size issues. However, in most of the cases, the coefficients of interest show marginally reduced relationships to the issue spread

compared to the main analysis. Thus, the finding suggests that obtained funds might also be invested in ESG projects in order to secure access to low-cost debt for the future. This supports the notion that the ESG coefficients of the main analysis may be biased to exaggerate the strength of the relationship between ESG and the cost of debt.

To conclude, the findings from the main analysis hold when controlling for the ESG performance one quarter before bond issuance. Moreover, the main analysis results may be biased by endogeneity issues in terms of the strength of the observed relationships, as companies potentially use their favorable obtained funds to invest in ESG activities and subsequently improve their ESG scores.

6. Conclusion

This work investigates the relationship between a company's ESG performance and its cost of debt and default risk in the United States and Europe, as well as the impact of the COVID-19 pandemic on this relationship by exploring corporate bond issue spreads. The main problem the paper addresses is that in times of uncertainty, risk-mitigating activities of companies, such as ESG management, may have an impact on the cost of debt of companies, giving them a competitive advantage on the market.

6.1 Findings, Contributions, and Implications

This paper argues that a company's ESG performance negatively relates to its cost of debt due to its risk mitigating characteristics and that it acts as a cushion for companies in need of debt capital, especially in times of crisis. To answer the research questions whether ESG has an impact on the cost of debt, especially in times of COVID-19, how this relationship differs across industries and in times of economic stability and whether high ESG firms also face lower distress risk, MSCI ESG ratings and corporate bond issue spreads were analyzed.

The main analysis findings document a negative and significant relationship between a company's ESG performance and its cost of debt. In times of economic stability, this relationship follows a linear and negative course. The effect is mainly driven by top governance performers, whereas environmental performance is only rewarded to a certain extent with

lower cost of debt, indicating a pronounced inverted u-shaped relationship between environmental performance and the cost of debt. For bonds issued during the COVID-19 crisis, a significant ESG premium was found. During the shock quarters, when uncertainty was highest, high ESG firms were also able to issue bonds at a lower cost of debt, although the marginal effect proved to be less pronounced than in post-shock quarters. The analysis revealed that social firms particularly exhibited lower issue spreads during the COVID-19 crisis. In addition, it was shown that environmental performance bears the potential to negatively influence distress risk, whereas social activities increase the probability of falling into financial distress. No such relationship was found for governance performance. Considering the strong efficient market hypothesis and the joint hypothesis problem, it is likely that the observed findings derived from the credit risk analysis result from the fact that ESG is capable of reducing credit risk through channels other than lower distress risk or better financial performance.

The analyses findings show strong support for the hypothesis that ESG performance negatively affects a firm's cost of debt. The performed robustness tests confirmed that the main analysis findings hold. In addition, it was shown that the relationship between ESG and the cost of corporate debt has intensified significantly over the observation period. Furthermore, the robustness tests revealed that the findings of the main analysis regarding the influence of ESG during the COVID-19 period appeared to be understated. After introducing lagged ESG variables into the models, the findings indicate that obtained funds were also used to invest in ESG activities. The introduction of firm fixed effects, on the other hand, showed mixed results. However, the inclusion of the additional within-estimator introduced collinearity problems to the models, affecting the explanatory power measured by the within R squared to up to 20.3%.

This paper contributes to the literature in many ways and provides important implications for managers, creditors, and investors regarding sustainability management and its associated benefits. First, this paper contributes to the fast-growing literature concerning the relationship between ESG and the cost of debt in times of the COVID-19 crisis. Second, the findings reveal insights into differences between this relationship during periods of economic stability and across industries. Third, the paper provides important insights into the drivers of the relationship between ESG and the cost of debt by conducting a pillar-level analysis. Finally, the study confirms that ESG is capable of reducing credit risk through channels other than lower distress risk or improved financial performance. The study results provide managers and

creditors with a guideline to improve credit risk management and form strategies for future sustainability management. Likewise, the study's implications are of particular relevance for portfolio managers and individual investors to minimize downside risks within their portfolios in times of crisis and provide guidance for future investment decisions.

6.2 Limitations

Although this work adds valuable information to the current state of research, some limitations must be pointed out.

First, the findings are limited to ESG measures from MSCI. Since other data providers make use of different ESG rating methodologies, the findings may not be applicable to other databases. *Second*, the MSCI ESG methodology only allows for a pillar-level analysis, as different key themes and sub-issues are used to measure ESG performance depending on the industry. Thus, it could not be determined which micro factor mostly influences the relationship between ESG performance and the cost of debt. *Third*, the analysis refers to bonds issued by companies listed in the S&P 500 and Stoxx Europe 600. As those companies are considered to be among the largest and economically most relevant in the world, it is likely that greater media attention and scrutiny from investors and analysts can be expected for irresponsible corporate behavior. Thus, size bias could affect the reliability of the analysis (Akgun et al., 2021). *Fourth*, the analysis only includes companies from developed economies that are considered as early adopters of ESG regulations and thus per se show higher ESG performance (Ferriani, 2022). *Fifth*, within the EU, individual member states are responsible for further developing and enforcing ESG regulations so that country-level differences may have influenced the results. *Sixth*, the distribution of observations across industries and regions is not homogeneous. For example, the manufacturing, information, and utility industries account for almost three-quarters of the total sample. With regard to the regions, with 92% of the observations in the United States, a bias is also apparent. *Finally*, unobservable or missing variables might bias the findings, which would improve the models.

6.3 Further Research Directions

To refine and extend the managerial implications and contribute to the generalization of the present findings, additional research of interest became evident during the investigations of this research study.

First, the observation of insignificant and inverted u-shaped relationships may indicate that ESG firms use additional financial slack efficiently and increase their debt levels, leading to unchanged credit risk. Sharfman's and Fernando's (2008) research could provide a guideline for future research by analyzing not only the access to low-cost debt capital, but also the consequences of ESG activities on the capital structure. *Second*, future research on the operational benefits of ESG, especially in the context of COVID-19, could provide insights into its relationship with the volatility of the sales and customers' loyalty toward high ESG firms. *Third*, the inclusion of alternative ESG proxies could provide further insights into the relationship of corporate socially responsible activities to confirm the robustness of the findings. *Fourth*, the scope of the study can be extended to companies from emerging markets to provide a global picture of the impact of ESG on the cost of debt. *Fifth*, since the MSCI ESG methodology incorporates specific key issues for each sector to measure ESG performance, MSCI's sustainability proxies provide opportunities for detailed sector-specific analyses. *Finally*, studies on small and family-owned companies could provide insights into whether ESG management is only an issue for companies under the spotlight of the global economy.

References

Acharya, V. V., Davydenko, S. A., Strebulaev, I. A., & National Bureau of Economic Research. (2011). *Cash holdings and credit risk* (Ser. Nber working paper series, no. 16995). National Bureau of Economic Research. Retrieved 2022, from https://www-nber-org.mu.idm.oclc.org/system/files/working_papers/w16995/w16995.pdf.

Acharya, V. V., Steffen, S., & National Bureau of Economic Research. (2020). *The risk of being a fallen angel and the corporate dash for cash in the midst of covid* (Ser. Nber working paper series, no. 27601). National Bureau of Economic Research.

Akgun, O., Mudge, T. J., & Townsend, B.. (2021). *How company size bias in esg scores impacts the small cap investor.* Retrieved 2022, from https://www.bailard.com/wp-content/uploads/2021/06/Company-Size-Bias-in-ESG-Scores-Impacts-Small-Cap-JIESG-Bailard.pdf

Albuquerque, R., Koskinen, Y., Yang, S., & Zhang, C. (2020). Resiliency of environmental and social stocks: an analysis of the exogenous covid-19 market crash. *Review of Corporate Finance Studies, 9*(3), 593–621. https://doi.org/10.1093/rcfs/cfaa011

Almaghrabi, K. S. (2021). Covid-19 and the cost of bond debt: the role of corporate diversification. *Finance Research Letters*. https://doi.org/10.1016/j.frl.2021.102454

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of Finance*, *23*(4), 589–609

Amiraslani, H., Lins, K. V., Servaes, H., & Tamayo, A. (2017). A matter of trust? the bond market benefits of corporate social capital during the financial crisis. *Ssrn Electronic Journal*, *(2017)*. https://doi.org/10.2139/ssrn.2978794

Augustin, P., Izhakian, Y., & Van Nieuwerburgh, S. (2020). Ambiguity, volatility, and credit risk. *The Review of Financial Studies*, *33*(4), 1618–1672. https://doi.org/10.1093/rfs/hhz082

Bauer, R., & Hann, D. (2010). Corporate environmental management and credit risk. *Ssrn Electronic Journal*, *(2010)*. https://doi.org/10.2139/ssrn.1660470

Barth, F., Hübel, B., & Scholz, H. (2022). Esg and corporate credit spreads. *Journal of Risk Finance (Emerald Group Publishing Limited)*, *23*(2).

Becker, G. S. (1971). *The economics of discrimination* (2nd ed., Ser. Economics research studies). University of Chicago Press.

Berkan, A., Leonardo, B., & Stefano, M. (2021). Media coverage, corporate social irresponsibility conduct, and financial analysts' performance. *Corporate Social Responsibility and Environmental Management*, *28*(5), 1456–1470. https://doi.org/10.1002/csr.2176

Blackrock. (2020). 2020 *global sustainable investing survey*. Retrieved from https://www.blackrock.com/corporate/literature/publication/blackrock-sustainability-survey.pdf

Bouslah, K., Kryzanowski, L., & M'Zali, B. (2013). The impact of the dimensions of social performance on firm risk. *Journal of Banking and Finance*, *37*(4), 1258–1273. https://doi.org/10.1016/j.jbankfin.2012.12.004

Boulatoff, C., & Boyer, C. M. (2009). Green recovery: how are environmental stocks doing? *The Journal of Wealth Management*, *12*(2), 9–20. https://doi.org/10.3905/jwm.2009.12.2.009

Brogi, M., Lagasio, V., & Porretta, P. (2022). Be good to be wise: environmental, social, and governance awareness as a potential credit risk mitigation factor. *Journal of International Financial Management & Accounting*, *(20220118)*. https://doi.org/10.1111/jifm.12156

Brown, L. D., & Caylor, M. L. (2009). Corporate governance and firm operating performance. *Review of Quantitative Finance and Accounting*, *32*(2), 129–144.

Carletti, E., Oliviero, T., Pagano, M., Pelizzon, L., & Subrahmanyam, M. G. (2020). The covid-19 shock and equity shortfall: firm-level evidence from italy. *The Review of Corporate Finance Studies*, *9*(3), 534–568. https://doi.org/10.1093/rcfs/cfaa014

Cassano, R. (2019). Corporate global responsibility and reputation risk management, *Symphonya: Emerging Issues in Management*, *1*(1). , 129–142. https://doi.org/10.4468/2019.1.10cassano

Claar, G. E. (1992). The case for a bankruptcy code priority for environmental cleanup claims. *William Mitchell Law Review*, *18*(1), 3–3. Retrieved April 11, 2022, from https://open.mitchellhamline.edu/cgi/viewcontent.cgi?article=2263&context=wmlr.

Claessens, S. (2006). Corporate governance and development. *The World Bank Research Observer*, *21*(1), 91–122.

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

Comprehensive Environmental Response, Compensation and Liability, Title 42 U.S.C § 9612. (2011). Retrieved 2022, from https://www.govinfo.gov/content/pkg/USCODE-2011-title42/html/USCODE-2011-title42-chap103.htm

DeBoskey, D. G., Li, Y., Lobo, G. J., & Luo, Y. (2021). Corporate political transparency and the cost of debt. *Review of Quantitative Finance and Accounting*, *57*(1), 111–145. https://doi.org/10.1007/s11156-020-00941-6

Dhaliwal, D., Hogan, C., Trezevant, R., & Wilkins, M. (2011). Internal control disclosures, monitoring, and the cost of debt. *The Accounting Review*, *86*(4), 1131–1156.

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

Eliwa, Y., Aboud, A., & Saleh, A. (2021). Esg practices and the cost of debt: evidence from eu countries. *Critical Perspectives on Accounting*, *79*. https://doi.org/10.1016/j.cpa.2019.102097

Ellul, A., Erel, I., & Rajan, U. (2020). The covid-19 pandemic crisis and corporate finance. *The Review of Corporate Finance Studies*, *9*(3), 421–429. https://doi.org/10.1093/rcfs/cfaa016

Erragragui, E. (2018). Do creditors price firms' environmental, social and governance risks? *Research in International Business and Finance*, *45*, 197–207. https://doi.org/10.1016/j.ribaf.2017.07.151

European Central Bank. (2021). Update on economic and monetary developments. *Economic Bulletin Issue 1, 2021*. Retrieved from https://www.ecb.europa.eu/pub/pdf/ecbu/eb202101.en.pdf

European Parliament. (2004). Directive 2004/35/CE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02004L0035-20190626&qid=1568193390794&from=EN

Falato, A., Goldstein, I., Hortaçsu A., & National Bureau of Economic Research. (2020). *Financial fragility in the covid-19 crisis : the case of investment funds in corporate bond markets* (Ser. Nber working paper series, no. w27559). National Bureau of Economic Research. Retrieved 2022, from https://www-nber-org.mu.idm.oclc.org/system/files/working_papers/w27559/w27559.pdf.

Fama, E. F. (1991). Efficient capital markets: ii. *The Journal of Finance*, *46*(5), 1575–1617.

Ferriani, F. (2022). Issuing bonds during the covid-19 pandemic: is there an esg premium? *Ssrn Electronic Journal*, *(2022)*. https://doi.org/10.2139/ssrn.4042802

Financial Stability Board (FSB). (2021). *Lessons learnt from the covid-19 pandemic from a financial stability perspective*. Retrieved from https://www.fsb.org/wp-content/uploads/P130721.pdf

Gao, H., He, J., & Li, Y. (2022). Media spotlight, corporate sustainability and the cost of debt. *Applied Economics*, *1-17*, 1–17. https://doi.org/10.1080/00036846.2021.2020710

García-Herrero A., & Ribakova, E. (2020). Covid-19's reality shock for emerging economies: solutions to deal with dependence on external funding. *SSRN*. Retrieved 2022, from https://ssrn.com/abstract=3644761.

Gerard, B. (2018). Esg and socially responsible investment: a critical review. *Ssrn Electronic Journal*, *(2018)*. https://doi.org/10.2139/ssrn.3309650

Gerwanski, J. (2020). Does it pay off? integrated reporting and cost of debt: european evidence. *Corporate Social Responsibility and Environmental Management*, *27*(5), 2299–2319. https://doi.org/10.1002/csr.1965

Ghouma, H., Ben-Nasr, H., & Yan, R. (2018). Corporate governance and cost of debt financing: empirical evidence from canada. *Quarterly Review of Economics and Finance*, *67*, 138–148. https://doi.org/10.1016/j.qref.2017.06.004

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

Goss, A., & Roberts, G. S. (2011). The impact of corporate social responsibility on the cost of bank loans. *Journal of Banking and Finance*, *35*(7), 1794–1810. https://doi.org/10.1016/j.jbankfin.2010.12.002

Gourinchas, P.-O., Kalemli-Özcan Şebnem, Penciakova, V., & Sander, N. (2021). Covid-19 and small- and medium-sized enterprises: a 2021 “time bomb”? *Aea Papers and Proceedings*, *111*, 282–286. https://doi.org/10.1257/pandp.20211109

Graham, A., & Maher, J. J. (2006). Environmental liabilities, bond ratings, and bond yields. *Environmental Accounting : Commitment and Propaganda*, *3*, 111–142. https://doi.org/10.1016/S1479-3598(06)03004-4

Griffin, J. M., & Lemmon, M. L. (2002). Book-to-market equity, distress risk, and stock returns. *The Journal of Finance*, *57*(5), 2317–2336.

Grove, H., Patelli, L., Victoravich, L. M., & Xu, P. (T. (2011). Corporate governance and performance in the wake of the financial crisis: evidence from us commercial banks. *Corporate Governance: An International Review*, *19*(5), 418–436. https://doi.org/10.1111/j.1467-8683.2011.00882.x

Halling, M., Yu, J., & Zechner, J. (2020). How did covid-19 affect firms' access to public capital markets?*. *The Review of Corporate Finance Studies*, *9*(3), 501–533. https://doi.org/10.1093/rcfs/cfaa008

Hoepner, A., 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*, *43*(1-2), 158–190. https://doi.org/10.1111/jbfa.12183

HSBC. (2020). *Sustainable financing and investing survey 2020*. Retrieved from https://www.sustainablefinance.hsbc.com/-/media/gbm/sustainable/attachments/sustainable-financing-and-investment-survey-2020.pdf

International Organization for Standardization (ISO). (2015). *Environmental management systems – requirements with guidance for use (ISO 14001:2015)*. Retrieved from https://www.iso.org/obp/ui/#iso:std:iso:14001:ed-3:v1:en

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, *3*(4), 305–360. https://doi.org/10.1016/0304-405X(76)90026-X

Jo, H., & Na, H. (2012). Does csr reduce firm risk? evidence from controversial industry sectors. *Journal of Business Ethics*, *110*(4), 441–456.

Jung, J., Herbohn, K., & Clarkson, P. (2018). Carbon risk, carbon risk awareness and the cost of debt financing. *Journal of Business Ethics, 150*(4), 1151–1171. https://doi.org/10.1007/s10551-016-3207-6

Keliuotytė-Staniulėnienė Greta, & Daunaravičiūtė Kamilė. (2021). The global green bond market in the face of the covid-19 pandemic. *Financial Markets, Institutions and Risks, 5*(1), 50–60. https://doi.org/10.21272/fmir.5(1).50-60.2021

Kargar, M., Lester, B., Lindsay, D., Liu, S., Weill, P.-O., Zúñiga Diego, & National Bureau of Economic Research. (2020). *Corporate bond liquidity during the covid-19 crisis* (Ser. Nber working paper series, no. 27355). National Bureau of Economic Research. Retrieved 2022, from https://www-nber-org.mu.idm.oclc.org/system/files/working_papers/w27355/w27355. pdf.

Krüger, P. (2015). Corporate goodness and shareholder wealth. *Journal of Financial Economics, 115*(2), 304–329. https://doi.org/10.1016/j.jfineco.2014.09.008

Koh, P., Qian, C. & Wang, H. (2014). Firm litigation risk and the insurance value of corporate social performance. *Strategic Management Journal*, *35*(10), 1464–1482.

La Rosa, F., Liberatore, G., Mazzi, F., & Terzani, S. (2018). The impact of corporate social performance on the cost of debt and access to debt financing for listed european non-financial firms. *European Management Journal*, *36*(4), 519–529. https://doi.org/10.1016/j.emj.2017.09.007

Lins, K. V., Servaes, H., & Tamayo, A. (2019). Social capital, trust, and corporate performance: how csr helped companies during the financial crisis (and why it can keep helping them). *Journal of Applied Corporate Finance*, *31*(2), 59–71. https://doi.org/10.1111/jacf.12347

Liu, Y., Qiu, B., & Wang, T. (2021). Debt rollover risk, credit default swap spread and stock returns: evidence from the covid-19 crisis. *Journal of Financial Stability*, *53*. https://doi.org/10.1016/j.jfs.2021.100855

Lorca, C., Sánchez-Ballesta Juan Pedro, & García-Meca Emma. (2011). Board effectiveness and cost of debt. *Journal of Business Ethics*, *100*(4), 613–631.

Maaloul, A., Zéghal, D., Ben Amar, W., & Mansour, S. (2021). The effect of environmental, social, and governance (esg) performance and disclosure on cost of debt: the mediating effect of corporate reputation. *Corporate Reputation Review*, *(20211202)*. https://doi.org/10.1057/s41299-021-00130-8

Magnanelli, B. S., & Izzo, M. F. (2017). Corporate social performance and cost of debt: the relationship. *Social Responsibility Journal*, *13*(2), 250–265. https://doi.org/10.1108/SRJ-06-2016-0103

Malkiel, B. G. (2003). The efficient market hypothesis and its critics. *Journal of Economic Perspectives*, *17*(1), 59–82. https://doi.org/10.1257/089533003321164958

Mazutis, D. D., & Slawinski, N. (2015). Reconnecting business and society: perceptions of authenticity in corporate social responsibility. *Journal of Business Ethics*, *131*(1), 137–150. https://doi.org/10.1007/s10551-014-2253-1

Meier, J.-M. A., & Smith, J. (2020). The covid-19 bailouts. *Ssrn Electronic Journal*, (2020). https://doi.org/10.2139/ssrn.3585515

Merchant, K. A. (1990). The effects of financial controls on data manipulation and management myopia. *Accounting, Organizations and Society*, *15*(4), 297–313. https://doi.org/10.1016/0361-3682(90)90021-L

Miles, M. P., & Covin, J. G. (2000). Environmental marketing: a source of reputational, competitive, and financial advantage. *Journal of Business Ethics*, *23*(3), 299–311.

MSCI. (2020a). *MSCI esg ratings.* Retrieved from https://www.msci.com/documents/1296102/21901542/MSCI+ESG+Ratings+Brochure-cbr-en.pdf

MSCI. (2020b). *MSCI esg ratings methodology.* Retrieved from https://www.msci.com/documents/1296102/21901542/MSCI+ESG+Ratings+Methodology+-+Exec+Summary+Nov+2020.pdf

MSCI. (2022). *ESG ratings key issue framework.* Retrieved from https://www.msci.com/our-solutions/esg-investing/esg-ratings/esg-ratings-key-issue-framework

Nason, R. S., & Patel, P. C. (2016). Is cash king? market performance and cash during a recession. *Journal of Business Research*, *69*(10), 4242–4248. https://doi.org/10.1016/j.jbusres.2016.03.001

Oh, H., Bae, J., & Kim, S.-J. (2017). Can sinful firms benefit from advertising their csr efforts? adverse effect of advertising sinful firms' csr engagements on firm performance. *Journal of Business Ethics*, *143*(4), 643–663. https://doi.org/10.1007/s10551-016-3072-3

Phelps, E. S. (1972). The statistical theory of racism and sexism. *The American Economic Review*, *62*(4), 659–661.

Piot, C. (2001). Agency costs and audit quality: evidence from france. *European Accounting Review*, *10*(3), 461–499

Polbennikov, S., Maitra, A., Desclee, A., & Dynkin, L. (2016). Esg ratings and performance of corporate bonds. *Journal of Fixed Income*, *26*(1), 21–41. https://doi.org/10.3905/jfi.2016.26.1.021

Rani, N., Yadav, S. S., & Jain, P. K. (2014). Impact of corporate governance score on abnormal returns and financial performance of mergers and acquisitions. *Decision: Official Journal of Indian Institute of Management Calcutta*, *41*(4), 371–398. https://doi.org/10.1007/s40622-014-0067-8

Reichling, P., & Zbandut, A. (2019). Costs of capital under credit risk. *The Journal of Credit Risk, 15*(4), 1–28. https://doi.org/10.21314/JCR.2019.254

Riedl, A., & Smeets, P. (2017). Why do investors hold socially responsible mutual funds? *Journal of Finance*, 72(6), 2505–2550.

Rossi, M., Nerino, M., & Capasso, A. (2015). Corporate governance and financial performance of italian listed firms. the results of an empirical research. *Corporate Ownership and Control*, *12*(2), 628–643. https://doi.org/10.22495/cocv12i2c6p6

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

Sengupta, P. (1998). Corporate disclosure quality and the cost of debt. *The Accounting Review*, *73*(4), 459–474.

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

Shuto, A., & Kitagawa, N. (2011). The effect of managerial ownership on the cost of debt: evidence from japan. *Journal of Accounting, Auditing and Finance*, *26*(3), 590–620. https://doi.org/10.1177/0148558X11401553

Sprinkle, G. B., & Maines, L. A. (2010). The benefits and costs of corporate social responsibility. *Business Horizons*, *53*(5), 445–453. https://doi.org/10.1016/j.bushor.2010.05.006

Stefansky, W. (1972). Rejecting outliers in factorial designs. *Technometrics*, *14*(2), 469–479.

Teoh, S. H., & Zhang, Y. (2011). Data truncation bias, loss firms, and accounting anomalies. *The Accounting Review*, *86*(4), 1445–1475.

Trumpp, C., Endrikat, J., Zopf, C., & Guenther, E. (2015). Definition, conceptualization, and measurement of corporate environmental performance: a critical examination of a multidimensional construct. *Journal of Business Ethics, 126*(2), 185–204.

United States Environmental Protection Agency (EPA). (2022). *Comprehensive environmental response, compensation and liability act (cercla) and federal facilities.* Retrieved 2022, from https://www.epa.gov/enforcement/comprehensive-environmental-response-compensation-and-liability-act-cercla-and-federal

Whitehead, C. K. (2009). The evolution of debt: covenants, the credit market, and corporate governance. *Journal of Corporation Law*, *34*(3).

Wood, D. J. (1991). Corporate social performance revisited. *The Academy of Management Review*, *16*(4), 691–718.

Wood, D. J. (2010). Measuring corporate social performance: a review. *International Journal of Management Reviews*, *12*(1), 50–84. https://doi.org/10.1111/j.1468-2370.2009.00274.x

Yang, Y., Du, Z., Zhang, Z., Tong, G., & Zhou, R. (2021). Does ESG disclosure affect corporate-bond credit spreads? evidence from china. *Sustainability*, *13*(15), 8500–8500. https://doi.org/10.3390/su13158500

Appendix

Appendix A – Tables

Table 1

This table lists all variables used in the paper, their abbreviations, definition and predicted correlation with the cost of debt.

Variable	Abbreviation	Definition	+/-
Bond Level Data			
Ln(Issue Spread)	lnIntIssueSpread	Natural logarithm of the yield to maturity of the corporate bond as of issuance and the corresponding government bond yield using linear interpolation	/
Ln(Issue Amount)	lnIssueAmount	Natural logarithm of the issued amount	+
Issue Years to Maturity	IssueYearsToMaturity	Years to maturity as of issuance	+
Ln(Spread)	lnIntSpread	Natural logarithm of the yield to maturity of the corporate bond and the corresponding government bond yield using linear interpolation	/
Ln(Amount Outstanding)	lnAmountOut	Natural logarithm of the amount outstanding	+
Years to Maturity	YearsToMaturity	Years to maturity at a given quarter	+
Callable	Call_Flag	Binary variable equal to 1 when bond carries embedded call option	+
Putable	Put_Flag	Binary variable equal to 1 when bond carries embedded put option	-
ESG Data			
ESG Rating	ESGOverall	MSCI ESG overall rating	-
ESG Rating Above Mean	ESGOverallMn	Binary variable equal to 1 when firm is a above mean ESG performer	-
ESG Rating Above Median	ESGOverallMed	Binary variable equal to 1 when firm is a above median ESG performer	-
ESG Rating Quartile 2	ESGOverallQ2	Firms that belong to the second quartile of the ESG distribution	-

ESG Rating Quartile 3	ESGOverallQ3	Firms that belong to the third quartile of the ESG distribution	-
ESG Rating Quartile 4	ESGOverallQ4	Firms that belong to the fourth quartile of the ESG distribution	-
Environmental Performance	E	MSCI environmental performance measure	-
Environmental Performance Quartile 2	EQ2	Firms that belong to the second quartile of the environmental performance distribution	-
Environmental Performance Quartile 3	EQ3	Firms that belong to the third quartile of the environmental performance distribution	-
Environmental Performance Quartile 4	EQ4	Firms that belong to the fourth quartile of the environmental performance distribution	-
Social Performance	S	MSCI governance performance measure	-
Social Performance Quartile 2	SQ2	Firms that belong to the second quartile of the social performance distribution	-
Social Performance Quartile 3	SQ3	Firms that belong to the third quartile of the social performance distribution	-
Social Performance Quartile 4	SQ4	Firms that belong to the fourth quartile of the social performance distribution	-
Governance Performance	G	MSCI governance performance measure	-
Governance Performance Quartile 2	GQ2	Firms that belong to the second quartile of the governance performance distribution	-
Governance Performance Quartile 3	GQ3	Firms that belong to the third quartile of the governance performance distribution	-
Governance Performance Quartile 4	GQ4	Firms that belong to the fourth quartile of the governance performance distribution	-
Firm Level Data			
Safe Zone	SafeZone	Firms with Altman Z-Scores >=3	-
Gray Zone	GrayZone	Firms with Altman Z-Scores <3; >=1.8	+/-

Distress Zone	DistressZone	Firms with Altman Z-Scores <1.8	+
Tobin's Q	TobinsQ	(Total Assets - (Total Assets – Total Liabilities) + Marketcap) / Total Assets	-
Volatility	Volatility	5 year price volatility, adjusted for spin offs and splits	+
Leverage	Leverage	Total Liabilities / Total Assets	+
Interest Coverage	InterestCoverage	EBITDA / Interest Expenses	-
Loss	Loss	Binary variable equal to 1 when firm has negative net income	+
ROA	ROA	Net Income / Total Assets	-
Size	Size	Natural logarithm of total assets	-
WC Ratio	WC	Working Capital / Total Assets	-
Europe	Europe	Binary variable equal to 1 when firm is located in Europe	+/-
Shock Q1 2020	Shock1	Binary variable equal to 1 for the first quarter of 2020	+
Shock Q1-Q2 2020	Shock2	Binary variable equal to 1 for the first and second quarter of 2020	+
Shock Q1-Q3 2020	Shock3	Binary variable equal to 1 for the first, second and third quarter of 2020	+

Table 2

This table provides the results of the correlation matrix. The variables are reported as follows: (1) ln(Issue Spread) (2) ESGOverall (3) ln(Issue Amount) (4) Issue Years to Maturity (5) Call Flag (6) Safe Zone (7) Gray Zone (8) Distress Zone (9) Tobins' Q (10) Volatility (11) Leverage (12) Interest Coverage (13) Loss (14) ROA (15) Size (16) WC Ratio (17) Europe (18) US. Coefficients greater than 0.7 and less than 0.7 are highlighted.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(1)	1.00																	
(2)	-0.23	1.00																
(3)	-0.11	-0.01	1.00															
(4)	0.28	0.01	-0.01	1.00														
(5)	-0.03	-0.12	0.21	0.12	1.00													
(6)	-0.16	0.12	0.09	-0.03	0.01	1.00												
(7)	-0.12	0.05	0.12	-0.02	0.01	-0.24	1.00											
(8)	0.22	-0.13	-0.16	0.04	-0.02	-0.52	***-0.71***	1.00										
(9)	-0.15	0.14	0.06	-0.02	0.00	0.58	0.18	-0.58	1.00									
(10)	0.29	-0.04	-0.14	-0.18	-0.12	-0.09	-0.04	0.10	0.02	1.00								
(11)	0.12	-0.01	-0.03	0.03	0.07	-0.18	-0.14	0.25	0.22	0.07	1.00							
(12)	-0.28	0.10	0.11	-0.06	-0.08	0.46	0.13	-0.44	0.30	-0.12	-0.28	1.00						
(13)	0.12	0.02	-0.14	-0.10	-0.08	-0.16	-0.03	0.14	-0.13	0.35	0.01	-0.25	1.00					
(14)	-0.18	0.04	0.13	0.07	0.12	0.38	0.15	-0.40	0.45	-0.29	0.03	0.45	-0.64	1.00				
(15)	-0.22	-0.06	-0.04	0.17	-0.10	-0.17	-0.08	0.20	-0.28	-0.26	-0.13	0.10	-0.01	-0.04	1.00			
(16)	-0.01	0.05	0.12	-0.06	0.10	0.21	0.21	-0.34	0.23	0.21	-0.12	0.17	0.00	0.21	-0.22	1.00		
(17)	-0.01	0.20	0.07	-0.15	-0.29	0.01	-0.09	0.08	-0.13	0.18	-0.01	0.09	0.03	-0.08	-0.05	-0.03	1.00	
(18)	0.01	-0.20	-0.07	0.15	0.29	-0.01	0.09	-0.08	0.13	-0.18	0.01	-0.09	-0.03	0.08	0.05	0.03	***-1.00***	1.00

Table 3

This table provides the results of the VIF test. The tolerance and the VIF are reported.

Variable	Tolerance	VIF
ESG Overall Score	0.9059848	1.103771
Issue Years to Maturity	0.9145421	1.093443
Ln(Issue Amount)	0.8751989	1.142597
Call Flag	0.7981274	1.252933
Gray Zone	0.5739910	1.742187
Safe Zone	0.3248733	3.078123
Volatility	0.6774142	1.476202
Leverage	0.6245538	1.601143
Interest Coverage	0.5822930	1.717349
Loss	0.5220390	1.915566
ROA	0.3781674	2.644332
Size	0.7513279	1.330977
Working Capital Ratio	0.7618872	1.312530
Tobins´ Q	0.3458402	2.891509
Europe	0.7680940	1.301924

Table 7

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt, by dividing the sample into high and low ESG risk exposure industries. The sample contains 4214 bonds issued between January 1, 2014 and December 31, 2021 by 385 companies. The dependent variable is the natural logarithm of the yield to maturity of the corporate bond as of issuance and the corresponding government bond yield using linear interpolation. The main explanatory variable in column (1) and (2) is the ESG overall score, in (3) and (4) the environmental, social and governance scores, in (5) and (6) the breakdown into ESG overall score quartiles and in (7) and (8) the breakdown into environmental, social and governance score quartiles. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High Risk	*Low Risk*	*High Risk*	*Low Risk*	*High Risk*	*Low Risk*	*High Risk*	*Low Risk*
ESGOverall	-0.662	-0.531***						
	(0.908)	(0.088)						
E			-0.160	-0.002				
			(0.073)	(0.008)				
S			0.062	-0.024				
			(0.039)	(0.015)				
G			-0.048***	-0.019				
			(0.006)	(0.012)				
ESGOverallQ2					-0.0153	-0.043		
					(0.101)	(0.035)		
ESGOverallQ3					-0.117	-0.283***		
					(0.190)	(0.042)		
ESGOverallQ4					-0.089	-0.276***		
					(0.227)	(0.053)		
EQ2							-0.344	-0.090***
							(0.367)	(0.016)
EQ3							-0.410	-0.070
							(0.306)	(0.050)
EQ4							-0.250	0.031
							(0.474)	(0.068)
SQ2							0.117***	0.007
							(0.019)	(0.051)

SQ3							0.198	-0.121**
							(0.132)	(0.055)
SQ4							-0.127**	-0.080
							(0.035)	(0.053)
GQ2							0.374	-0.113***
							(0.245)	(0.021)
GQ3							-0.164	-0.083*
							(0.192)	(0.046)
GQ4							0.113	-0.130***
							(0.208)	(0.029)
lnIssueAmount	-0.028	-0.001	-0.030	0.001	-0.032*	0.001	-0.024	0.001
	(0.018)	(0.015)	(0.013)	(0.017)	(0.013)	(0.013)	(0.027)	(0.016)
IssueYearsToMaturity	0.034**	0.024***	0.035**	0.024***	0.034**	0.024***	0.033**	0.024***
	(0.008)	(0.004)	(0.007)	(0.004)	(0.007)	(0.004)	(0.008)	(0.004)
Call_Flag	0.247***	-0.192**	0.294**	-0.169**	0.327***	-0.210**	0.374***	-0.182**
	(0.030)	(0.080)	(0.081)	(0.070)	(0.048)	(0.080)	(0.028)	(0.077)
GrayZone	0.289	-0.121**	0.165	-0.149***	0.321	-0.127**	-0.160	-0.157***
	(0.195)	(0.045)	(0.249)	(0.048)	(0.207)	(0.044)	(0.320)	(0.048)
SafeZone	0.586*	-0.076	0.497	-0.094	0.662	-0.074	0.775	-0.097
	(0.242)	(0.058)	(0.399)	(0.063)	(0.471)	(0.063)	(0.430)	(0.072)
TobinsQ	-0.186	-0.110***	-0.189	-0.128***	-0.265	-0.116***	-0.335	-0.124***
	(0.144)	(0.013)	(0.124)	(0.012)	(0.117)	(0.013)	(0.170)	(0.013)
Volatility	0.100*	0.058***	0.102	0.060***	0.113*	0.058***	0.015**	0.059***
	(0.034)	(0.009)	(0.046)	(0.010)	(0.037)	(0.009)	(0.004)	(0.011)
Leverage	0.858***	0.448**	0.923*	0.426**	1.089	0.452**	0.657	0.440**
	(0.112)	(0.165)	(0.385)	(0.190)	(0.612)	(0.163)	(1.095)	(0.177)
InterestCoverage	-0.006**	-0.006**	-0.005	-0.007**	-0.006	-0.006**	-0.011	-0.006**
	(0.001)	(0.002)	(0.005)	(0.002)	(0.003)	(0.003)	(0.006)	(0.003)
Loss	-0.139	0.133*	-0.020	0.124	-0.079	0.139**	-0.232	0.138
	(0.329)	(0.068)	(0.218)	(0.077)	(0.234)	(0.064)	(0.112)	(0.080)

ROA	-5.578	0.945	-3.104	1.352	-6.292	1.013	-2.159	1.406
	(8.172)	(1.567)	(8.475)	(1.522)	(9.706)	(1.488)	(6.539)	(1.531)
Size	-0.295	-0.164***	-0.261	-0.172***	-0.248*	-0.162***	-0.397**	-0.173***
	(0.141)	(0.043)	(0.133)	(0.040)	(0.078)	(0.038)	(0.110)	(0.038)
WC	-3.032	0.080	-3.457	0.078	-2.950	0.094	0.016	0.093
	(2.275)	(0.149)	(1.822)	(0.193)	(2.158)	(0.147)	(1.266)	(0.174)
Europe	0.941**	0.003	1.011***	-0.057	0.827***	0.020	0.214	-0.053
	(0.197)	(0.030)	(0.040)	(0.033)	(0.039)	(0.043)	(0.179)	(0.032)
Observations	172	4042	172	4042	172	4042	172	4042
R^2	0.708	0.452	0.713	0.438	0.707	0.460	0.734	0.448
$R^2 Adj.$	0.658	0.447	0.659	0.432	0.652	0.454	0.671	0.442
$R^2 Within$	0.517	0.378	0.524	0.361	0.515	0.386	0.560	0.373
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y

Table 8

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt. The sample contains 2963 bonds issued between January 1, 2014 and December 31, 2019 by 335 companies.. The dependent variable is the natural logarithm of the yield to maturity of the corporate bond as of issuance and the corresponding government bond yield using linear interpolation. The main explanatory variable in column (1) is the ESG overall score, in (2) the environmental, social and governance scores, in (3) the breakdown into ESG overall score quartiles and in (4) the breakdown into environmental, social and governance score quartiles. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)
ESGOverall	-0.461***			
	(0.123)			
E		-0.004		
		(0.010)		
S		-0.006		
		(0.018)		
G		-0.018		
		(0.015)		
ESGOverallQ2			-0.018	
			(0.061)	
ESGOverallQ3			-0.141***	
			(0.040)	
ESGOverallQ4			-0.283***	
			(0.067)	
EQ2				-0.157***
				(0.026)
EQ3				-0.119**
				(0.043)
EQ4				-0.009
				(0.095)
SQ2				0.057
				(0.047)
SQ3				-0.069
				(0.070)
SQ4				-0.022
				(0.058)
GQ2				-0.011
				(0.036)
GQ3				-0.047
				(0.052)
GQ4				-0.121***
				(0.039)
lnIssueAmount	-0.010	-0.009	-0.008	-0.005
	(0.014)	(0.016)	(0.014)	(0.016)
IssueYearsToMaturity	0.023***	0.023***	0.023***	0.023***
	(0.004)	(0.004)	(0.004)	(0.004)
Call_Flag	-0.108	-0.089	-0.121	-0.082
	(0.076)	(0.087)	(0.080)	(0.089)

GrayZone	-0.109*	-0.131**	-0.116**	-0.146**
	(0.054)	(0.047)	(0.053)	(0.052)
SafeZone	-0.014	-0.028	-0.040	-0.043
	(0.089)	(0.096)	(0.097)	(0.103)
TobinsQ	-0.154***	-0.176***	-0.152***	-0.169***
	(0.032)	(0.030)	(0.032)	(0.028)
Volatility	0.073***	0.074***	0.074***	0.072***
	(0.008)	(0.010)	(0.007)	(0.011)
Leverage	0.596***	0.613**	0.599***	0.574***
	(0.201)	(0.223)	(0.176)	(0.184)
InterestCoverage	-0.005	-0.005*	-0.005	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)
Loss	0.040	0.029	0.049	0.057
	(0.138)	(0.155)	(0.117)	(0.132)
ROA	0.737	1.088	0.912	1.446
	(2.116)	(2.119)	(1.989)	(1.695)
Size	-0.170***	-0.180***	-0.171***	-0.180***
	(0.048)	(0.049)	(0.046)	(0.046)
WCRatio	-0.041	-0.070	-0.037	0.027
	(0.166)	(0.220)	(0.170)	(0.169)
Europe	-0.092	-0.160**	-0.053	-0.121*
	(0.068)	(0.060)	(0.079)	(0.057)
Observations	2963	2963	2963	2963
R^2	0.440	0.429	0.450	0.443
$R^2 Adj.$	0.434	0.421	0.443	0.435
$R^2 Within$	0.384	0.371	0.394	0.386
Industry FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y

Table 9

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt during the COVID years 2020 and 2021. The sample contains 1251 bonds issued by 271 companies between January 1, 2020 and December 31, 2021. The dependent variable is the natural logarithm of the issue yield to maturity of the corporate bond and the corresponding government bond yield using linear interpolation. The main explanatory variables for regression (1), (2) and (3) is the ESG overall score and for regression (4), (5) and (6) the environmental score, social score and governance score. The analysis makes use of the binary variable Shock, which takes the value of 1 for shock quarters and 0 for the post-crisis period. Shock1 takes the value of 1 for the first quarter of 2020. Shock2 takes the value of 1 for the first two quarters of 2020. Shock 3 takes the value of 1 for the first three quarters of 2020. Treatment variables are included in all models. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)
ESGOverall	-0.627***	-0.653***	-0.548***			
	(0.090)	(0.116)	(0.155)			
E				-0.004	-0.001	0.001
				(0.007)	(0.006)	(0.007)
S				-0.049***	-0.041***	-0.035***
				(0.010)	(0.009)	(0.009)
G				-0.018	-0.017	-0.010
				(0.029)	(0.030)	(0.033)
Shock1	-0.244*			-0.027		
	(0.118)			(0.095)		
Shock2		-0.084			0.188**	
		(0.080)			(0.079)	
Shock3			0.068			0.302**
			(0.131)			(0.101)
ESGOverall * Shock1	0.495***			0.159		
	(0.133)			(0.106)		
ESGOverall * Shock2		0.233**			-0.174**	
		(0.086)			(0.071)	
ESGOverall * Shock3			0.017			-0.340**
			(0.154)			(0.125)
lnIssueAmount	0.009	0.011	0.011	0.014	0.016	0.015
	(0.010)	(0.010)	(0.010)	(0.011)	(0.011)	(0.011)

IssueYearsToMaturity	0.030***	0.030***	0.030***	0.029***	0.029***	0.029***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Call_Flag	-0.421*	-0.398*	-0.413*	-0.394*	-0.397*	-0.417*
	(0.208)	(0.212)	(0.217)	(0.213)	(0.219)	(0.226)
GrayZone	-0.099*	-0.098*	-0.092	-0.087	-0.087	-0.079
	(0.051)	(0.049)	(0.052)	(0.050)	(0.054)	(0.057)
SafeZone	-0.161**	-0.160**	-0.157**	-0.142**	-0.146*	-0.149*
	(0.057)	(0.060)	(0.062)	(0.064)	(0.072)	(0.073)
TobinsQ	-0.063***	-0.062***	-0.061***	-0.071***	-0.069***	-0.063***
	(0.015)	(0.015)	(0.015)	(0.016)	(0.016)	(0.015)
Volatility	0.046**	0.047**	0.047**	0.057***	0.057***	0.055**
	(0.017)	(0.016)	(0.017)	(0.019)	(0.019)	(0.019)
Leverage	0.332	0.357	0.371	0.243	0.292	0.308
	(0.221)	(0.219)	(0.214)	(0.250)	(0.236)	(0.228)
InterestCoverage	-0.007*	-0.006	-0.006	-0.008*	-0.007	-0.007
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Loss	0.171***	0.162***	0.162***	0.179***	0.170***	0.167***
	(0.039)	(0.034)	(0.042)	(0.041)	(0.040)	(0.047)
ROA	-1.171	-0.851	-1.019	-0.472	-0.363	-0.637
	(2.694)	(2.710)	(2.717)	(2.771)	(2.801)	(2.762)
Size	-0.172***	-0.173***	-0.172***	-0.169***	-0.172***	-0.171***
	(0.034)	(0.033)	(0.035)	(0.029)	(0.028)	(0.029)
WCRatio	0.299	0.242	0.213	0.245	0.191	0.186
	(0.310)	(0.314)	(0.320)	(0.311)	(0.309)	(0.310)
Europe	0.123***	0.104***	0.114***	0.077*	0.078*	0.095**
	(0.032)	(0.030)	(0.032)	(0.040)	(0.037)	(0.036)
Observations	1251	1251	1251	1251	1251	1251
R^2	0.500	0.498	0.496	0.490	0.491	0.493
$R^2 Adj.$	0.487	0.485	0.484	0.476	0.477	0.479
$R^2 Within$	0.450	0.448	0.446	0.439	0.440	0.442
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y

Table 10

This table provides the results of the probit regression analysis on the relationship between a company's ESG performance and its likelihood of running into financial distress. The sample contains 4214 bonds issued between January 1, 2014 and December 31, 2021 by 385 companies. The dependent variables are the Altman Z classifications, defined as binary variables. In regression (1) and (2), the explanatory variables are regressed on the Distress Zone classification, (3) and (4) use the Gray Zone as a dependent variable and regression (5) and (6) the Safe Zone classification. The main explanatory variables for regression (1), (3) and (4) is the ESG overall score and for regression (2), (4) and (6) the environmental score, social score and governance score. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1) *Distress Zone*	(2) *Distress Zone*	(3) *Gray Zone*	(4) *Gray Zone*	(5) *Safe Zone*	(6) *Safe Zone*
ESGOverall	-0.116		0.145		-0.029	
	(0.096)		(0.104)		(0.023)	
E		-0.015*		0.020**		-0.005
		(0.007)		(0.007)		(0.004)
S		0.005		-0.008		0.003
		(0.012)		(0.011)		(0.003)
G		0.007		-0.004		-0.003
		(0.011)		(0.013)		(0.005)
lnIssueAmount	-0.017**	-0.016**	0.021***	0.020***	-0.004	-0.004
	(0.007)	(0.007)	(0.004)	(0.004)	(0.005)	(0.005)
IssueYearsToMaturity	0.000	0.000	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Call_Flag	0.036	0.029	-0.151**	-0.142*	0.115***	0.112***
	(0.056)	(0.057)	(0.071)	(0.068)	(0.023)	(0.022)
TobinsQ	-0.220***	-0.225***	0.022	0.029	0.198***	0.197***
	(0.012)	(0.011)	(0.030)	(0.026)	(0.021)	(0.020)
Volatility	0.030***	0.029***	-0.021***	-0.019***	-0.009	-0.010
	(0.004)	(0.004)	(0.007)	(0.006)	(0.008)	(0.009)
Leverage	0.920***	0.938***	-0.365***	-0.393***	-0.554***	-0.545***
	(0.071)	(0.063)	(0.088)	(0.097)	(0.086)	(0.087)
InterestCoverage	-0.005***	-0.005***	-0.002	-0.001	0.006***	0.006***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)

Loss	-0.063	-0.070	0.052	0.060	0.011	0.010
	(0.047)	(0.043)	(0.052)	(0.046)	(0.018)	(0.017)
ROA	-2.426*	-2.561*	2.006	2.170	0.420	0.391
	(1.312)	(1.434)	(1.600)	(1.732)	(0.530)	(0.524)
Size	0.038*	0.045**	-0.018	-0.025	-0.020	-0.020
	(0.020)	(0.018)	(0.020)	(0.019)	(0.012)	(0.014)
WCRatio	-0.489**	-0.503**	0.347	0.365	0.142	0.138
	(0.182)	(0.201)	(0.317)	(0.351)	(0.154)	(0.162)
Europe	0.031	0.019	-0.174***	-0.161***	0.143***	0.143***
	(0.062)	(0.063)	(0.053)	(0.054)	(0.030)	(0.027)
Observations	4214	4214	4214	4214	4214	4214
R^2	0.589	0.591	0.189	0.193	0.519	0.520
$R^2Adj.$	0.585	0.587	0.182	0.186	0.515	0.515
$R^2Within$	0.487	0.490	0.086	0.090	0.457	0.458
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y

Table 11

This table provides the results of the probit regression analysis on the relationship between a company's ESG performance and its likelihood of running into financial distress. The sample contains 4214 bonds issued between January 1, 2014 and December 31, 2021 by 385 companies. The dependent variables are the Altman Z classifications, defined as binary variables. In regression (1) and (2), the explanatory variables are regressed on the Distress Zone classification, (3) and (4) use the Gray Zone as a dependent variable and regression (5) and (6) the Safe Zone classification. The main explanatory variables for regression (1), (3) and (4) are the ESG overall quartile dummies and for regression (2), (4) and (6) the environmental score, social score and governance score quartile dummies. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)
	Distress Zone	*Distress Zone*	*Gray Zone*	*Gray Zone*	*Safe Zone*	*Safe Zone*
ESGOverallQ2	0.012		-0.024		0.012	
	(0.034)		(0.049)		(0.023)	
ESGOverallQ3	-0.020		0.006		0.015	
	(0.059)		(0.077)		(0.022)	

ESGOverallQ4	-0.056		0.076		-0.020	
	(0.063)		(0.074)		(0.015)	
EQ2		-0.002		0.029		-0.027
		(0.037)		(0.026)		(0.020)
EQ3		-0.046		0.062		-0.016
		(0.048)		(0.043)		(0.025)
EQ4		-0.096*		0.142***		-0.045
		(0.045)		(0.043)		(0.037)
SQ2		0.098**		-0.093*		-0.005
		(0.037)		(0.049)		(0.025)
SQ3		0.087**		-0.078		-0.009
		(0.039)		(0.044)		(0.019)
SQ4		0.009		-0.006		-0.003
		(0.051)		(0.051)		(0.015)
GQ2		0.019		-0.051		0.032*
		(0.024)		(0.031)		(0.016)
GQ3		0.031		-0.060		0.028
		(0.072)		(0.065)		(0.017)
GQ4		0.033		-0.038		0.004
		(0.051)		(0.066)		(0.028)
lnIssueAmount	-0.016**	-0.014*	0.020***	0.017***	-0.004	-0.004
	(0.006)	(0.007)	(0.004)	(0.004)	(0.005)	(0.005)
IssueYearsToMaturity	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Call_Flag	0.036	0.040	-0.151**	-0.150*	0.115***	0.111***
	(0.058)	(0.062)	(0.070)	(0.072)	(0.022)	(0.020)
TobinsQ	-0.219***	-0.224***	0.020	0.027	0.199***	0.197***
	(0.012)	(0.012)	(0.030)	(0.027)	(0.021)	(0.020)
Volatility	0.031***	0.030***	-0.022***	-0.020***	-0.009	-0.010
	(0.004)	(0.005)	(0.007)	(0.007)	(0.008)	(0.009)
Leverage	0.921***	0.935***	-0.367***	-0.375***	-0.554***	-0.560***
	(0.072)	(0.059)	(0.089)	(0.096)	(0.085)	(0.085)

InterestCoverage	-0.005***	-0.005***	-0.002	-0.002	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Loss	-0.064	-0.089*	0.056	0.081	0.009	0.008
	(0.046)	(0.045)	(0.051)	(0.047)	(0.018)	(0.017)
ROA	-2.507*	-2.791*	2.158	2.499	0.349	0.292
	(1.294)	(1.538)	(1.620)	(1.813)	(0.523)	(0.483)
Size	0.039*	0.042**	-0.018	-0.023	-0.020	-0.019
	(0.021)	(0.018)	(0.020)	(0.019)	(0.012)	(0.014)
WCRatio	-0.491**	-0.505**	0.351	0.347	0.140	0.158
	(0.182)	(0.178)	(0.315)	(0.324)	(0.152)	(0.161)
Europe	0.040	0.016	-0.192***	-0.165***	0.152***	0.149***
	(0.058)	(0.054)	(0.058)	(0.049)	(0.031)	(0.026)
Observations	4214	4214	4214	4214	4214	4214
R^2	0.589	0.599	0.191	0.204	0.520	0.521
$R^2 Adj.$	0.585	0.594	0.184	0.195	0.516	0.516
$R^2 Within$	0.487	0.499	0.088	0.102	0.458	0.460
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y

Table 12

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt. The sample contains 4214 bonds issued between January 1, 2014 and December 31, 2021 by 385 companies. The dependent variable is the natural logarithm of the yield to maturity of the corporate bond as of issuance and the corresponding government bond yield using linear interpolation. The main explanatory variable in column (1) is the ESG overall score, in (2) the environmental, social and governance scores, in (3) the breakdown into above and below mean performers, in (4) the breakdown into above and below median performers, in (5) the breakdown into ESG overall score quartiles and in (6) the breakdown into environmental, social and governance score quartiles. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ESGOverall	-0.204							
	(0.215)							
E		-0.045***						
		(0.014)						

S	-0.016						
	(0.021)						
G	-0.013						
	(0.010)						
ESGOverallAboveMean		-0.113					
		(0.081)					
ESGOverallAboveMedian			-0.036				
			(0.054)				
ESGOverallQ2				-0.020			
				(0.028)			
ESGOverallQ3				-0.120			
				(0.082)			
ESGOverallQ4				-0.084			
				(0.108)			
EAboveMean					-0.031		
					(0.038)		
SAboveMean					-0.062**		
					(0.022)		
GAboveMean					-0.033		
					(0.025)		
EAboveMedian						-0.030	
						(0.022)	
SAboveMedian						-0.064*	
						(0.031)	
GAboveMedian						-0.034	
						(0.024)	
EQ2							-0.064
							(0.065)
EQ3							-0.058
							(0.074)

EQ4								-0.174
								(0.148)
SQ2								0.019
								(0.060)
SQ3								-0.066
								(0.048)
SQ4								-0.090
								(0.061)
GQ2								0.063**
								(0.027)
GQ3								-0.069**
								(0.025)
GQ4								-0.106***
								(0.033)
lnIssueAmount	-0.018	-0.019	-0.018	-0.018	-0.017	-0.018	-0.019	-0.019*
	(0.012)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)
IssueYearsToMaturity	0.027***	0.027***	0.027***	0.027***	0.027***	0.027***	0.027***	0.027***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Call_Flag	-0.279***	-0.272***	-0.277***	-0.279***	-0.277***	-0.276***	-0.273***	-0.271***
	(0.078)	(0.078)	(0.076)	(0.079)	(0.078)	(0.078)	(0.077)	(0.079)
GrayZone	-0.056*	-0.047*	-0.053	-0.056*	-0.049	-0.054*	-0.054*	-0.054*
	(0.029)	(0.024)	(0.030)	(0.029)	(0.031)	(0.029)	(0.029)	(0.026)
SafeZone	-0.037	-0.022	-0.028	-0.038	-0.021	-0.037	-0.035	-0.041
	(0.075)	(0.073)	(0.072)	(0.079)	(0.075)	(0.074)	(0.071)	(0.070)
TobinsQ	-0.070***	-0.079***	-0.073***	-0.070***	-0.072***	-0.072***	-0.073***	-0.078***
	(0.020)	(0.019)	(0.019)	(0.021)	(0.022)	(0.020)	(0.020)	(0.019)
Volatility	0.007	0.007	0.006	0.007	0.008	0.005	0.005	0.005
	(0.009)	(0.009)	(0.010)	(0.009)	(0.011)	(0.009)	(0.009)	(0.007)
Leverage	0.431	0.466	0.437	0.429	0.448	0.479	0.461	0.507
	(0.418)	(0.406)	(0.406)	(0.420)	(0.412)	(0.400)	(0.396)	(0.413)
InterestCoverage	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)

Loss	0.032	0.021	0.035	0.033	0.038	0.028	0.036	0.026
	(0.029)	(0.031)	(0.028)	(0.029)	(0.031)	(0.032)	(0.030)	(0.032)
ROA	1.415	1.234	1.413	1.498	1.436	1.274	1.369	1.108
	(1.570)	(1.655)	(1.516)	(1.499)	(1.500)	(1.442)	(1.477)	(1.325)
Size	-0.154	-0.140	-0.152	-0.154	-0.147	-0.153	-0.152	-0.152
	(0.100)	(0.093)	(0.098)	(0.100)	(0.096)	(0.102)	(0.101)	(0.089)
WCRatio	-0.467**	-0.492**	-0.466**	-0.477**	-0.450**	-0.466**	-0.473**	-0.426**
	(0.178)	(0.194)	(0.179)	(0.175)	(0.183)	(0.188)	(0.190)	(0.171)
Europe	1.495	1.645	2.115	1.864	1.844	1.799	1.819	1.737
	(1226.89)	(1237.541)	(1224.762)	(1227.339)	(1214.836)	(1242.191)	(1236.584)	(1244.348)
Observations	4214	4214	4214	4214	4214	4214	4214	4214
R^2	0.686	0.688	0.687	0.686	0.687	0.687	0.687	0.689
$R^2Adj.$	0.651	0.653	0.653	0.651	0.652	0.652	0.652	0.654
$R^2Within$	0.296	0.300	0.299	0.296	0.299	0.297	0.298	0.302
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y

Table 13

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt, by dividing the sample into high and low ESG risk exposure industries. The sample contains 4214 bonds issued between January 1, 2014 and December 31, 2021 by 385 companies. The dependent variable is the natural logarithm of the yield to maturity of the corporate bond as of issuance and the corresponding government bond yield using linear interpolation. The main explanatory variable in column (1) and (2) is the ESG overall score, in (3) and (4) the environmental, social and governance scores, in (5) and (6) the breakdown into ESG overall score quartiles and in (7) and (8) the breakdown into environmental, social and governance score quartiles. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High Risk	*Low Risk*	*High Risk*	*Low Risk*	*High Risk*	*Low Risk*	*High Risk*	*Low Risk*
ESGOverall	-1.185	-0.258						
	(1.492)	(0.216)						
E			-0.204	-0.038**				
			(0.204)	(0.015)				

S			0.149***	-0.021				
			(0.011)	(0.022)				
G			-0.061	-0.011				
			(0.124)	(0.010)				
ESGOverallQ2					-0.044	-0.039		
					(0.066)	(0.032)		
ESGOverallQ3					-0.205	-0.137		
					(0.244)	(0.087)		
ESGOverallQ4					-0.232	-0.100		
					(0.247)	(0.106)		
EQ2							-0.425	-0.070
							(0.362)	(0.054)
EQ3							-0.585*	-0.081
							(0.217)	(0.055)
EQ4							-0.382	-0.127
							(0.472)	(0.142)
SQ2							0.114	0.002
							(0.070)	(0.062)
SQ3							0.180	-0.093
							(0.228)	(0.056)
SQ4							-0.010	-0.083
							(0.245)	(0.052)
GQ2							0.516	-0.045
							(0.250)	(0.033)
GQ3							-0.038	-0.047
							(0.176)	(0.030)
GQ4							0.444	-0.075**
							(0.352)	(0.032)
lnIssueAmount	-0.022	-0.016	-0.019	-0.017	-0.021	-0.015	-0.023	-0.018
	(0.020)	(0.012)	(0.022)	(0.012)	(0.022)	(0.012)	(0.023)	(0.011)
IssueYearsToMaturity	0.035**	0.027***	0.036**	0.027***	0.034**	0.027***	0.035**	0.027***
	(0.008)	(0.004)	(0.008)	(0.004)	(0.008)	(0.004)	(0.008)	(0.004)

Call_Flag	0.186*	-0.300***	0.158	-0.293***	0.241**	0.300***	0.284	-0.293***
	(0.064)	(0.077)	(0.077)	(0.077)	(0.069)	(0.077)	(0.143)	(0.077)
GrayZone	0.152	-0.068**	0.053	-0.059*	0.147	-0.058	-0.512	-0.070**
	(0.431)	(0.030)	(0.412)	(0.030)	(0.458)	(0.036)	(0.381)	(0.029)
SafeZone	0.724*	-0.048	0.379	-0.035	0.473	-0.026	0.708	-0.052
	(0.239)	(0.076)	(0.259)	(0.074)	(0.558)	(0.082)	(0.550)	(0.072)
TobinsQ	-0.363	-0.071***	-0.001	-0.078***	-0.615**	-0.075***	0.383	-0.078***
	(0.186)	(0.022)	(0.240)	(0.021)	(0.151)	(0.024)	(0.418)	(0.023)
Volatility	0.075	0.005	0.051	0.004	0.090	0.006	-0.016	0.003
	(0.059)	(0.010)	(0.028)	(0.010)	(0.043)	(0.011)	(0.053)	(0.009)
Leverage	0.792	0.398	1.707*	0.430	1.241	0.425	-0.963**	0.472
	(0.466)	(0.411)	(0.600)	(0.400)	(1.832)	(0.404)	(0.214)	(0.399)
InterestCoverage	-0.010	0.002	-0.010**	0.002	-0.007	0.002	-0.017**	0.003
	(0.006)	(0.002)	(0.003)	(0.002)	(0.004)	(0.002)	(0.004)	(0.002)
Loss	-0.220	0.055*	-0.084	0.044	-0.164	0.062**	-0.287	0.053*
	(0.408)	(0.026)	(0.413)	(0.029)	(0.427)	(0.028)	(0.251)	(0.028)
ROA	-3.773	1.631	0.982	1.530	-4.300	1.790	4.349	1.384
	(7.073)	(1.553)	(6.365)	(1.583)	(6.075)	(1.391)	(3.334)	(1.422)
Size	-0.673*	-0.151	-0.062*	-0.141	-0.661	-0.137	-0.574	-0.150
	(0.278)	(0.102)	(0.439)	(0.096)	(0.342)	(0.096)	(0.530)	(0.090)
WC	-4.918	-0.434**	-2.501	-0.455**	-4.852	-0.417**	1.490	-0.424*
	(3.140)	(0.190)	(3.234)	(0.207)	(2.469)	(0.195)	(1.531)	(0.215)
Europe	-	1.192	-	1.630	-	-1.614	-	1.438
	(-)	(1486.792)	(-)	(1493.959)	(-)	(1472.736)	(-)	(1510.872)
Observations	172	4042	172	4042	172	4042	172	4042
R^2	0.713	0.690	0.718	0.691	0.712	0.691	0.745	0.692
$R^2 Adj.$	0.644	0.655	0.645	0.656	0.638	0.656	0.665	0.656
$R^2 Within$	0.377	0.299	0.387	0.301	0.375	0.301	0.447	0.303
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y

Table 14

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt. The sample contains 2963 bonds issued between January 1, 2014 and December 31, 2019 by 335 companies.. The dependent variable is the natural logarithm of the yield to maturity of the corporate bond as of issuance and the corresponding government bond yield using linear interpolation. The main explanatory variable in column (1) is the ESG overall score, in (2) the environmental, social and governance scores, in (3) the breakdown into ESG overall score quartiles and in (4) the breakdown into environmental, social and governance score quartiles. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)
ESGOverall	-0.122			
	(0.235)			
E		-0.047*		
		(0.022)		
S		-0.007		
		(0.029)		
G		-0.022		
		(0.014)		
ESGOverallQ2			0.039	
			(0.082)	
ESGOverallQ3			-0.015	
			(0.045)	
ESGOverallQ4			-0.086	
			(0.077)	
EQ2				-0.040
				(0.097)
EQ3				-0.072
				(0.096)
EQ4				-0.152
				(0.161)
SQ2				0.046
				(0.037)
SQ3				0.051
				(0.085)
SQ4				-0.041
				(0.100)
GQ2				-0.027
				(0.050)
GQ3				-0.105*
				(0.053)
GQ4				-0.145*
				(0.077)
lnIssueAmount	-0.017	-0.019	-0.017	-0.017
	(0.013)	(0.013)	(0.012)	(0.013)
IssueYearsToMaturity	0.025***	0.025***	0.025***	0.025***
	(0.004)	(0.004)	(0.004)	(0.004)
Call_Flag	-0.247**	-0.242*	-0.248**	-0.241*
	(0.112)	(0.116)	(0.111)	(0.113)

GrayZone	-0.040	0.055	0.034	0.069
	(0.044)	(0.041)	(0.043)	(0.044)
SafeZone	0.066	0.082	0.046	0.092
	(0.064)	(0.061)	(0.075)	(0.066)
TobinsQ	-0.098	-0.110	-0.090	-0.111
	(0.063)	(0.068)	(0.069)	(0.068)
Volatility	0.007	0.007	0.008	0.008
	(0.012)	(0.012)	(0.012)	(0.012)
Leverage	0.277	0.325	0.293	0.368
	(0.436)	(0.435)	(0.425)	(0.434)
InterestCoverage	0.004	0.004	0.004*	0.004
	(0.002)	(0.002)	(0.002)	(0.002)
Loss	-0.001	-0.013	0.003	-0.008
	(0.075)	(0.081)	(0.067)	(0.073)
ROA	2.621	2.534	2.670	2.198
	(2.200)	(2.329)	(2.054)	(1.957)
Size	-0.029	-0.020	-0.025	-0.013
	(0.123)	(0.113)	(0.117)	(0.104)
WCRatio	-0.631**	-0.694**	-0.633**	-0.652**
	(0.253)	(0.273)	(0.278)	(0.289)
Europe	1.808	1.737	2.119	1.514
	(757.447)	(774.563)	(759.061)	(762.353)
Observations	2963	2963	2963	2963
R^2	0.699	0.701	0.700	0.703
$R^2 Adj.$	0.656	0.659	0.657	0.659
$R^2 Within$	0.256	0.262	0.259	0.265
Industry FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y

Table 15

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt during the COVID years 2020 and 2021. The sample contains 1251 bonds issued by 271 companies between January 1, 2020 and December 31, 2021. The dependent variable is the natural logarithm of the issue yield to maturity of the corporate bond and the corresponding government bond yield using linear interpolation. The main explanatory variables for regression (1), (2) and (3) is the ESG overall score and for regression (4), (5) and (6) the environmental score, social score and governance score. The analysis makes use of the binary variable Shock, which takes the value of 1 for shock quarters and 0 for the post-crisis period. Shock1 takes the value of 1 for the first quarter of 2020. Shock2 takes the value of 1 for the first two quarters of 2020. Shock 3 takes the value of 1 for the first three quarters of 2020. Treatment variables are included in all models. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)
ESGOverall	0.116	0.060	0.106			
	(0.164)	(0.334)	(0.293)			
E				-0.052	-0.040	-0.025
				(0.046)	(0.043)	(0.039)
S				-0.002	-0.007	-0.013
				(0.031)	(0.035)	(0.027)
G				-0.071	-0.098**	-0.103**
				(0.043)	(0.039)	(0.040)
Shock1	0.062			0.014		
	(0.154)			(0.157)		
Shock2		0.092			0.113	
		(0.187)			(0.177)	
Shock3			0.322**			0.333**
			(0.120)			(0.118)
ESGOverall *	0.124			0.175		
Shock1	(0.171)			(0.175)		
ESGOverall *		0.090			0.080	
Shock2		(0.260)			(0.238)	
ESGOverall *			-0.155			
Shock3			(0.128)			
lnIssueAmount	-0.009	-0.002	-0.002	-0.007	-0.001	-0.002
	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)	(0.008)

IssueYearsToMaturity	0.032***	0.032***	0.032***	0.032***	0.032***	0.032***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Call_Flag	-0.561**	-0.571**	-0.576**	-0.557**	-0.563**	-0.562*
	(0.255)	(0.251)	(0.263)	(0.257)	(0.253)	(0.265)
GrayZone	-0.127	-0.119	-0.076	-0.136	-0.126	-0.083
	(0.105)	(0.097)	(0.086)	(0.120)	(0.109)	(0.098)
SafeZone	-0.031	-0.042	-0.003	-0.041	-0.062	-0.022
	(0.144)	(0.133)	(0.128)	(0.145)	(0.138)	(0.135)
TobinsQ	0.108	0.124**	0.102	0.095	0.110	0.084
	(0.066)	(0.057)	(0.073)	(0.075)	(0.063)	(0.079)
Volatility	0.126**	0.118***	0.124***	0.099*	0.088*	0.094**
	(0.046)	(0.037)	(0.029)	(0.047)	(0.045)	(0.033)
Leverage	1.302	1.509*	1.683**	0.960	1.031	1.188
	(0.810)	(0.848)	(0.746)	(0.815)	(0.805)	(0.749)
InterestCoverage	-0.006	-0.004	-0.005	-0.007	-0.006	-0.007
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
Loss	0.030	-0.004	-0.046	0.021	-0.003	-0.044
	(0.133)	(0.114)	(0.116)	(0.111)	(0.096)	(0.097)
ROA	-0.395	-0.273	-0.115	-0.093	0.363	0.638
	(4.800)	(4.123)	(4.126)	(4.589)	(4.005)	(3.794)
Size	-0.907**	-0.885**	-0.873***	-0.988**	-0.969**	-0.949**
	(0.349)	(0.320)	(0.268)	(0.390)	(0.355)	(0.316)
WCRatio	-0.612	-0.637	-0.873	-0.475	-0.438	-0.689
	(0.784)	(0.755)	(0.758)	(0.776)	(0.749)	(0.786)
Europe	-	-	-	-	-	-
	(-)	(-)	(-)	(-)	(-)	(-)
Observations	1251	1251	1251	1251	1251	1251
R^2	0.772	0.773	0.774	0.774	0.776	0.776
$R^2 Adj.$	0.701	0.702	0.702	0.702	0.704	0.705
$R^2 Within$	0.476	0.478	0.478	0.480	0.484	0.484
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y

Table 16

This table provides the results of the probit regression analysis on the relationship between a company's ESG performance and its likelihood of running into financial distress. The sample contains 4214 bonds issued between January 1, 2014 and December 31, 2021 by 385 companies. The dependent variables are the Altman Z classifications, defined as binary variables. In regression (1) and (2), the explanatory variables are regressed on the Distress Zone classification, (3) and (4) use the Gray Zone as a dependent variable and regression (5) and (6) the Safe Zone classification. The main explanatory variables for regression (1), (3) and (4) is the ESG overall score and for regression (2), (4) and (6) the environmental score, social score and governance score. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1) *Distress Zone*	(2) *Distress Zone*	(3) *Gray Zone*	(4) *Gray Zone*	(5) *Safe Zone*	(6) *Safe Zone*
ESGOverall	-0.014		-0.020		0.006	
	(0.086)		(0.066)		(0.054)	
E		-0.026*		0.021		0.005
		(0.014)		(0.017)		(0.007)
S		0.015		-0.018		0.002
		(0.013)		(0.011)		(0.007)
G		0.002		-0.005		0.002
		(0.007)		(0.009)		(0.005)
lnIssueAmount	-0.007	-0.008	0.007	0.007	0.000	0.000
	(0.012)	(0.012)	(0.008)	(0.008)	(0.004)	(0.003)
IssueYearsToMaturity	0.000	0.000	0.001	0.001	-0,001**	-0.001**
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Call_Flag	-0.027	-0.029	-0.021	-0.017	0.048***	0.047***
	(0.046)	(0.047)	(0.054)	(0.054)	(0.011)	(0.011)
TobinsQ	-0.183***	-0.183***	-0.026	-0.027	0.209***	0.210***
	(0.025)	(0.025)	(0.045)	(0.045)	(0.030)	(0.030)
Volatility	0.006	0.007	-0.013	-0.014	0.007***	0.007***
	(0.011)	(0.011)	(0.013)	(0.012)	(0.002)	(0.002)
Leverage	1.457***	1.454***	-0.609**	-0.605**	-0.848***	-0.850***
	(0.224)	(0.223)	(0.269)	(0.264)	(0.164)	(0.164)
InterestCoverage	0.000	0.000	-0.004***	-0.004***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)

Loss	0.004	-0.010	-0.005	-0.001	0.010	0.011
	(0.037)	(0.034)	(0.043)	(0.039)	(0.015)	(0.017)
ROA	-0.913	-0.944	1.305	1.299	-0.392	-0.356
	(1.461)	(1.453)	(1.699)	(1.681)	(0.434)	(0.421)
Size	0.299***	0.309***	-0.205**	-0.214**	-0.093	-0.094
	(0.036)	(0.037)	(0.079)	(0.075)	(0.059)	(0.057)
WCRatio	-0.739***	-0.774***	0.726***	0.760***	0.014	0.014
	(0.148)	(0.128)	(0.240)	(0.226)	(0.126)	(0.129)
Europe	1.995	1.844	-0.758	-0.635	-1.418	1.389
	(111.351)	(109.451)	(180.620)	(178.619)	(99.699)	(99.292)
Observations	4214	4214	4214	4214	4214	4214
R^2	0.836	0.838	0.602	0.604	0.793	0.793
$R^2 Adj.$	0.818	0.820	0.558	0.560	0.770	0.770
$R^2 Within$	0.284	0.291	0.056	0.060	0.255	0.256
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y

Table 17

This table provides the results of the probit regression analysis on the relationship between a company's ESG performance and its likelihood of running into financial distress. The sample contains 4214 bonds issued between January 1, 2014 and December 31, 2021 by 385 companies. The dependent variables are the Altman Z classifications, defined as binary variables. In regression (1) and (2), the explanatory variables are regressed on the Distress Zone classification, (3) and (4) use the Gray Zone as a dependent variable and regression (5) and (6) the Safe Zone classification. The main explanatory variables for regression (1), (3) and (4) are the ESG overall quartile dummies and for regression (2), (4) and (6) the environmental score, social score and governance score quartile dummies. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)
	Distress Zone	*Distress Zone*	*Gray Zone*	*Gray Zone*	*Safe Zone*	*Safe Zone*
ESGOverallQ2	0.000		-0.019		0.020	
	(0.025)		(0.043)		(0.025)	
ESGOverallQ3	-0.036		0.001		0.035	
	(0.059)		(0.070)		(0.023)	

ESGOverallQ4	-0.043		0.055		-0.012	
	(0.071)		(0.080)		(0.016)	
EQ2		0.024		0.029		-0.052
		(0.024)		(0.068)		(0.051)
EQ3		-0.050		0.076		-0.026
		(0.054)		(0.079)		(0.039)
EQ4		-0.130*		0.187**		-0.057*
		(0.073)		(0.083)		(0.029)
SQ2		0.041*		-0.060**		0.019
		(0.020)		(0.024)		(0.027)
SQ3		0.064		-0.068**		0.004
		(0.042)		(0.029)		(0.022)
SQ4		-0.001		0.020		-0.012
		(0.049)		(0.056)		(0.030)
GQ2		0.026		-0.057**		0.031*
		(0.019)		(0.026)		(0.017)
GQ3		-0.016		-0.017		0.033**
		(0.035)		(0.038)		(0.013)
GQ4		0.021		-0.039		0.018
		(0.034)		(0.045)		(0.020)
lnIssueAmount	-0.007	-0.008	0.007	0.008	0.000	0.000
	(0.011)	(0.012)	(0.008)	(0.008)	(0.003)	(0.004)
IssueYearsToMaturity	0.000	0.000	0.001	0.001	-0.001**	0.000**
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Call_Flag	-0.027	-0.025	-0.018	-0.022	0.045***	0.046***
	(0.045)	(0.045)	(0.054)	(0.053)	(0.012)	(0.012)
TobinsQ	-0.182***	-0.178***	-0.030	-0.028	0.212***	0.206***
	(0.023)	(0.023)	(0.044)	(0.036)	(0.031)	(0.026)
Volatility	0.006	0.004	-0.013	-0.011	0.007***	0.007**
	(0.010)	(0.010)	(0.012)	(0.012)	(0.002)	(0.003)
Leverage	1.449***	1.445***	-0.592**	-0.601**	-0.856***	-0.844***
	(0.229)	(0.216)	(0.272)	(0.262)	(0.159)	(0.166)

InterestCoverage	0.000	-0.001	-0.005***	-0.004***	0.005***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Loss	-0.004	-0.014	-0.002	0.005	0.006	0.009
	(0.040)	(0.039)	(0.046)	(0.048)	(0.014)	(0.017)
ROA	-0.990	-1.249	1.443	1.716	-0.453	-0.467
	(1.416)	(1.510)	(1.722)	(1.748)	(0.511)	(0.391)
Size	0.300***	0.300***	-0.205**	-0.201***	-0.095	-0.099*
	(0.038)	(0.033)	(0.081)	(0.061)	(0.061)	(0.048)
WCRatio	-0.733***	-0.734***	0.740***	0.708***	-0.001	0.026
	(0.146)	(0.133)	(0.234)	(0.221)	(0.114)	(0.123)
Europe	1.928	1.487	-0.735	-0.022	-1.373	-1.644
	(112.100)	(105.185)	(179.335)	(181.961)	(96.711)	(101.418)
Observations	4214	4214	4214	4214	4214	4214
R^2	0.836	0.840	0.603	0.609	0.794	0.795
$R^2 Adj.$	0.818	0.822	0.559	0.565	0.771	0.771
$R^2 Within$	0.285	0.302	0.058	0.073	0.260	0.262
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y

Table 18

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt over time. The sample contains 4513 bonds issued and circulating by 421 companies between January 1, 2014 and December 31, 2021. The dependent variable is the natural logarithm of the issue yield to maturity of the corporate bond and the corresponding government bond yield using linear interpolation. The main explanatory variables are the environmental score, social score and governance score. The analysis divides the sample into yearly subsamples: (1) 2014; (2) 2015; (3) 2016; (4) 2017; (5) 2018; (6) 2019; (7) 2020; (8) 2021. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1) *2014*	(2) *2015*	(3) *2016*	(4) *2017*	(5) *2018*	(6) *2019*
ESGOverall	-0.182	-0.319*	-0.412**	-0.572*	-0.137	-1.027***
	(0.203)	(0.167)	(0.142)	(0.313)	(0.266)	(0.274)
lnIssueAmount	-0.092***	0.011	-0.023	-0.004	-0.040*	0.015
	(0.024)	(0.024)	(0.015)	(0.017)	(0.019)	(0.009)
IssueYearsToMaturity	0.014***	0.021***	0.022***	0.025***	0.022***	0.027***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)
Call_Flag	0.225	0.132	0.096*	0.021	-0.240**	-0.284**
	(0.202)	(0.228)	(0.051)	(0.064)	(0.096)	(0.100)
GrayZone	-0.002	0.036	-0.149**	-0.127**	-0.195**	-0.188*
	(0.239)	(0.090)	(0.063)	(0.053)	(0.087)	(0.101)
SafeZone	-0.041	0.095	0.054	-0.156	-0.141	0.092
	(0.365)	(0.181)	(0.072)	(0.180)	(0.278)	(0.103)
TobinsQ	-0.242	-0.169**	-0.085**	-0.047	-0.114*	-0.245***
	(0.182)	(0.057)	(0.037)	(0.069)	(0.059)	(0.036)
Volatility	0.071***	0.100***	0.076***	0.083***	0.109***	0.020
	(0.022)	(0.010)	(0.010)	(0.012)	(0.029)	(0.022)
Leverage	1.154	0.698**	0.440	0.517	-0.049	0.938***
	(0.701)	(0.298)	(0.280)	(0.371)	(0.212)	(0.294)
InterestCoverage	-0.003	-0.006*	-0.004***	-0.012***	-0.003	0.002
	(0.007)	(0.003)	(0.001)	(0.002)	(0.008)	(0.005)
Loss	-0.002	-0.094	-0.156	0.413***	0.376***	-0.365*
	(0.196)	(0.085)	(0.100)	(0.091)	(0.071)	(0.180)
ROA	-1.705	0.083	-6.626***	4.613***	8.222*	-7.223**
	(6.489)	(2,365)	(2.017)	(1.190)	(3.928)	(2.662)
Size	-0.204***	-0.164***	-0.160***	-0.158***	-0.075	-0.222***
	(0.067)	(0.046)	(0.044)	(0.030)	(0.069)	(0.070)
WCRatio	-0.150	0.074	0.068	-0.230	0.356	-0.490
	(0.355)	(0.334)	(0.176)	(0.335)	(0.329)	(0.444)
Europe	-0.115	-0.113	-0.156	0.074	-0.288*	-0.154
	(0.073)	(0.146)	(0.097)	(0.102)	(0.162)	(0.130)
Observations	379	503	469	506	432	674
R^2	0.474	0.474	0.566	0.591	0.445	0.492
$R^2 Adj.$	0.430	0.445	0.540	0.567	0.405	0.471
$R^2 Within$	0.425	0.455	0.495	0.531	0.337	0.384
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y

Table 19

This table provides the results of the fixed effects regression analysis on the relationship between a company's ESG performance and its cost of debt during the COVID years 2020 and 2021 before manipulating the dataset. The sample contains 1417 bonds by 303 companies issued between January 1, 2020 and December 31, 2021. The dependent variable is the natural logarithm of the issue yield to maturity of the corporate bond and the corresponding government bond yield using linear interpolation. The main explanatory variables for regression (1), (2) and (3) is the ESG overall score and for regression (4), (5) and (6) the environmental score, social score and governance score. The analysis makes use of the binary variable Shock, which takes the value of 1 for shock quarters and 0 for the post-crisis period. Shock1 takes the value of 1 for the first quarter of 2020. Shock2 takes the value of 1 for the first two quarters of 2020. Shock 3 takes the value of 1 for the first three quarters of 2020. Treatment variables are included in all models. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)
ESGOverall	-0.740***	-0.641***	-0.510**			
	(0.104)	(0.172)	(0.198)			
E				-0.021*	-0.016	-0.013
				(0.011)	(0.011)	(0.011)
S				-0.057***	-0.042***	-0.035***
				(0.007)	(0.008)	(0.007)
G				-0.027	-0.023	-0.015
				(0.021)	(0.022)	(0.025)
Shock1	-0.172			0.035		
	(0.183)			(0.170)		
Shock2		0.143			0.353***	
		(0.130)			(0.082)	
Shock3			0.298*			0.474***
			(0.149)			(0.083)
ESGOverall * Shock1	0.394			0.062		
	(0.224)			(0.219)		
ESGOverall * Shock2		-0.039			-0.376***	
		(0.147)			(0.076)	
ESGOverall * Shock3			-0.228			-0.509***
			(0.164)			(0.094)
lnIssueAmount	0.014	0.017*	0.017*	0.020*	0.022*	0.021*
	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.011)

IssueYearsToMaturity	0.029***	0.029***	0.029***	0.029***	0.029***	0.029***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Call_Flag	-0.447**	-0.432**	-0.446**	-0.416*	-0.427*	-0.449**
	(0.194)	(0.197)	(0.200)	(0.196)	(0.199)	(0.205)
GrayZone	-0.152**	-0.148**	-0.139**	-0.150**	-0.146**	-0.136*
	(0.061)	(0.060)	(0.063)	(0.062)	(0.065)	(0.066)
SafeZone	-0.239***	-0.233***	-0.241***	-0.239**	-0.232**	-0.242**
	(0.071)	(0.077)	(0.075)	(0.091)	(0.095)	(0.088)
TobinsQ	-0.047***	-0.045***	-0.044***	-0.056***	-0.053***	-0.049***
	(0.012)	(0.013)	(0.013)	(0.012)	(0.011)	(0.011)
Volatility	0.050***	0.053***	0.052***	0.054***	0.056***	0.053***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Leverage	0.413**	0.429**	0.445**	0.335	0.379*	0.398**
	(0.161)	(0.154)	(0.149)	(0.193)	(0.176)	(0.169)
InterestCoverage	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Loss	0.186***	0.166***	0.160***	0.203***	0.184***	0.174***
	(0.057)	(0.049)	(0.052)	(0.060)	(0.056)	(0.057)
ROA	-3.193	-3.069	-3.364	-2.452	-2.390	-2.822
	(2.428)	(2.457)	(2.285)	(2.651)	(2.624)	(2.341)
Size	-0.188***	-0.185***	-0.185***	-0.187***	-0.186***	-0.186***
	(0.033)	(0.031)	(0.032)	(0.028)	(0.026)	(0.027)
WCRatio	0.427	0.391	0.387	0.446	0.404	0.399
	(0.324)	(0.313)	(0.315)	(0.309)	(0.291)	(0.289)
Europe	0.106***	0.095***	0.104***	0.066*	0.078**	0.094***
	(0.028)	(0.028)	(0.028)	(0.032)	(0.028)	(0.028)
Observations	1417	1417	1417	1417	1417	1417
R^2	0.532	0.533	0.532	0.521	0.528	0.531
$R^2 Adj.$	0.521	0.522	0.522	0.510	0.517	0.520
$R^2 Within$	0.454	0.455	0.454	0.442	0.449	0.453
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y

Table 20

This table provides the results of the fixed effects regression analysis on the relationship between a company's lagged ESG performance and its cost of debt. The sample contains 4204 bonds issued between January 1, 2014 and December 31, 2021 by 385 companies. The dependent variable is the natural logarithm of the yield to maturity of the corporate bond as of issuance and the corresponding government bond yield using linear interpolation. The main explanatory variable in column (1) is the lagged ESG overall score, in (2) the lagged environmental, social and governance scores, in (3) the breakdown into lagged above and below mean performers, in (4) the breakdown into lagged above and below median performers, in (5) the breakdown into lagged ESG overall score quartiles and in (6) the breakdown into lagged environmental, social and governance score quartiles. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
LagESGOverall	-0.432***							
	(0.086)							
LagE		-0.003						
		(0.007)						
LagS		-0.015						
		(0.013)						
LagG		-0.018						
		(0.013)						
LagESGOverallAboveMean			-0.189***					
			(0.035)					
LagESGOverallAboveMedian				-0.163***				
				(0.037)				
LagESGOverallQ2					0.009			
					(0.038)			
LagESGOverallQ3					-0.271***			
					(0.039)			
LagESGOverallQ4					-0.246***			
					(0.053)			
LagEAboveMean						0.000		
						(0.033)		
LagSAboveMean						-0.032		
						(0.048)		

LagGAboveMean						-0.060*		
						(0.031)		
LagEAboveMedian							-0.008	
							(0.030)	
LagSAboveMedian							-0.031	
							(0.049)	
LagGAboveMedian							-0.047	
							(0.045)	
LagEQ2								-0.106**
								(0.042)
LagEQ3								-0.076
								(0.048)
LagEQ4								-0.030
								(0.068)
LagSQ2								-0.029
								(0.066)
LagSQ3								-0.041
								(0.035)
LagSQ4								-0.059
								(0.049)
LagGQ2								-0.089*
								(0.049)
LagGQ3								-0.067
								(0.047)
LagGQ4								-0.119**
								(0.041)
lnIssueAmount	-0.003	-0.001	-0.001	-0.003	-0.001	-0.001	-0.001	0.001
	(0.013)	(0.015)	(0.013)	(0.014)	(0.011)	(0.015)	(0.015)	(0.014)
IssueYearsToMaturity	0.025***	0.025***	0.025***	0.025***	0.025***	0.025***	0.025***	0.025***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)

Call_Flag	-0.147**	-0.131**	-0.140*	-0.159**	-0.165**	-0.125*	-0.130*	-0.135**
	(0.068)	(0.060)	(0.071)	(0.066)	(0.069)	(0.061)	(0.062)	(0.055)
GrayZone	-0.137**	-0.151**	-0.137**	-0.151***	-0.128**	-0.155**	-0.154**	-0.151***
	(0.056)	(0.052)	(0.054)	(0.050)	(0.049)	(0.055)	(0.055)	(0.047)
SafeZone	-0.056	-0.068	-0.055	-0.069	-0.042	-0.071	-0.068	-0.067
	(0.050)	(0.056)	(0.056)	(0.051)	(0.054)	(0.056)	(0.056)	(0.065)
TobinsQ	-0.125***	-0.139***	-0.123***	-0.135***	-0.123***	-0.139***	-0.140***	-0.136***
	(0.012)	(0.011)	(0.013)	(0.011)	(0.012)	(0.010)	(0.010)	(0.011)
Volatility	0.064***	0.066***	0.064***	0.065***	0.064***	0.066***	0.066***	0.065***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)	(0.009)
Leverage	0.467**	0.450**	0.477**	0.448**	0.483***	0.464**	0.465**	0.461**
	(0.163)	(0.185)	(0.167)	(0.161)	(0.150)	(0.164)	(0.166)	(0.180)
InterestCoverage	-0.006**	-0.006**	-0.006**	-0.006*	-0.006*	-0.006**	-0.006**	-0.006**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Loss	0.114	0.106	0.119*	0.121	0.127*	0.106	0.107	0.108
	(0.074)	(0.082)	(0.066)	(0.078)	(0.060)	(0.083)	(0.085)	(0.077)
ROA	1.105	1.266	1.066	1.437	0.924	1.258	1.192	1.152
	(1.909)	(1.863)	(1.945)	(1.825)	(1.817)	(1.849)	(1.900)	(1.649)
Size	-0.166***	-0.172***	-0.166***	-0.169***	-0.165***	-0.173***	-0.171***	-0.172***
	(0.041)	(0.038)	(0.038)	(0.038)	(0.036)	(0.038)	(0.036)	(0.036)
WCRatio	0.048	0.021	0.032	-0.013	0.063	0.032	0.031	0.042
	(0.165)	(0.193)	(0.169)	(0.175)	(0.151)	(0.196)	(0.197)	(0.175)
Europe	-0.023	-0.081**	-0.028	-0.064*	0.006	-0.086**	-0.089**	-0.069**
	(0.040)	(0.036)	(0.036)	(0.036)	(0.048)	(0.038)	(0.035)	(0.031)
Observations	4204	4204	4204	4204	4204	4204	4204	4204
R^2	0.466	0.437	0.448	0.445	0.461	0.436	0.436	0.442
$R^2 Adj.$	0.441	0.431	0.444	0.440	0.456	0.431	0.430	0.436
$R^2 Within$	0.385	0.375	0.388	0.384	0.402	0.374	0.374	0.380
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y

Table 21

This table provides the results of the fixed effects regression analysis on the relationship between a company's lagged ESG performance and its cost of debt, by dividing the sample into high and low ESG risk exposure industries. The sample contains 4204 bonds issued between January 1, 2014 and December 31, 2021 by 385 companies. The dependent variable is the natural logarithm of the yield to maturity of the corporate bond as of issuance and the corresponding government bond yield using linear interpolation. The main explanatory variable in column (1) and (2) is the lagged ESG overall score, in (3) and (4) the lagged environmental, social and governance scores, in (5) and (6) the breakdown into lagged ESG overall score quartiles and in (7) and (8) the breakdown into lagged environmental, social and governance score quartiles. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	High Risk	*Low Risk*	*High Risk*	*Low Risk*	*High Risk*	*Low Risk*	*High Risk*	*Low Risk*
LagESGOverall	-0.611	-0.464***						
	(0.766)	(0.077)						
LagE			-0.093	-0.001				
			(0.108)	(0.008)				
LagS			-0.038*	-0.019				
			(0.015)	(0.013)				
LagG			-0.015	-0.018				
			(0.033)	(0.013)				
LagESGOverallQ2					0.267	-0.024		
					(0.300)	(0.039)		
LagESGOverallQ3					-0.026	-0.263***		
					(0.263)	(0.033)		
LagESGOverallQ4					-0.046	-0.260***		
					(0.335)	(0.044)		
LagEQ2							-0.107	-0.067***
							(0.273)	(0.020)
LagEQ3							-0.274	-0.067
							(0.318)	(0.041)
LagEQ4							-0.404	-0.013
							(0.330)	(0.057)

LagSQ2							-0.091	-0.007
							(0.065)	(0.071)
LagSQ3							-0.200	-0.085***
							(0.127)	(0.022)
LagSQ4							-0.309	-0.050
							(0.170)	(0.054)
LagGQ2							-0.047	-0.094
							(0.221)	(0.065)
LagGQ3							0.069	0.062
							(0.336)	(0.051)
LagGQ4							0.121	-0.111**
							(0.334)	(0.042)
lnIssueAmount	-0.029	-0.001	-0.026	0.001	-0.029	-0.001	-0.023	0.004
	(0.016)	(0.014)	(0.016)	(0.016)	(0.014)	(0.012)	(0.028)	(0.016)
IssueYearsToMaturity	0.034**	0.024***	0.034**	0.024***	0.034**	0.025***	0.034**	0.024***
	(0.008)	(0.004)	(0.008)	(0.004)	(0.008)	(0.004)	(0.009)	(0.004)
Call_Flag	0.261***	-0.179**	0.307**	-0.165**	0.283***	-0.195**	0.301**	-0.177**
	(0.020)	(0.075)	(0.059)	(0.070)	(0.048)	(0.073)	(0.053)	(0.076)
GrayZone	0.266	-0.126**	0.205	-0.148***	0.172	-0.120**	0.127	-0.147**
	(0.205)	(0.047)	(0.252)	(0.048)	(0.147)	(0.045)	(0.310)	(0.050)
SafeZone	0.564	-0.072	0.612	-0.090	0.059	-0.060	0.699*	-0.082
	(0.275)	(0.057)	(0.292)	(0.064)	(0.323)	(0.058)	(0.238)	(0.067)
TobinsQ	-0.177	-0.115***	0.207	-0.129***	-0.166	-0.117***	-0.333***	-0.128***
	(0.157)	(0.011)	(0.106)	(0.011)	(0.133)	(0.011)	(0.036)	(0.011)
Volatility	0.096*	0.058***	0.089*	0.061***	0.074	0.060***	0.077***	0.061***
	(0.040)	(0.009)	(0.037)	(0.010)	(0.036)	(0.009)	(0.007)	(0.010)
Leverage	0.916***	0.451**	1.036***	0.428**	0.745	0.449**	1.396	0.448**
	(0.119)	(0.164)	(0.109)	(0.187)	(0.638)	(0.160)	(1.756)	(0.162)
InterestCoverage	-0.007***	-0.006**	-0.006	-0.007**	-0.004	-0.006**	-0.006	-0.007**
	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Loss	-0.136	0.129*	-0.082	0.120	-0.016	0.136*	-0.008	0.122
	(0.323)	(0.073)	(0.235)	(0.080)	(0.247)	(0.064)	(0.264)	(0.080)

ROA	-4.818	0.948	-4.111	1.188	-4.133	0.684	-2.556	0.905
	(7.476)	(1.562)	(6.828)	(1.556)	(8.729)	(1.604)	(5.074)	(1.454)
Size	-0.291	-0.162***	-0.318**	-0.171***	-0.211*	-0.162***	-0.343**	-0.170***
	(0.127)	(0.043)	(0.099)	(0.040)	(0.076)	(0.039)	(0.103)	(0.038)
WC	-3.067	0.073	-2.922	0.060	-1.265	0.058	-3.267*	0.059
	(2.225)	(0.156)	(1.782)	(0.187)	(1.874)	(0.149)	(1.228)	(0.162)
Europe	0.905***	-0.005	0.852***	-0.064*	0.744***	0.019	0.731***	-0.065**
	(0.134)	(0.031)	(0.094)	(0.031)	(0.011)	(0.041)	(0.104)	(0.028)
Observations	172	4032	172	4032	172	4032	172	4032
R^2	0.708	0.448	0.708	0.437	0.712	0.458	0.717	0.442
$R^2 Adj.$	0.658	0.443	0.653	0.432	0.658	0.453	0.650	0.436
$R^2 Within$	0.516	0.373	0.516	0.361	0.523	0.385	0.532	0.367
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y

Table 22

This table provides the results of the fixed effects regression analysis on the relationship between a company's lagged ESG performance and its cost of debt. The sample contains 2953 bonds issued between January 1, 2014 and December 31, 2019 by 335 companies. The dependent variable is the natural logarithm of the yield to maturity of the corporate bond as of issuance and the corresponding government bond yield using linear interpolation. The main explanatory variable in column (1) is the lagged ESG overall score, in (2) the lagged environmental, social and governance scores, in (3) the breakdown into lagged ESG overall score quartiles and in (4) the breakdown into lagged environmental, social and governance score quartiles. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)
LagESGOverall	-0.373***			
	(0.121)			
LagE		-0.002		
		(0.011)		
LagS		-0.003		
		(0.017)		
LagG		-0.014		
		(0.017)		
LagESGOverallQ2			-0.026	
			(0.045)	
LagESGOverallQ3			-0.081	
			(0.059)	
LagESGOverallQ4			-0.247*	
			(0.059)	
LagEQ2				-0.096*
				(0.047)
LagEQ3				-0.097**
				(0.042)
LagEQ4				0.022
				(0.088)
LagSQ2				0.090**
				(0.037)
LagSQ3				-0.099
				(0.064)
LagSQ4				0.025
				(0.062)
LagGQ2				-0.019
				(0.062)
LagGQ3				-0.071
				(0.058)
LagGQ4				-0.095
				(0.060)
lnIssueAmount	-0.011	-0.010	-0.010	-0.007
	(0.012)	(0.015)	(0.013)	(0.015)
IssueYearsToMaturity	0.023***	0.023***	0.023***	0.023***
	(0.004)	(0.004)	(0.004)	(0.004)
Call_Flag	-0.092	-0.082	-0.094	-0.081

	(0.082)	(0.091)	(0.075)	(0.102)
GrayZone	-0.114*	-0.128**	-0.105*	-0.148**
	(0.055)	(0.047)	(0.055)	(0.053)
SafeZone	-0.009	-0.021	-0.023	-0.042
	(0.087)	(0.097)	(0.090)	(0.099)
TobinsQ	-0.163***	-0.178***	-0.157***	-0.170***
	(0.031)	(0.030)	(0.029)	(0.029)
Volatility	0.075***	0.076***	0.076***	0.075***
	(0.008)	(0.010)	(0.008)	(0.010)
Leverage	0.604***	0.616**	0.610***	0.607***
	(0.203)	(0.223)	(0.195)	(0.169)
InterestCoverage	-0.005	-0.005	-0.005	-0.005
	(0.003)	(0.003)	(0.003)	(0.003)
Loss	0.029	0.018	0.038	0.031
	(0.147)	(0.164)	(0.130)	(0.145)
ROA	0.795	0.959	0.737	1.100
	(2.078)	(2.183)	(2.060)	(1.940)
Size	-0.169***	-0.177***	-0.169***	-0.183***
	(0.049)	(0.050)	(0.047)	(0.048)
WCRatio	-0.054	-0.083	-0.067	-0.017
	(0.173)	(0.210)	(0.171)	(0.168)
Europe	-0.109	-0.169**	-0.072	-0.142**
	(0.073)	(0.058)	(0.075)	(0.051)
Observations	2953	2953	2953	2953
R^2	0.437	0.429	0.442	0.445
$R^2 Adj.$	0.430	0.422	0.435	0.437
$R^2 Within$	0.380	0.372	0.385	0.389
Industry FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y

Table 23

This table provides the results of the fixed effects regression analysis on the relationship between a company's lagged ESG performance and its cost of debt during the COVID years 2020 and 2021. The sample contains 1251 bonds issued by 271 companies between January 1, 2020 and December 31, 2021. The dependent variable is the natural logarithm of the issue yield to maturity of the corporate bond and the corresponding government bond yield using linear interpolation. The main explanatory variables for regression (1), (2) and (3) is the lagged ESG overall score and for regression (4), (5) and (6) the lagged environmental score, social score, and governance score. The analysis makes use of the binary variable Shock, which takes the value of 1 for shock quarters and 0 for the post-crisis period. Shock1 takes the value of 1 for the first quarter of 2020. Shock2 takes the value of 1 for the first two quarters of 2020. Shock 3 takes the value of 1 for the first three quarters of 2020. Treatment variables are included in all models. Standard errors of the coefficients are reported in parentheses below the coefficients. P-values are reported as follows: p<0.01***; p<0.05**; p<0.1*.

	(1)	(2)	(3)	(4)	(5)	(6)
LagESGOverall	-0.624***	-0.647***	-0.551***			
	(0.085)	(0.122)	(0.177)			
LagE				-0.002	0.001	0.003
				(0.007)	(0.007)	(0.007)
LagS				-0.047***	-0.038***	-0.031**
				(0.009)	(0.011)	(0.013)
LagG				-0.019	-0.018	-0.010
				(0.027)	(0.028)	(0.032)
Shock1	-0.235*			-0.031		
	(0.110)			(0.094)		
Shock2		-0.076			0.179*	
		(0.092)			(0.089)	
Shock3			0.065			0.294**
			(0.153)			(0.129)
ESGOverall * Shock1	0.480***			0.162		
	(0.123)			(0.103)		
ESGOverall * Shock2		0.220**			-0.164*	
		(0.092)			(0.079)	
ESGOverall * Shock3			0.016*			-0.339**
			(0.181)			(0.145)

lnIssueAmount	0.010	0.012	0.012	0.014	0.016	0.014
	(0.010)	(0.009)	(0.010)	(0.011)	(0.011)	(0.011)
IssueYearsToMaturity	0.030***	0.030***	-0.030***	0.029***	0.029***	0.029***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Call_Flag	-0.423*	-0.402*	-0.416*	-0.411*	-0.410*	-0.429*
	(0.207)	(0.212)	(0.217)	(0.214)	(0.218)	(0.225)
GreyZone	-0.099*	-0.098*	-0.092	-0.090*	-0.089	-0.082
	(0.051)	(0.050)	(0.053)	(0.050)	(0.054)	(0.057)
SafeZone	-0.156**	-0.155**	-0.152**	-0.139*	-0.144*	-0.149*
	(0.057)	(0.061)	(0.063)	(0.068)	(0.075)	(0.077)
TobinsQ	-0.062***	-0.062***	-0.060***	-0.071***	-0.069***	-0.063***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Volatility	0.046**	0.047**	0.047**	0.056***	0.057***	0.055**
	(0.017)	(0.017)	(0.017)	(0.018)	(0.018)	(0.019)
Leverage	0.342	0.367	0.379*	0.243	0.291	0.308
	(0.219)	(0.217)	(0.213)	(0.242)	(0.226)	(0.217)
InterestCoverage	-0.006	-0.006	-0.006	-0.007*	-0.007*	-0.007*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Loss	0.172***	0.162***	0.163***	0.183***	0.172***	0.170***
	(0.039)	(0.035)	(0.043)	(0.039)	(0.037)	(0.043)
ROA	-1.323	-1.016	-1.150	-0.754	-0.615	-0.818
	(2.704)	(2.717)	(2.716)	(2.636)	(2.677)	(2.666)
Size	-0.172***	-0.173***	-0.172***	-0.169***	-0.171***	-0.170***
	(0.034)	(0.034)	(0.035)	(0.028)	(0.027)	(0.029)
WCRatio	-0.309	0.253	0.223	0.236	0.185	0.182
	(0.314)	(0.318)	(0.323)	(0.298)	(0.298)	(0.300)
Europe	0.123***	0.105***	0.115***	0.071*	0.073*	0.090**
	(0.031)	(0.031)	(0.032)	(0.036)	(0.034)	(0.034)
Observations	1251	1251	1251	1251	1251	1251
R^2	0.500	0.498	0.497	0.490	0.490	0.492
$R^2 Adj.$	0.488	0.486	0.484	0.476	0.477	0.479

$R^2Within$	0.450	0.448	0.447	0.439	0.440	0.442
Industry FE	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y

Appendix B – Figures

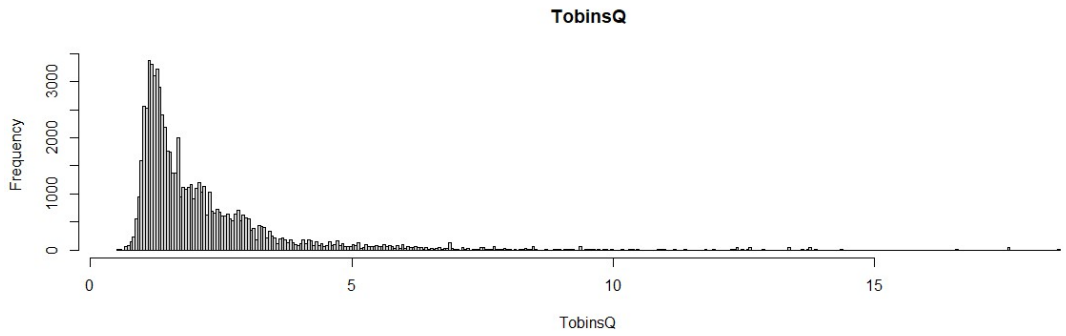


Figure 3: Tobin's Q Distribution before truncation

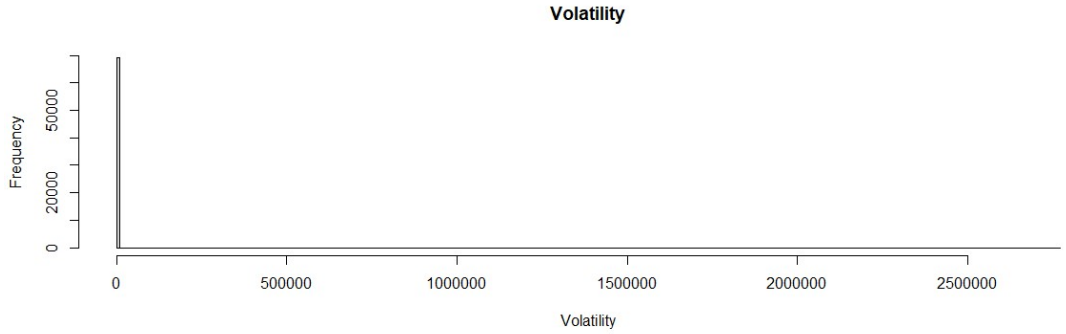


Figure 4 Volatility distribution before truncation

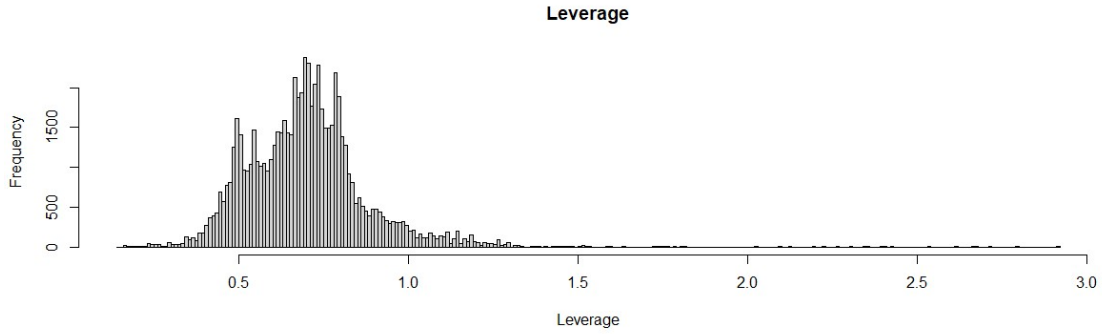


Figure 5 Leverage distribution before truncation

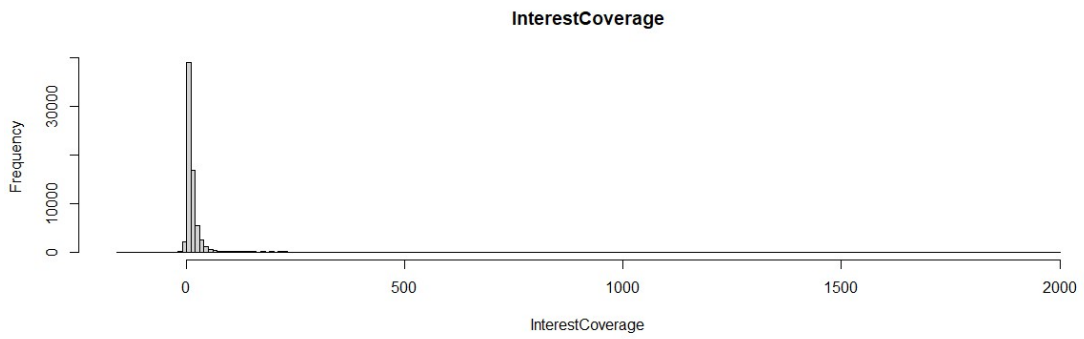


Figure 6 Interest Coverage distribution before truncation

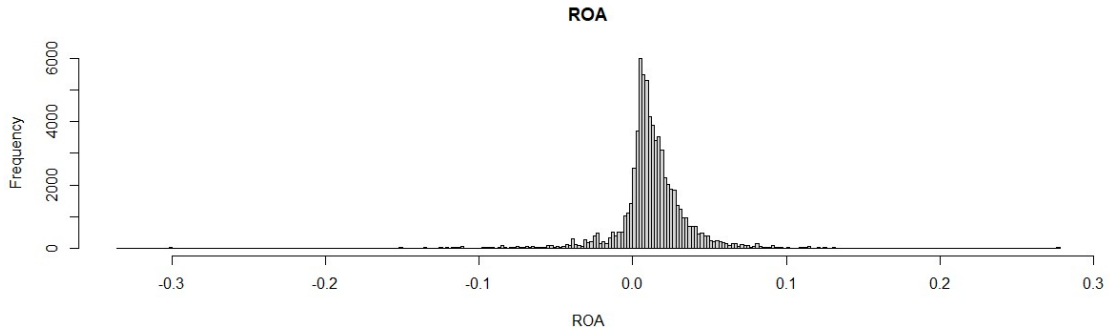


Figure 7 ROA distribution before truncation

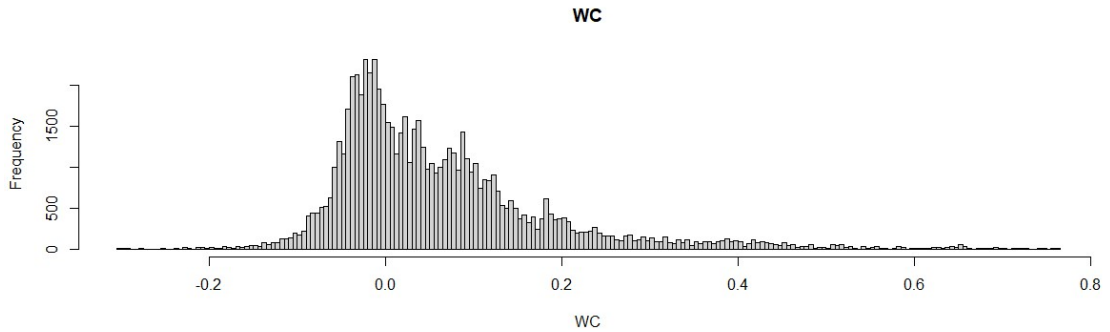


Figure 8 WC Ratio distribution before truncation

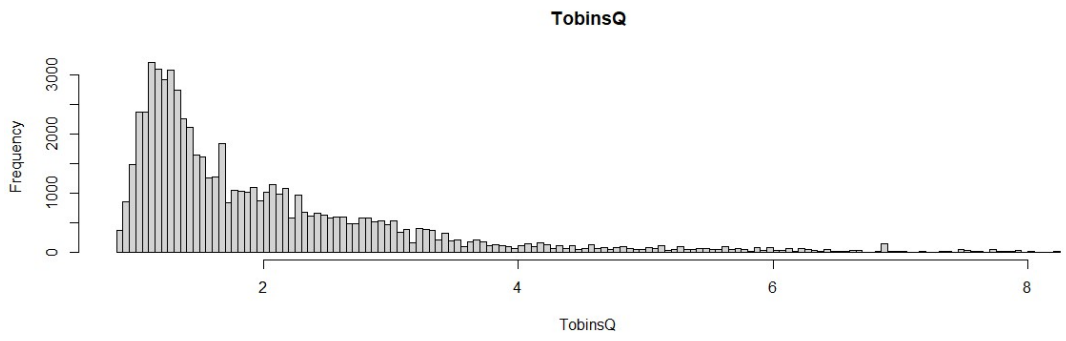


Figure 9 Tobin's Q distribution after truncation

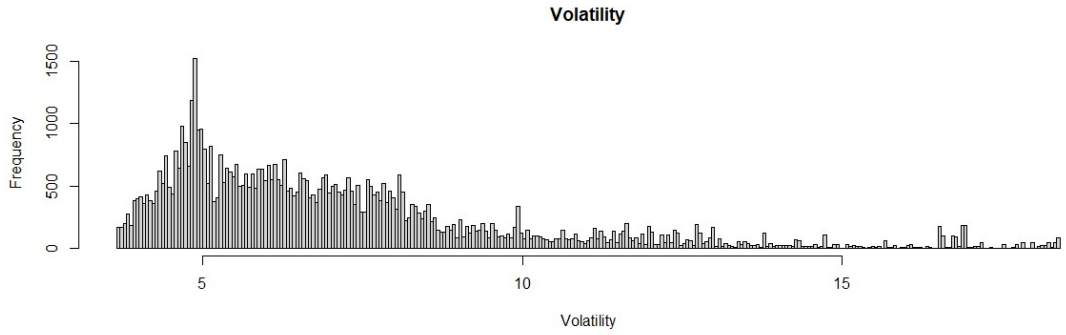


Figure 10 Volatility distribution after truncation

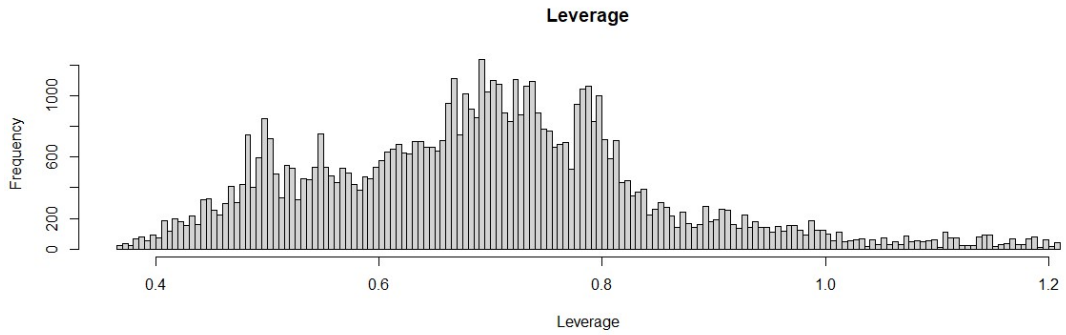


Figure 11 Leverage distribution after truncation

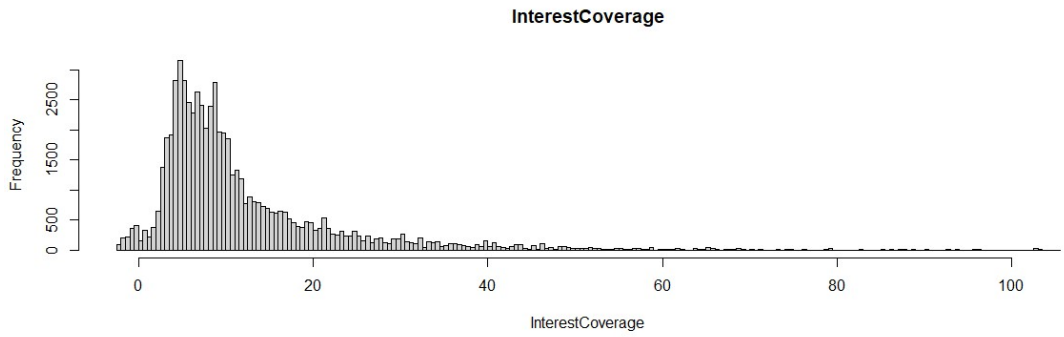


Figure 12 Interest Coverage distribution after truncation

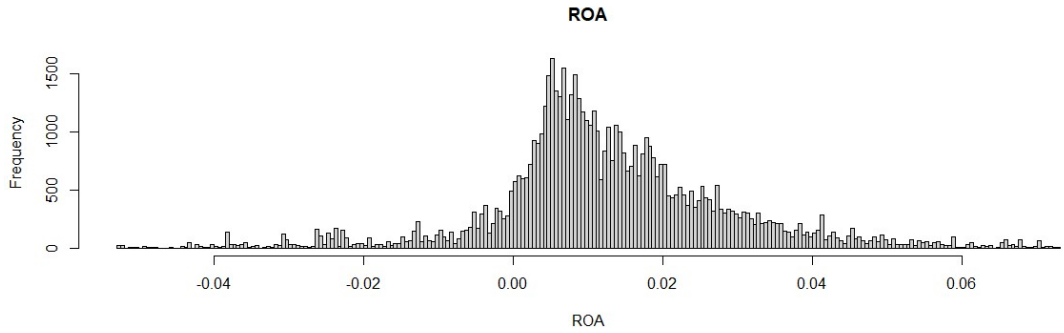


Figure 13 ROA distribution after truncation

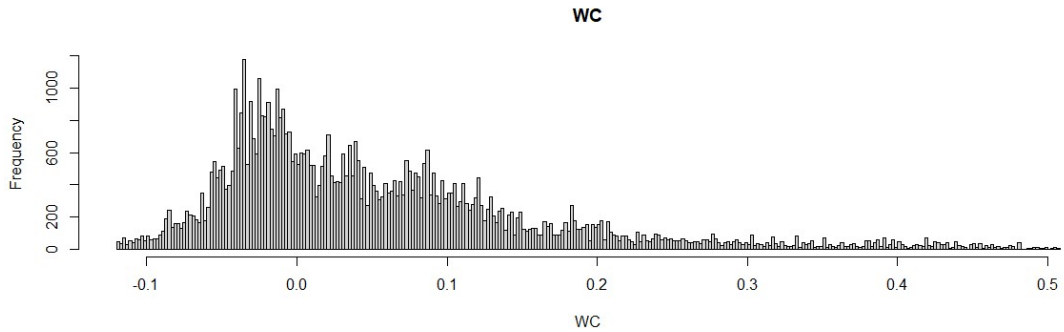


Figure 14 WC Ratio distribution after truncation

Appendix C – Official Statement of Original Thesis

By signing this statement, I hereby acknowledge the submitted thesis (hereafter mentioned as "product"), titled:

"The relationship between ESG performance and cost of debt during the COVID-19 crisis - a cushion for the economic downturn"

to be produced independently by me, without external help.

Wherever I paraphrase or cite literally, a reference to the original source (journal, book, report, internet, etc.) is given.

By signing this statement, I explicitly declare that I am aware of the fraud sanctions as stated in the Education and Examination Regulations (EERs) of the SBE.

Place: Cologne

Date: 14.04.2022

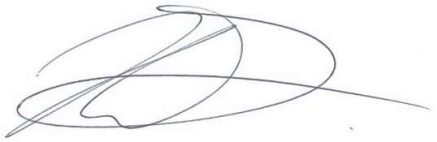
First and last name: Hasan Duran

Study program: International Business – Strategic Corporate Finance

Course/skill: Writing a Master Thesis

ID number: i6259382

Signature:



Appendix D – R Programming Code

The full code and all datasets can be found on GitHub under the following link *https:// https://github.com/hasanduranmaastricht/ThesisHasan*