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The impact of a company's ESG score on the cost of debt during and before the Covid-19 crisis

Abstract

The role corporate social responsibility plays in the financial success of corporations has been extensively researched in the literature. However, there is no consensus about the relationship between ESG scores and the cost of debt. This thesis empirically examines the relationship between ESG scores and the cost of debt before and during the Covid-19 crisis for consolidated ESG scores as well as for the stand-alone E, S and G pillar scores. The objective of this thesis is to answer the question whether the relationship between the cost of debt and ESG scores was stronger during the Covid-19 crisis compared to more stable times, which is expected to be the case due to the increased importance of risk management and social trust during times of crisis. To investigate this relationship 3,177 bonds that were issued by 335 different U.S. listed firms were analysed over the period 2010-2021. The empirical study shows that there was a negative relationship between the cost of debt and the consolidated ESG score as well as the stand-alone E,S and G pillar scores in the 10 years prior to the Covid-19 crisis. During the Covid-19 crisis the negative relationships change to non-significant relationships for the consolidated ESG score and stand-alone Environmental and Governance pillar scores and changes into a stronger negative relationship for the stand-alone Social pillar score. When comparing the relationships during the Covid-19 crisis to the relationships before the crisis for the independent industries, a stronger significant negative relationship was found between the consolidated ESG score and the cost of debt for the communication, consumer discretionary and real estate industry during the crisis. A stronger significant negative relationship between the Environmental pillar score and the cost of debt was found for the consumer discretionary and real estate industry during the crisis. A stronger significant negative relationship between the Social pillar score and the cost of debt was found for the consumer staples and real estate industry during the crisis. A stronger significant negative relationship between the Social pillar score and the cost of debt was found for the communication and energy industry during the crisis. Stronger significant positive relationships were found between the Social pillar score and the cost of debt for the communication industry and between the Governance pillar score and the cost of debt for the utilities industry during the crisis.

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1. Introduction

In October 2021 ABP, one of the world's biggest pension funds, divested all of its interests, worth 57 million Euros, in mining giant Glencore. ABP divested its interest in Glencore due to the large sustainability risks the company faces. Next to Glencore, ABP declared that it will divest 15 billion Euros of investments in fossil fuel producers by 2023 in order to reduce the carbon footprint of its portfolios (Sterling, 2021). The pension fund stated it will only invest in companies that are behind in the field of corporate social responsibility (CSR) if it is expected that they will improve themselves: "If we don't see enough progress or if the outlook isn't good enough, we will sell our stake in the company" (Feenstra, 2021). The decisions of ABP reflect the increased importance of a company's Environmental, Social and Governance (ESG) characteristics in the investment process of institutional investors. According to the 2020 Global Sustainable Investment Review (GSIA, 2021), the market for sustainable investing has grown extensively over the last few years, with assets under management (AUM) of 35.3 trillion Dollars in 2020, which was a 15% increase compared to the AUM in 2018.

When observing the enormous influx of money to companies with high ESG scores, two relevant questions arise. The first question that arises is what the effect of ESG scores is on the cost of equity and the second question that arises is what the effect of ESG scores is on the cost of debt. The first question has been thoroughly analysed in the literature and most of the research finds that high ESG scores lead to a lower cost of equity (Crifo et al., 2015; Dhaliwal et al., 2011; Ng & Rezaee, 2015). The negative relationship between the cost of equity and ESG scores can be explained by the fact that firms that disclose on ESG factors are more transparent which leads to less information asymmetry and thus to a lower cost of equity. The relationship between ESG and the cost of debt has been researched to a much lesser extent and the academic papers that did research the relationship present varying results (Cantino et al., 2017).

The Covid-19 crisis has been one of the most destabilizing events in the last five decades and simultaneously impacted public health systems and economic trajectories worldwide. It is vital for investors to avoid risks and opt for long-term certainty during times of crisis, which is why money inflow to firms with high ESG scores drastically increased during the Covid-19 crisis (Stevens, 2020). A pertinent question that should be asked is whether companies with high ESG scores actually are a safe haven for investors during a crisis. According to research, companies with a high level of corporate social responsibility (CSR) performed substantially better during the 2008

financial crisis compared to those with a low level of CSR. Lins et al. (2017) found that during the 2008 financial crisis, companies with high CSR intensity had stock returns that were four to seven percentage points higher compared to firms with low CSR intensity and that firms with high CSR intensity were able to issue more debt. Amiraslani et al. (2018) found that during the 2008 financial crisis, firms with high CSR intensity were able to raise more debt at lower market yield spreads, had better credit ratings and were able to issue debt with longer maturities. The better performance of sustainable assets during times of crisis can be explained by the importance of social trust in companies, where CSR intensity should be seen as a proxy for social trust (Amiraslani et al., 2018; Lins et al., 2017). Although the relationship between ESG scores and the cost of debt during the financial crisis has been analysed, there is still no clarity regarding the relationship during the Covid-19 crisis. In light of the presented arguments, this thesis aims to clarify the relationship between ESG scores and the cost of debt during and before the Covid-19 crisis. To do this the following research question will be addressed:

Was the relationship between a company's ESG score and its cost of debt stronger during the Covid-19 crisis compared to more stable times?

Due to the fact that debt capital markets are an important source of external financing for many companies, understanding the factors that influence the cost of debt is crucial. Because companies have control over their ESG performance it is of practical relevance for companies that use debt financing to answer the stated research question. The existing literature provides insight into the relationship between ESG scores and the cost of debt during the financial crisis. This thesis adds to the existing literature by analysing the relationship during and before the Covid-19 crisis. To answer the research question a quantitative data analysis has been performed using data concerning the companies that are listed on the Russell 3000 Index. Both the relationship between the cost of debt and composite ESG scores, and the relationship between the cost of debt and the stand-alone E, S and G pillar scores have been analysed. In the methodology section a detailed description of this analysis will be given.

This thesis is divided into several sections. The first section provides an introduction. In the second section the available literature and empirical research concerning the topic will be discussed and hypotheses will be stated. In the third section, the methods and data that were used

to test the hypotheses will be discussed. In the fourth section the obtained results will be presented. In the fifth section the discussion of the obtained results will be presented and in the sixth section a conclusion will be drawn.

2. Literature review

2.1. CSR/ESG incentives

According to the neoclassical approach firms should only focus on the maximization of profits and all expenditures that do not contribute to a higher profit should be seen as redundant expenses (Friedman, 1970). According to this view, investments in CSR should be seen as unnecessary. However, due to the increased importance that key stakeholders give to ESG performance it is crucial for companies to incorporate a CSR policy in order to remain competitive. A CSR policy is directed at improving the impact that corporations have on the environment, people and society (Kanji & Chopra, 2010). ESG scores form an instrument to measure and report the goals that a company has achieved regarding CSR and focuses on a company's sustainability. There is not one uniform theory that explains why firms incorporate a CSR policy but social and political theories give the most insightful perspective on CSR implementation and point out the opposite of what the neoclassical approach describes to be the best way for corporations to act (Gray et al., 1995). The most accepted social and political theories are stakeholder theory, legitimacy theory and institutional theory (Fernando & Lawrence, 2014).

Stakeholder theory defines a stakeholder as: "any group or individual who can affect or is affected by the achievement of the firm's objectives" (Freeman, 2010). Examples of key stakeholders are customers, employees, governments, shareholders, local communities, suppliers and vendors. The theory states that a company that satisfies the demands of all its stakeholders, not just its shareholders, will eventually be more successful in selling their products or services compared to companies that don't satisfy these demands. Because ethical behaviour leads to improved relationships with all stakeholders, firms that prioritise all stakeholders will have lower agency costs, transaction costs and other relationship related costs (Jones, 1995). Due to the lower costs, firms that focus on all stakeholders will have a competitive advantage over firms that do not. This forms an incentive for corporations to apply CSR procedures.

Legitimacy theory highlights that corporations strive to be recognized as entities that operate within the boundaries set by the norms and values present in the society they are a part of (Suchman, 1995). According to legitimacy theory, a company that does not behave according to what is expected of them by society will face a competitive disadvantage compared to companies that do behave according to these expectations. A company that wants to be regarded as a "good" entity by society has an incentive to incorporate a CSR policy and disclose its ESG achievements

in order to be regarded as legitimate. Because of the increased value that our society gives to combating climate change, ESG performance has become more important in order for companies to be regarded as legitimate (Okafor et al., 2021).

Institutional theory is based on the principle of isomorphism, which means that entities operating within the same environment tend to mimic each other. The theory points out that corporations that operate within a social structure with the same norms and values tend to behave in a likewise manner. There are three forms of isomorphism: coercive isomorphism, mimetic isomorphism and normative isomorphism (DiMaggio & Powell, 1983). Coercive isomorphism is caused by external circumstances, for example key stakeholders that coerce corporations to behave in a certain way in a specific industry. If stakeholders have certain expectations of companies operating within an industry, the companies operating in that industry will try to act in a way that meets the expectations of the stakeholders which leads to isomorphism in that industry. Mimetic isomorphism is related to legitimacy theory since both focus on the importance of a company's legitimacy. If a company fails to adopt innovative institutional practices which their competitors do follow, that company will lose its competitive advantage regarding legitimacy. This forms an incentive to act in the same way as competitors. Normative isomorphism is caused by certain norms and values that are present in a specific industry. These norms and values form a pressure for corporations to act in a certain manner which leads to isomorphism. Because corporate social responsibility is increasingly important for stakeholders, the different forms of isomorphism are an explanation for the fact that many companies incorporate a CSR policy.

All stated theories form an explanation for firms that implement a CSR policy. From all theories it follows that firms that have implemented a CSR policy and have high ESG scores have better relationships with their stakeholders compared to firms that have not implemented a CSR policy and have low ESG scores. Because firms with high CSR intensity have better relationships with their stakeholders they accrue social capital. Social capital can be defined as valuable resources for firms/individuals that include "authority relations, relations of trust, and consensual allocations of rights which establish norms" (Coleman, 1988). Firms with more social capital will also have more moral reputational capital. Moral reputational capital can be described as an intangible asset in the form of a good reputation that is generated by a positive assessment of a company's moral behaviour by its stakeholders. This moral reputational capital creates value because it works as an insurance policy against a firms relationship-based intangible assets in

scenarios of conflict, because it gives companies the benefit of the doubt if they acted wrongfully which leads to leniency in the punishment (Godfrey, 2005). Social and moral reputational capital play an important role for the relationship between ESG scores and the cost of debt.

2.2. The cost of debt

The cost of debt is the interest that a company pays on its outstanding debt. The interest that is paid on bonds is measured by the credit spread, which should be regarded as the remuneration an investor receives for taking on more risk compared to investing in 10 year U.S. Treasury bonds. The value of the credit spread is thus determined by the risk that a company does not pay back the principal of a loan, this risk is called a company's credit risk. There are three commercial credit rating companies that yield much influence: Moody's, Standard & Poors and Fitch. The commercial credit rating agencies fundamentally assess the credit risk of corporations using the fundamental approach to corporate credit.

When a company needs external financing, the company in question has several options, namely issuing debt, hybrid securities (e.g. convertible bonds) or equity. According to the pecking order theory there exists a financing hierarchy among the different financing options and firms prefer the option that is least affected by information asymmetry because information asymmetry increases financing costs (Myers & Maljuf, 1984). Since debt instruments are least affected by information asymmetry, debt financing is preferred above hybrid securities and equity. It is therefore crucial to understand what determines the cost of debt.

Credit analysts at rating agencies look at several things when analysing a corporate bond's default risk: covenants, collateral and the ability of a company to repay the principal. Covenants are provisions that have been included in the prospectus of a certain bond and provide rules for management decisions and form a protection for the investor. Strict covenants are associated with a better credit rating. Collateral is important in case the company defaults. In the case that a company defaults, the investor can claim ownership of the collateral, if there is any. Loans with collateral agreements have better credit ratings. When analysing the ability of a company to repay the principal, credit analysts look at a company's business risk, corporate governance risk and financial risk. Business risk is determined by looking at a company's operating cash flows. Corporate governance risk encompasses management behaviour, policies for financial disclosure

and the ownership structure of a company. Financial risk is measured by looking at financial ratios like liquidity and solvency (M. Pieterse-Bloem, personal communication, November 2021). Although credit risk is important for estimating credit spreads, previous studies found that a company's credit spread cannot entirely be explained by credit risks. The gap between actual credit spreads and expected credit spreads that are constructed using credit risk is called the credit spread puzzle (Amato & Remolona, 2003). Because the credit spread can not be fully explained by credit risk, there must be other factors that affect the credit spread. ESG scores might be a factor that affects credit spreads.

2.3. ESG and the cost of debt

Most of the relevant literature that examines the relationship between ESG scores and the cost of debt from a theoretical perspective expect the relationship to be negative for different reasons. The first reason is associated with the fact that social capital leads to a lower cost of debt and ESG scores form a proxy for investments in social capital. The second reason is that healthy ESG scores reduce the riskiness of a company. The empirical results concerning the relationship between ESG scores and the cost of debt will first be addressed after which the relationship will be elaborated upon from a theoretical perspective.

2.3.1. Empirical results concerning the ESG scores and the cost of debt

Prior empirical research found different results when analysing the relationship between ESG scores and the cost of debt. Menz (2010) analysed 498 European bonds from 2004 to 2007 and found, contrasting to what he expected, that there exists a positive relationship between ESG scores and the cost of debt. However the relationship was only weakly significant. Amiraslani et al. (2018) found that there was a nonexistent relationship during normal times but they found that there was a negative relationship during the financial crisis. A more recent study by Aboud et al. (2021) examined the relationship for European countries and found that higher ESG scores lead to a lower cost of debt. Ge & Lui (2015) examined the relationship of approximately 4000 bonds in the period from 1992 to 2009 and found that firms with higher ESG scores are associated with lower yield spreads when issuing new bonds. Oikonomou et al. (2014) also indicate that there exists a negative relationship between ESG scores and the cost of debt. Although most of the

research shows a negative relationship, there is no consensus among the results since negative, positive and nonexistent relationships have been found.

2.3.2. Social capital

Within companies that use both debt and equity financing there is a conflict between the interests of stockholders and debtholders which leads to agency costs of debt. Stockholders want to maximise the return they make on their investment and because taking risks may lead to returns, stockholders want managers to take on risky projects which is why stockholders can be described as risk seeking. Debtholders get a fixed interest on their investment and taking on extra risk will not yield a higher return for debtholders but will increase the probability of default which is why debtholders can be classified as risk averse. When managers take risks, the stockholders reap all the benefits while the debtholders bear the risk but don't get compensated for it. When a debtholder lends money, the interest he receives is based on the risk of a firm at a certain point in time. Asset substitution is a form of risk-shifting and happens if managers that act in the interest of stockholders increase the amount of risk after obtaining low interest debt financing (Jensen & Meckling, 1976). These agency costs of debt will decrease if a company has more social capital. If a company has a lot of social capital, debtholders will trust that managers will not participate in asset substitution and debtholders will demand a lower interest rate (Amiraslani, et al., 2018). So social capital reduces the agency costs of debt and therefore the cost of debt for companies with a lot of social capital will be lower compared to companies with less social capital. By investing in social capital, managers can signal to debt investors that they can be trusted. Investing resources in order to improve ESG scores is a way to build this trust and thus ESG scores can be seen as an insurance policy against asset substitution.

Another reason why social capital might lead to a lower cost of debt is due to reciprocity. Reciprocity in this context entails that firms that are good to its stakeholders will have stakeholders that will be good to them (Fehr & Gächter, 2000). Cooperative stakeholders reduce the cost of debt because stakeholders that are willing to help the company thrive, will decrease the probability of a company's default.

2.3.3. Stand-alone CSR measures

Most of the prior research focusses on the relationship between consolidated ESG scores and the cost of debt. In order to get a better understanding of this relationship, the relationship between the stand-alone Environmental, Social and Governance pillar scores and the cost of debt will now be further examined. Several practical examples are discussed in order to demonstrate the importance of the different pillar scores.

2.3.3.1. Environmental pillar scores

In 2006 Trafigura, a global commodity trading firm, dumped caustic soda and other toxic waste at several sites in Ivory Coast. This action caused severe health issues for more than 30,000 people and lead to the death of 17. Due to the problems created by the incident, Trafigura agreed to pay USD 42 million to the victims in 2009. Next to the financial consequences, Trafigura suffered enormous reputational damage. The Trafigura case forms a good example of the disastrous effects that environmental issues can cause for a firm. Prior research found that environmental disasters lead to a declining share price, the loss of customers, reputational damage and many other indirect costs (Klassen & McLaughlin, 1996). Bauer & Hann (2010) found that the legal, reputational and regulatory risks associated with environmental concerns raises the cost of debt and that proactively managing environmental risks reduces the costs of debt. With the introduction of the Emission Trading System (ETS) in 2005 the importance of managing environmental sustainability increased because emitting carbon dioxide above a certain level will cost a company valuable resources. Not all studies find that there exists a negative relationship between the cost of debt and environmental risk management. Sharman & Fernando (2008) find that that there exists a positive relationship between environmental risk management and the cost of debt. This can be explained by the neoclassical economics theory that sees environmental expenditures as a waste of valuable resources (Friedman 1970; Jensen, 2002). Since the environment plays an increasingly important role in our society, the neoclassical theory seems outdated and the argument that states that environmental risk mitigation leads to a lower cost of debt makes more sense. It is therefore expected that there exists a negative relationship between the Environmental pillar score and the cost of debt.

2.3.3.2. Social pillar scores

The social pillar score takes into account factors that measure a company's relationship with people. When a company performs well on the social pillar score, its relationships with stakeholders will improve, which will lead to an increase of social capital. As has been described earlier, it is expected that more social capital leads to a lower cost of debt.

Employees are important stakeholders and it is in the interest of companies to maintain a good relationship with them. Since bad relationships with employees might lead to resignations and weaker performance, and because employees are directly responsible for revenue generation, it is of great importance for debtholders that corporations maintain good relationships with their employees. The negligence of this relationship will lead to a greater risk of default (Turnley & Feldman, 1999). Another reason for increased default risk is that bad relationships with employees might lead to legal disputes which directly impacts a company's cashflows and therefore its ability to pay back debtholders. Bauer et al. (2009) examined the effect that good employee relations have on the cost of debt and found that better relationships lead to a lower cost of debt. Following the given argumentation and empirical results it is expected that the relationship between the cost of debt and Social pillar scores is negative.

2.3.3.3. Governance pillar scores

One of the most disastrous bankruptcies of the 21st century was the collapse of Enron. Enron was a reputable American energy company and employed over 29,000 people. In 2001 the company filed for bankruptcy due to large scale accounting fraud by the senior management of the company. The large scale fraud was able to happen because the company had neglected to implement decent corporate governance mechanisms. The Enron bankruptcy serves as a textbook example of the importance of decent corporate governance mechanisms for large corporations. According to prior research, unethical behaviour and fraud by management have played a significant role in the bankruptcy of many large corporations (Bollen et al., 2005). The implementation of corporate governance mechanisms mitigates the risk that management behaves unethically or fraudulently. Companies that have a high Governance pillar score will therefore have a lower chance of default. It is therefore expected that high Governance pillar scores are associated with a lower cost of debt.

2.4. ESG and the cost of debt during crises

The question whether the relationship between ESG scores and the cost of debt was affected during the 2008 financial crisis has been analysed by Amiraslani et al. (2018). Their paper finds no significant relationship during 'normal' times and a significant negative relationship during the financial crisis. This negative relationship can be explained by the fact that ESG scores form a proxy for investments in social capital and social capital leads to a lower cost of debt.

As has been discussed, social capital mitigates the risk of asset substitution because debt investors trust managers not to participate in risk-shifting, which decreases the cost of debt. Because overall trust in companies is low in times of crisis, social capital plays a more important role if the economy is in a recession Amiraslani et al. (2018). For this reason it is even more important for debt investors to trust the managers of their portfolio companies in times of crisis.

Social capital also adds value because of reciprocity, which is of particular value for debtholders in times of crisis. Because the probability of default is higher during times of crisis, social capital plays a more important role during times of crisis because cooperating stakeholders will be able to decrease the probability of default (Fehr & Gächter, 2000). In line with the given argumentation it is expected that the relationship between ESG scores and the cost of debt will be stronger during times of crisis compared to more stable times.

2.5. Hypotheses

To answer the research question, that asks whether the relationship between ESG scores and the cost of debt was stronger during the Covid-19 crisis compared to more stable times, several hypotheses were tested. The presented literature and empirical studies are a guideline for the formulation of the hypotheses. Hypotheses were stated for the relationship between consolidated ESG scores and the cost of debt as well as for the relationship between the cost of debt and the stand-alone Environmental, Social and Governance pillar scores. The rationale behind the relationships before and during the crisis is the same for all ESG measures.[1] Because firms with high ESG scores are less risky and have more social capital which decreases agency problems, the first hypotheses will expect a negative relationship before the covid-19 crisis. The Covid-19 crisis

[1] Risk and reputation loss mitigation leads to a lower cost of debt and social capital leads to the mitigation of the risk of asset substitution.

increased the default risk of almost all corporations and resulted in a loss of trust in firms and capital markets in general. Due to these circumstances it is expected that social capital played a more important role during the Covid-19 crisis. Hence a stronger negative relationship between ESG scores and the cost of debt is expected. Following this line of reasoning, the following hypotheses will be tested:

H1: "The relationship between consolidated ESG scores and the cost of debt was negative before the Covid-19 crisis"

H2: "The relationship between consolidated ESG scores and the cost of debt was negative during the Covid-19 crisis and this relationship was stronger compared to the relationship before the crisis"

H3: "The relationship between the stand-alone Environmental, Social and Governance pillar scores and the cost of debt was negative before the Covid-19 crisis"

H4: "The relationship between the stand-alone Environmental, Social and Governance pillar scores and the cost of debt was negative during the Covid-19 crisis and this relationship was stronger compared to the relationship before the crisis"

3. Methodology & Data

In this section the methodology that has been used to answer the research question will be elaborated upon. Using the described methodology, the hypotheses stated in section 2 will be tested. Also the data that have been used to perform the analysis will be discussed and descriptive statistics regarding the data will be presented. Firstly the variables that were used in the analysis will be discussed after which the empirical design will be explained.

3.1. Independent and dependent variables

To answer the stated hypotheses, this thesis used several independent variables in order to quantify the relationship between ESG scores and the cost of debt. The independent variables that were used are: the consolidated ESG scores, the Environmental pillar score, the Social pillar score and the Governance pillar score.

The consolidated ESG score is an overall company score based on the Environmental, Social and Governance pillar scores. The Environmental pillar score assesses a business's impact on natural systems and ecosystems as a whole. The Environmental pillar score measures how well a company manages Environmental risks and seizes Environmental opportunities to build long-term shareholder value (Refinitiv Eikon database, 2022).

The Social pillar score assesses a company's ability to build trust among its employees, clients, the general public and other key stakeholders. It represents the company's legitimacy and reputation, both of which are important variables in determining the company's capacity to generate long-term shareholder value (Refinitiv Eikon database, 2022).

The Governance pillar score assesses a company's infrastructure and procedures that assure its management behaves in the long-term interests of its shareholders. It represents a company's ability to govern and control its management by establishing incentives and oversight in order to maximize long-term shareholder value (Refinitiv Eikon database, 2022).

The consolidated ESG and stand-alone E,S and G scores are rated on a scale from 0-100. This thesis divides the observed companies into different categories based on their ESG scores. Companies that have consolidated ESG or stand-alone E,S and G scores between 0 and 20 fall in category 1, companies that score between 20 and 40 fall in category 2, companies that score between 40 and 60 fall in category 3, companies that score between 60 and 80 fall in category 4 and companies that score above 80 fall in category 5.

The dependent variable is the Yield Spread, measured by the difference between U.S. Treasury bond yields and corporate bond yields on a yearly basis. The Yield Spread is measured in basis points. In order to mitigate omitted variable bias, several control variables were added to the models. These will now be discussed.

3.2. Control variables

This thesis uses the same control variables used in the study by Menz (2010), that investigates the relationship between the cost of debt and ESG scores. These variables are: firm size (total assets), the amount of leverage (debt ratio), return on assets (EBIT/Total assets), interest coverage ratio (EBIT/interest expenses), credit risk rating, bond maturity and dummies for different industries. Not adding control variables causes omitted variable bias which leads to spurious regressions. The rationale behind adding the control variables will be discussed.

3.2.1. Firm size

The size of a company has to be included as a control variable for two reasons. Firstly large firms have the financial capability to implement a more extensive CSR policy which causes firms to have better ESG scores (Drempetic et al., 2020). Secondly firm size is associated with less risk which leads to a lower cost of debt (Fama & French, 1993). Total assets are included in the model as a proxy for firm size.

3.2.2. Leverage

Firms with high amounts of leverage have a significant interest burden. Because firms with high leverage need to pay periodical interest, its future returns are predicted to be lower compared to companies with less leverage. This is due to the lower operating flexibility that is caused by the interest payments (Akron et Al., 2022). Due to the lower operating flexibility and lower future income, firms with more leverage have a larger risk of default which results in a higher cost of debt. It is also expected that the lower operating flexibility limits a company's ability to implement a CSR policy which results in lower ESG scores (McGuire et al., 1988). To control for a company's leverage, debt ratio is added as a proxy for the amount of leverage.

3.2.3. Return on assets & interest coverage ratio

Return on assets (ROA) and the interest coverage ratio are financial indicators that respectively measure the efficiency of a company's management to generate income with existing assets and a company's ability to pay interest due on outstanding debt. These financial ratios are an indicator of a firm's business risk. A high ROA indicates that a firm is operating efficiently which is associated with less risk and a higher debt capacity. A high interest coverage ratio indicates that a company is able to pay interest on its outstanding debt which is also associated with less risk. Since both ratios have an effect on a company's riskiness they will also impact the cost of debt and thus have to be controlled for.

3.2.4. Credit risk rating

The credit risk ratings that are assigned to companies by the largest risk rating agencies[2] are an important determinant of the credit spread. In order to assure that the ESG variable in the model is not only measuring the credit risk of companies, the credit risk ratings, ranging from 1-10, will be added to the model. An explanation of the rating scale is presented in table A2.

3.2.5. Maturity

Bonds are being affected by interest rate risk because the price of bonds fluctuate as a consequence of movements in market yields (Fama & French, 1993). According to the liquidity preference theory investors prefer assets that are more liquid to assets that are less liquid and therefore demand a higher premium for less liquid assets (Tobin, 1958). Bonds with a long maturity face higher interest rate risk and are less liquid compared to assets with a short maturity and therefore the interest on bonds with long maturities is higher. To control for this the maturity, measured in years is added as a control variable to the model.

3.2.6. Industries

Prior research has shown that firms that are operating within different industries often have different interest rates despite having the same credit rating (Amiram et al., 2017). Because companies in different industries have different characteristics and face other risks, the interest

[2] Moody's, Fitch and S&P

paid on bonds of these companies often differs. The relevance of ESG scores also differs per industry (Scholtens, 2008). Following the given argumentation industry dummies are added to the model. The following industries are added to the model: Communication Services, Consumer Discretionary, Information Technology, Health Care, Consumer Staples, Energy, Industrials, Materials, Real Estate and Utilities.

3.3. Empirical design

In order to analyse whether there exists a relationship between ESG scores and the cost of debt, OLS regression models as well as fixed/random effects models were used. For the consolidated ESG score as well as for the stand-alone E, S and G scores two regression analyses were performed, one for the period before the Covid-19 crisis (2010-2019) and one during the Covid-19 crisis (2020-2022). So in total sixteen regression analyses were performed, eight OLS models and eight fixed/random effects models.

To test if there exists a significant difference of the relationship between ESG scores and the cost of debt before and during the Covid-19 crisis, interaction models were used next to the sixteen regressions. In order to do this, a Covid dummy was created to examine the effect of the Covid-19 crisis on the relationship between ESG scores and the cost of debt. This Covid dummy is equal to 0 for the years 2010-2019 and equal to 1 for 2020 and 2021. For the interaction models, OLS as well as fixed/random effects models were performed.

In order to test whether ESG scores have influence on the amount of money that is issued by the companies in the sample, OLS as well as fixed/random effects models were performed using the natural logarithm of the amount offered as the dependent variable. The performed regressions are summarized by the following formula:

$$
\begin{aligned}
&Yieldspread_{it} \backslash Ln(Amountoffered_{it}) \\
&\quad = \alpha_0 + \beta_1 * ESG_{it} \backslash E_{it} \backslash S_{it} \backslash G_{it} + \beta_2 * Leverage_{it} + \beta_3 * Interestcoverageratio_{it} \\
&\quad + \beta_3 * Creditrisk_{it} + \beta_4 * Ln(Size_{it}) + \beta_5 * Maturity_{it} + \beta_6 \\
&\quad * D(Communication\ Services) + \beta_7 * D(Consumer\ Discretionary) + \beta_8 \\
&\quad * D(Information\ Technology) + \beta_9 * D(Health\ Care) + \beta_{10} \\
&\quad * D(Consumer\ Staples) + \beta_{11} * D(Energy) + \beta_{12} * D(Industrials) + \beta_{13} \\
&\quad * D(Materials) + \beta_{14} * D(Real\ estate) + \beta_{15} * D(Utilities) + \beta_{16} \\
&\quad * ESG_{it} \backslash E_{it} \backslash S_{it} \backslash G_{it} * Covid\ Dummy_t + \beta_{17} * ROA_{it} + \varepsilon_{it}
\end{aligned}
$$

One of the assumptions of an OLS model is that there is homoscedasticity. If the standard errors do not have a constant variance, the standard errors are said to be heteroscedastic. The data was tested for heteroscedasticity by performing the Breusch-Pagan/Cook-Weisberg test for heteroscedasticity. The test indicated that there is heteroscedasticity in the data. The heteroscedasticity can be explained by the fact that the data consists of firms that issue bonds more than once, so there is clustering in the standard errors for bonds that are issued by the same company. To account for this, robust standard errors were used in the analysis. In the models it was specified that the standard errors are independent across groups but not within groups. The company CUSIP codes were used as an identifier to indicate that the standard errors are not independent and cluster within groups of bonds issued by the same company. In order to test whether the regression results differ per industry, all OLS regressions were also performed for each industry separately.

3.4. Data and descriptive statistics

The sample used in this thesis consists of non-financial firms that are listed on the Russell 3000 Index and that have ESG data available between 2010-2021. Financial firms were excluded from the sample since these firms received government support after the financial crisis. The bonds that were issued by the respective firms in the period from and including 2010 to and including 2021 were used to conduct the analysis. To examine the relationship between ESG scores and the cost of debt, two databases were used to gather information. After obtaining all the relevant data the gathered information from the different databases has been merged. To obtain the relevant consolidated ESG and stand-alone E, S and G scores, the *Refinitiv Eikon* database was used. *Refinitiv Eikon* offers one of the most complete ESG databases in the industry. The ESG scores are rated on a scale from 0-100 in the *Refinitiv Eikon* database and this thesis categorized the ESG scores on a scale of 1-5. The firms that did not have available ESG data were excluded from the sample. Next to ESG scores, the following control variables were also obtained from the *Refinitiv Eikon* database: Total Assets, Debt to Assets, Return on Assets, EBIT, Interest coverage ratio and the industries. The data was collected for all firms in the period from and including 2010 to and including 2021.

The *Mergent Fisd* database was used in order to obtain information concerning the bonds that the respective firms issued in the period from and including 2010 to and including 2021. The

dependent variable, Yield Spread, as well as several other control variables were obtained from *Mergent Fisd*. The control variables that were collected using the *Mergent Fisd* database are: Credit Rating (Moody's), Offering Amount and Maturity.

Table 1 and table 2 provide descriptive statistics concerning the sample. The final sample consists of 3,177 bonds that were issued by 335 different firms. The average Yield Spread of the sample is 145.31 basis points. This means that the average bond in the sample has a cost of debt that is 1.45% above the 10 year U.S. treasury yield. The median yield spread is 120.00 basis points, which is lower than the average yield spread, explaining that its distribution is skewed to the right (see graph A1 in the appendix). The average ESG score of the firms in the sample is 64.19 while the median ESG score is 67.49 which explains why the distribution of ESG score is skewed to the left (see graph A2). The skewedness of the distributions are interesting to observe. The observation that ESG scores are skewed to the left means that there are more firms with above average ESG scores and the observation that Yield Spreads are skewed to the right means that there are more firms with below average Yield Spreads in this sample. This is an interesting observation since this thesis hypothesizes a negative relationship between ESG scores and Yield Spreads.

Table 1
Summary statistics

	Mean	SD	Min	p25	Median	p75	Max
Yield Spread (bps)	145.31	98.23	3.70	85.00	120.00	175.00	917.00
Maturity	12.37	9.77	1.00	5.00	10.00	11.00	100.00
Amount offered /Total Assets	0.03	0.05	0.00	0.01	0.02	0.039	1.71
ESG Score	64.19	16.87	2.28	53.91	67.49	76.30	95.15
Environmental Score	60.02	24.77	1.00	46.07	66.11	79.38	98.55
Sustainability Score	65.48	19.624	6.91	52.952	67.962	80.919	97.711
Governance Score	65.95	19.12	0.62	53.92	68.90	81.31	98.64
Debt to Assets	.34	.14	0.00	.24	.33	.42	1.03
Interest Coverage Ratio	19.66	101.30	-21.49	4.23	8.69	15.14	324.00
Credit Rating	7.66	1.58	4.00	7.00	7.00	9.00	10.00
Total Assets (USDmln)	64983.89	78225.95	412.00	15474.00	36124.00	80064.00	654954.00
ROA	0.11	0.15	0.00	0.07	0.08	0.11	0.17

In table 2 the mean of the variables are presented per ESG score category. The first thing that stands out is that most of the firms have an ESG score between 40 and 80, which means that most of the firms in the sample fall within category 3 or 4. Other interesting observations are that the Yield Spread decreases when the ESG scores of a company falls into a higher ESG score category, but also that the maturity of the issued bonds increases when the ESG scores of a company falls into a higher ESG score category and that the amount issued relative to total assets decreases when the ESG scores of a company falls into a higher ESG score category. Moreover the credit rating increases when the ESG scores of a company falls into a higher ESG score category and both the total assets and the ROA increase if when the ESG score of a company falls into a higher ESG score category.

Table 2
Summary statistics based on ESG score categories: the mean is displayed

	ESG score category					
	1	2	3	4	5	Total
Frequency	25.00	294.00	760.00	1600.00	498.00	3178.00
Yield Spread (bps)	215.52	207.39	169.42	131.00	114.33	145.31
Maturity	9.12	10.59	11.68	12.94	12.81	12.37
Amount offered /Total Assets	0.09	0.06	0.04	0.02	0.02	0.03
Debt to Assets	0.30	0.35	0.33	0.35	0.31	0.34
Interest Coverage Ratio	9.96	20.54	22.29	16.74	24.99	19.66
Credit Rating	6.60	6.87	7.24	7.78	8.44	7.66
Total Assets (USDmln)	8476.16	16697.84	37269.72	77519.44	98346.73	64983.89
ROA	0.11	0.09	0.10	0.11	0.13	0.11

To test if the differences in means between companies that fall within a low ESG score category compared to companies that fall within a high ESG score category are significant, a Welch t-test of the differences in means was performed. To test this, the differences between the means of the companies that fall within ESG score category 1 and 2 were compared to the means of the companies that fall within ESG score category 5. A Welch t-test was used because the sample sizes of the firms that fall into ESG score category 1 plus 2 and ESG score category 5 differ from each other. The results of this test are presented in table 3. As can be seen in table 3 all the observed differences in means are significantly different from each other.

Table 3

Two-sample t test with unequal variances: Welch test comparing ESG score category 5 with 1&2

	Obs1+2	Obs5	Mean1+2	Mean5	dif	St Err	t value	p value
Yield Spread (bps)	319	498	208.03	114.33	93.70***	7.05	13.30	0.00
Maturity	319	498	10.47	12.81	-2.34 ***	0.62	-3.75	0.00
Amount offered /Total Assets	319	498	0.06	0.02	0.04***	0.00	13.9	0.00
Credit Rating	319	498	6.85	8.44	-1.59***	0.09	-17.3	0.00
Total Assets (USDmln)	319	498	16053.50	98346.73	-82293.22***	4060.10	-20.25	0.00
ROA	319	498	0.09	0.13	-0.04***	0.01	-8.25	0.00

**** p<0.01, ** p<0.05, * p<0.1*

Table 4 displays the pairwise correlation matrix for the relevant variables concerning the firms in the sample. The correlation coefficient represents the strength and direction of the relationship between two variables and ranges between -1 and 1. In table 4 all the correlations that are significant at a 5% level are being marked with a star. As can be seen in table 4, there exists a moderately strong significant negative relationship between consolidated ESG scores and Yield Spread as well as between the stand-alone Environmental, Social and Governance scores and Yield Spread. The relationship between the consolidated ESG score and Yield Spread is strongest. Despite the interesting finding that there exists a significant negative relationship between Yield Spreads and ESG scores, the correlation between the variables does not imply causality. The

pairwise correlation matrix can also be used to detect multicollinearity. As can be seen in the table there exist a strong correlation between the consolidated ESG and the stand-alone E, S and G scores. Because the consolidated ESG and stand-alone E, S and G scores are never in the same model together, this correlation will not cause multicollinearity problems. The table does not indicate that other variables will cause multicollinearity problems. Table A1 in the appendix also shows that all variables have a variation inflation coefficient below 5 which indicates that there are no multicollinearity concerns.

Table 4
Pairwise correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Yield Spread	1.00												
(2) ESG	-0.28*	1.00											
(3) Environmental score	-0.25*	0.79*	1.00										
(4) Social score	-0.23*	0.80*	0.67*	1.00									
(5) Governance score	-0.19*	0.60*	0.33*	0.41*	1.00								
(6) Maturity	0.12*	0.08*	0.09*	0.07*	0.02	1.00							
(7) Amount	-0.04*	0.11*	0.10*	0.15*	0.09*	0.05*	1.00						
(8) Debt to Assets	0.18*	-0.02	-0.03	0.02	-0.04*	-0.03	-0.03	1.00					
(9) Interest Coverage Ratio	-0.03	0.00	0.01	0.00	-0.02	0.01	0.01	-0.13*	1.00				
(10) Credit Rating	-0.36*	0.29*	0.25*	0.27*	0.17*	0.08*	0.09*	-0.12*	0.07*	1.00			
(11) Total Assets	-0.23*	0.33*	0.30*	0.27*	0.27*	0.06*	0.27*	-0.19*	0.01	0.31*	1.00		
(12) EBIT	-0.27*	0.24*	0.18*	0.20*	0.26*	0.06*	0.20*	-0.09*	0.07*	0.33*	0.73*	1.00	
(13) ROA	-0.27*	0.13*	0.09*	0.16*	0.06*	0.06*	-0.00	0.14*	0.11*	0.27*	-0.03	0.39*	1.00

* $p<0.05$

4. Results

In this section the results of the performed regression analyses will be presented. Firstly the regression models that examine the relationship between the cost of debt and the consolidated ESG scores/stand-alone E, S and G scores before the Covid-19 crisis will be discussed. Secondly the regression models that examine the relationship between the cost of debt and the consolidated ESG scores/the stand-alone E, S and G scores during the Covid-19 crisis will be elaborated upon. Thirdly the results of the performed interaction models will be presented. Fourthly the results of the regression models that use the amount offered as the dependent variable will be presented for the period before and during the Covid-19 crisis. Fifthly the results of the fixed/random effects models will be discussed. Lastly the results of the OLS regressions per industry will be discussed.

4.1. Relationship before Covid-19

The results of the regression models that examine the relationship between the cost of debt and the consolidated ESG scores/the stand-alone E, S and G scores before the Covid-19 crisis are presented in table 5. The sensitivity of the Yield Spread with respect to consolidated ESG and stand-alone E, S and G scores is the coefficient of interest. The coefficient should be interpreted as the change in Yield Spread, expressed in basis points, as a result of the ESG/E/S/G category going up by one[3]. With respect to the ESG score the table presents a significant coefficient of -13.13, which means that the Yield Spread decreases by 13.13 basis points if the ESG score category goes up by one. As a result, hypothesis 1, which states that the relationship between consolidated ESG scores and the cost of debt was negative before the Covid-19 crisis, can be accepted.

When observing the E, S and G scores independently the table presents significant coefficients of respectively -9.99, -10.66 and -4.67. The results indicate that there exists a significant negative relationship between the cost of debt and each stand-alone E, S and G score before the Covid-19 crisis. As a result, hypothesis 3, which states that the relationship between the stand-alone E, S and G scores and the cost of debt was negative before the Covid-19 crisis, can be accepted. It can be observed that the negative effect of the increase in the Social pillar score category is the largest, followed by the negative effect of the increase in the Environmental pillar score category. The

[3] On a the scale of 1-5

negative effect of the increase in the Governance score category is least impactful. The R-squared value of all four regressions is around 0.45 which means that 45% of the variability in the dependent variable is explained by the performed regression model.

Table 5

Regression results before Covid:(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) Yield Spread	(2) Yield Spread	(3) Yield Spread	(4) Yield Spread
ESG Score	-13.13***			
	(3.39)			
Leverage	116.06***	112.22***	118.70***	113.78***
	(22.65)	(22.67)	(22.64)	(22.93)
Interest Coverage Ratio	0.01	0.01	0.01	0.01
	(0.03)	(0.03)	(0.03)	(0.03)
Credit Rating	-10.93***	-11.10***	-10.93***	-11.31***
	(2.86)	(2.75)	(2.92)	(2.96)
Ln(Size)	-20.58***	-20.30***	-21.46***	-23.81***
	(3.11)	(2.98)	(3.07)	(3.34)
Maturity	1.93***	1.94***	1.91***	1.89***
	(0.14)	(0.14)	(0.14)	(0.14)
ROA	-237.79***	-240.21***	-234.79***	-248.72***
	(47.48)	(45.31)	(49.46)	(52.92)
Environmental Score		-9.99***		
		(2.51)		
Social Score			-10.66***	
			(2.51)	
Governance Score				-4.67**
				(2.22)
Constant	717.04***	699.17***	730.94***	772.93***
	(60.36)	(60.11)	(59.70)	(65.83)
Observations	2,543	2,543	2,543	2,543
R-squared	0.44	0.45	0.44	0.43

Robust standard errors in parentheses
Industry dummy variables are part of the model but were removed to increase readability
***p<0.01, **p<0.05, *p<0.1

4.2.Relationship during Covid-19

Table 6 presents the results of the regression models that examine the relationship between the cost of debt and the consolidated ESG scores/stand-alone E, S and G scores during the Covid-19 crisis. As can be seen in table 6 both the relationship between the cost of debt and the consolidated ESG scores and the relationship between the cost of debt and the stand-alone E, S and G scores are positive. However none of the described relationships are significant. Therefore hypotheses 2

and 4 which respectively state that the relationship between consolidated ESG/stand-alone E, S and G scores and the cost of debt was negative during the Covid-19 crisis and stronger compared to the relationship before the Covid-19 crisis should be rejected based on the results of the performed OLS regression models. The results that are presented in table 6 indicate that there was no significant effect of ESG scores on the cost of debt during the Covid-19 crisis.

4.3. Interaction models

In table 7 the results concerning the interaction effect between the ESG scores and the Covid dummy, representing 1 during the Covid-19 crisis and 0 in the period before the Covid-19 crisis, are presented. The interaction coefficient should be interpreted as the change Yield Spread, expressed in basis points, as a consequence of the Covid dummy changing from 0 to 1. So the coefficient captures the effect the Covid-19 crisis had on the relationship between the cost of debt and ESG scores. As can be seen in table 7 the interaction effects for all relationships is positive. However none of the presented interaction coefficients are significant. This result indicates that the Covid-19 crisis did not have a significant impact on the relationship between the consolidated ESG scores and the cost of debt as well as the relationship between the stand-alone E, S and G scores and the cost of debt. This results confirms again that hypotheses 2 and 4 should be rejected.

Table 6

Regression results during Covid:(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) Yield Spread	(2) Yield Spread	(3) Yield Spread	(4) Yield Spread
ESG Score	3.33			
	(10.01)			
Leverage	201.62***	201.09***	200.97***	203.13***
	(63.48)	(63.69)	(63.50)	(63.04)
Interest Coverage Ratio	-0.01	-0.01	-0.01	-0.01
	(0.03)	(0.03)	(0.03)	(0.03)
Credit Rating	-14.99*	-14.47*	-14.86*	-14.69*
	(7.96)	(7.89)	(7.85)	(7.88)
Ln(Size)	-21.54***	-19.18**	-21.66***	-21.19**
	(7.88)	(8.05)	(7.57)	(8.17)
Maturity	1.10***	1.11***	1.09***	1.12***
	(0.34)	(0.34)	(0.34)	(0.35)
ROA	-615.11***	-607.68***	-613.66***	-618.49***
	(126.34)	(126.78)	(126.84)	(124.21)
Environmental Score		-4.31		
		(6.55)		
Social Score			3.52	
			(10.13)	
Governance Score				1.76
				(6.95)
Constant	836.26***	798.44***	836.16***	830.67***
	(189.21)	(189.28)	(187.35)	(192.63)
Observations	634	634	634	634
R-squared	0.31	0.32	0.31	0.31

Robust standard errors in parentheses

Industry dummy variables are part of the model but were removed to increase readability

***p<0.01, **p<0.05, *p<0.1

Table 7
Interaction regressions :(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) Yield Spread	(2) Yield Spread	(3) Yield Spread	(4) Yield Spread
ESG Score	-11.18***			
	(3.67)			
Covid Dummy * ESG Score	4.27			
	(9.27)			
Leverage	140.64***	137.70***	142.65***	139.40***
	(25.34)	(24.88)	(25.03)	(25.33)
Interest Coverage Ratio	0.01	0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.03)
Credit Rating	-10.11***	-10.21***	-10.13***	-10.44***
	(2.82)	(2.75)	(2.85)	(2.88)
Ln(Size)	-21.46***	-20.65***	-22.32***	-24.03***
	(3.40)	(3.25)	(3.33)	(3.57)
Maturity	1.70***	1.73***	1.69***	1.68***
	(0.14)	(0.14)	(0.15)	(0.14)
ROA	-331.36***	-331.48***	-329.98***	-339.99***
	(58.05)	(55.83)	(59.61)	(61.32)
Environmental Score		-9.27***		
		(2.77)		
Covid Dummy * Environmental Score		0.92		
		(5.81)		
Social Score			-9.21***	
			(2.70)	
Covid Dummy * Social Score			8.43	
			(9.38)	
Governance Score				-3.95*
				(2.37)
Covid Dummy * Governance Score				4.34
				(7.16)
Constant	710.15***	683.71***	721.48***	751.65***
	(69.82)	(68.10)	(67.98)	(73.12)
Observations	3,177	3,177	3,177	3,177
R-squared	0.39	0.39	0.39	0.39

Robust standard errors in parentheses
Industry dummy variables are part of the model but were removed to increase readability
***p<0.01, **p<0.05, *p<0.1

4.4. Amount offered models

Table 8 and 9 present the results of the models that examine the relationship between ESG scores and the natural logarithm of the amount of money that is issued before and during the Covid-19 crisis. The coefficient of interest should be interpreted as the percentual change in the amount of money that is offered as a result of the ESG/E/S/G category going up by one. The first interesting thing that can be observed from table 8 is that the relationship between the amount of money offered and the ESG/E/S/G scores was insignificant before the Covid-19 crisis. In table 9 it can be observed that the relationship between the amount offered and the consolidated ESG score as well

as the relationship between the amount offered and the Environmental pillar score were significantly negative at respectively the 10 and 5 percent level during the Covid-19 crisis. The coefficients of -0.06 and -0.04 indicate that the amount offered decreases by 6 and 4 percent if respectively the consolidated ESG score and the Environmental pillar score go up by one.

4.5. Fixed/Random effects models

To determine whether it is better to apply a fixed effects or a random effects model, a Hausman test was performed. If the H0 is rejected, fixed effects is better and if the H0 is not rejected, random effects are better. For all relevant models that give an answer to the research question fixed effects models were more appropriate. The R-squared of the OLS regressions was higher for every model and therefore the results concerning the fixed effects models are presented in the appendix. The size and direction of the fixed effects models that answer the research question did not substantially differ from the performed OLS regressions. The only interesting thing to observe is that the effect of the Social pillar score was negative and significant at the 10 percent level during the Covid-19 crisis when observing the fixed effects models. The coefficient of -91.83 indicates that the Yield Spread decreases by almost 92 basis points if the Social pillar score category of a company increases by one. Hypothesis 4 states that the relationship between the stand-alone E,S and G pillar scores and the cost of debt was negative during the Covid-19 crisis and that this relationship was stronger compared to the relationship before the crisis. This hypothesis can partially be accepted, namely for the Social pillar score.

Table 8

Regression results with Ln(Amount Offered) as the dependent variable before Covid:(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) Ln(Amount)	(2) Ln(Amount)	(3) Ln(Amount)	(4) Ln(Amount)
ESG Score	0.01			
	(0.02)			
Yield Spread	0.00**	0.00**	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)
Leverage	0.56***	0.56***	0.54***	0.56***
	(0.18)	(0.18)	(0.18)	(0.18)
Interest Coverage Ratio	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Credit Rating	-0.01	-0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Ln(Size)	0.31***	0.31***	0.30***	0.31***
	(0.02)	(0.02)	(0.02)	(0.02)
Maturity	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
ROA	0.14	0.15	0.11	0.13
	(0.32)	(0.32)	(0.32)	(0.32)
Environmental Score		0.00		
		(0.02)		
Social Score			0.03	
			(0.02)	
Governance Score				0.02
				(0.02)
Constant	5.50***	5.48***	5.61***	5.54***
	(0.51)	(0.51)	(0.50)	(0.51)
Observations	2,543	2,543	2,543	2,543
R-squared	0.42	0.42	0.42	0.42

Robust standard errors in parentheses
Industry dummy variables are part of the model but were removed to increase readability
***p<0.01, **p<0.05, *p<0.1

Table 9

Regression results with Ln(Amount Offered) as the dependent variable during Covid:(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) Ln(Amount)	(2) Ln(Amount)	(3) Ln(Amount)	(4) Ln(Amount)
ESG Score	-0.06*			
	(0.04)			
Yield Spread	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Leverage	0.61**	0.61**	0.62**	0.62**
	(0.24)	(0.26)	(0.26)	(0.25)
Interest Coverage Ratio	0.00	-0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Credit Rating	0.01	0.01	0.01	0.01
	(0.02)	(0.02)	(0.02)	(0.02)
Ln(Size)	0.32***	0.32***	0.31***	0.30***
	(0.03)	(0.03)	(0.03)	(0.03)
Maturity	0.00	0.00*	0.00*	0.00*
	(0.00)	(0.00)	(0.00)	(0.00)
ROA	-0.41	-0.42	-0.45	-0.48
	(0.43)	(0.44)	(0.45)	(0.43)
Environmental Score		-0.04**		
		(0.02)		
Social Score			-0.04	
			(0.03)	
Governance Score				0.01
				(0.02)
Constant	5.82***	5.71***	5.88***	5.98***
	(0.72)	(0.71)	(0.70)	(0.72)
Observations	634	634	634	634
R-squared	0.49	0.49	0.49	0.48

Robust standard errors in parentheses
Industry dummy variables are part of the model but were removed to increase readability
***p<0.01, **p<0.05, *p<0.1

4.6. Relationship per industry

4.6.1. Before Covid-19

Table 10 provides a summary of the relationship between the cost of debt and the ESG/E/S/G scores for each separate industry before and during the Covid-19 crisis. It can be observed that all the relationships that are significant before the Covid-19 crisis are negative relationships, which is in line with what was expected by reviewing the literature. It is interesting to observe that the effect of the stand-alone E, S and G scores on the cost of debt differs per industry. Before the Covid-19 crisis the Social pillar score was the only stand-alone pillar score that had a significant negative effect on the cost of debt for firms operating in the consumer discretionary industry. The Governance pillar score was the only stand-alone pillar score that had a significant negative effect on the cost of debt for firms operating in the information technology industry, for the health industry the Governance pillar score was the only stand-alone pillar score that did not have a significant effect on the cost of debt. For firms operating in the utilities industry only the consolidated ESG score had a negative significant effect on the cost of debt. The consolidated ESG score also had a significant negative effect on the cost of debt for firms operating in the consumer discretionary industry. Hypothesis 1, which states that the relationship between consolidated ESG scores and the cost of debt was negative before the Covid-19 crisis can thus be accepted for firms operating in the consumer discretionary and utilities industries. Hypothesis 3, which states that the relationship between the stand-alone E,S and G pillar scores and the cost of debt was negative before the Covid-19 crisis can also be accepted for the discussed pillar scores in the consumer discretionary, information technology, health and utilities industries.

Table 11 presents a summary of the relationship between the natural logarithm of the amount offered and the ESG/E/S/G scores for each separate industry before and during the Covid-19 crisis. As can be seen in table 11 most of the significant relationships before the Covid-19 crisis were positive, which means that a higher ESG/E/S/G score led to a higher amount of money that was issued. The only significant negative relationship that was found before the Covid-19 crisis was the relationship between the Environmental pillar score and the amount offered for the utilities industry. Before the Covid-19 crisis the Social pillar score was the only stand-alone pillar score that had a significant negative effect on the amount offered for firms operating in the materials and energy industries and for firms operating in the communication industry, only the consolidated ESG score had a negative significant effect on the amount offered.

4.6.2. During Covid-19

When observing the relationship between the cost of debt and the ESG/E/S/G scores for the independent industries during the Covid-19 crisis, it can be seen that most of the relationships are significantly negative. The only significant positive relationships that were found during the Covid-19 crisis are the relationship between the cost of debt and the Social pillar score for firms operating in the communication industry and the relationship between the cost of debt and the Governance pillar score for firms operating in the utilities industry.

Also during the Covid-19 crisis the effect of the stand-alone E, S and G scores on the cost of debt differs per industry. During the Covid-19 crisis the consolidated ESG score had a significant negative effect on the cost of debt for firms operating in the communication, consumer discretionary and real estate industry. The stand-alone Environmental pillar score had a significant negative effect on the cost of debt for firms operating in the consumer discretionary and the real estate industry and had a significant positive effect on the cost of debt for firms operating in the energy industry. The stand-alone Social pillar score had a significant negative effect on the cost of debt for firms operating in the consumer staples and real estate industry and a significant positive effect on the cost of debt for companies operating in the communication industry. The stand-alone Governance pillar score had a significant negative effect on the cost of debt for firms operating in the communication and energy industry and a significant positive effect on the cost of debt for firms operating in the utilities industry. Hypothesis 2, which states that the relationship between consolidated ESG scores and the cost of debt was negative during the Covid-19 crisis and that this relationship was stronger compared to the relationship before the crisis can partially be accepted, namely for the communication, consumer discretionary and real estate industry. Hypothesis 4, which states that the relationship between the stand-alone E,S and G pillar scores and the cost of debt was negative during the Covid-19 crisis and that this relationship was stronger compared to the relationship before the crisis can also be partially accepted, namely for the relationship between the cost of debt and the Environmental pillar score in the consumer discretionary and real estate industry, for the relationship between the cost of debt and the Social pillar score in the consumer staples and real estate industry and for the relationship between the cost of debt and the Governance pillar score in the communication and energy industry.

In table 11 it can be observed that most of the significant relationships during the Covid-19 crisis were negative, which means that a higher ESG/E/S/G score led to a lower amount of

money that was issued. This is interesting to observe since most of the significant relationships were positive before the Covid-19 crisis. Only the relationship between the amount offered and the Governance pillar score for firms operating in the utilities industry was positive during the Covid-19 crisis.

4.6.3. Interaction effect

As has been discussed before, the interaction effect of the Covid dummy was non-significant when looking at the total sample of firms. When looking at the separate industries however, the Covid dummy is significant for certain pillar scores in several industries. Most of the observed interaction effects are negative, however the Covid dummy regarding the Social pillar score in the communication industry and the Covid dummy regarding the consolidated ESG and stand-alone Environmental scores in the material industry were positive. When observing the dummy variable in the models with the natural logarithm of the amount offered as the dependent variable, all of the significant interaction effects are negative.

Table 10

Summary table of the regression results per industry with Yield Spread as the dependent variable:(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) ESG Score	(2) Environmental Score	(3) Social Score	(4) Governance Score
Communication				
Before Covid	-6.61	-2.58	2.17	-10.21
During Covid	-169.70***	-94.60	176.09***	-111.70***
Covid Dummy * ESG/E/S/G	-88.03	-88.03	86.55**	-84.17
Consumer Discretionary				
Before Covid	-17.15*	-7.04	-18.63**	-8.24
During Covid	-57.20**	-23.61**	-13.17	-20.46
Covid Dummy * ESG/E/S/G	-22.04	-16.15	0.10	-15.82
Information Technology				
Before Covid	-4.38	-4.23	-3.24	-7.42**
During Covid	16.21	24.04	18.43	4.59
Covid Dummy * ESG/E/S/G	15.09	14.72	9.03	7.93
Health Care				
Before Covid	-7.25	-6.62*	-7.03*	-3.46
During Covid	13.51	-9.55	-21.13	-5.67
Covid Dummy * ESG/E/S/G	39.67	13.61	-16.79	4.39
Consumer Staples				
Before Covid	0.95	0.90	-3.85	-1.88
During Covid	1.08	-17.19	-41.13**	2.35
Covid Dummy * ESG/E/S/G	-5.26	-10.01	-34.48*	7.58
Energy				
Before Covid	-27.23	-20.27	-14.59	7.77
During Covid	-89.30	-59.00	13.68	-133.35***
Covid Dummy * ESG/E/S/G	23.03	-17.59	46.14	-37.01
Industrials				
Before Covid	-2.86	-4.72	-5.09	-5.09
During Covid	-44.16	-10.29	4.45	-37.29
Covid Dummy * ESG/E/S/G	-4.56	11.01	34.57	-14.15
Material				
Before Covid	-6.03	-6.99	-3.30	-3.04
During Covid	10.75	13.00	-1.28	-5.07
Covid Dummy * ESG/E/S/G	29.07**	26.14***	16.23	-14.46**
Real Estate				
Before Covid	-7.41	-1.32	-5.99	-2.83
During Covid	-79.93***	-88.91***	-54.98**	-32.20
Covid Dummy * ESG/E/S/G	-59.81***	-26.64	-31.54	-45.92
Utilities				
Before Covid	-19.56**	-12.42	-0.66	-1.98
During Covid	25.49	-19.60	6.37	40.99*
Covid Dummy * ESG/E/S/G	35.58	-4.60	7.30	-45.92

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11

Summary table of the regression results per industry with Ln(Amount Offered) as the dependent variable:(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) ESG Score	(2) Environmental Score	(3) Social Score	(4) Governance Score
Communication				
Before Covid	0.15*	-2.58	0.08	0.18
During Covid	-0.47**	-0.22	0.49*	-0.27
Covid Dummy * ESG/E/S/G	-0.37	-0.42***	-0.03	-0.21
Consumer Discretionary				
Before Covid	0.03	-0.02	0.00	0.03
During Covid	0.04	-0.02	0.01	0.09
Covid Dummy * ESG/E/S/G	-0.01	-0.01	-0.01	0.02
Information Technology				
Before Covid	-0.07	-0.02	-0.02	-0.06
During Covid	-0.14*	-0.05	-0.08	-0.03
Covid Dummy * ESG/E/S/G	-0.10	-0.03	-0.10	0.00
Health Care				
Before Covid	0.04	0.06	0.05	0.05
During Covid	-0.14*	-0.10	-0.05	0.03
Covid Dummy * ESG/E/S/G	-0.17	-0.13	-0.09	-0.04
Consumer Staples				
Before Covid	0.05	-0.02	0.03	0.03
During Covid	-0.01	-0.10*	-0.14	0.01
Covid Dummy * ESG/E/S/G	0.04	-0.02	-0.08	-0.02
Energy				
Before Covid	0.12**	-0.00	0.09***	0.01
During Covid	0.25	0.07	-0.00	-0.04
Covid Dummy * ESG/E/S/G	-0.12	-0.00	-0.12**	-0.05
Industrials				
Before Covid	0.04	0.02	0.05	0.02
During Covid	-0.05	-0.05	0.08	0.02
Covid Dummy * ESG/E/S/G	-0.04	-0.02	0.07	0.00
Material				
Before Covid	0.02	-0.02	0.01	0.07**
During Covid	0.09	0.08	-0.01	0.04
Covid Dummy * ESG/E/S/G	-0.01	0.00	-0.06	0.00
Real Estate				
Before Covid	-0.02	-0.00	-0.02	-0.05
During Covid	-0.00	-0.19**	-0.08	-0.06
Covid Dummy * ESG/E/S/G	-0.06	-0.08	0.04	0.04
Utilities				
Before Covid	-0.08	-0.07*	0.03	0.04
During Covid	-0.05	-0.10	-0.15*	0.23***
Covid Dummy * ESG/E/S/G	-0.12	-0.09*	-0.22**	0.04

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5. Discussion

In this section the importance, meaning, relevance and interpretation of the results presented in section four will be discussed. The section focusses on the explanation and evaluation of the obtained results and relates the results to findings of prior research papers.

The main objective of this thesis is to examine the relationship between ESG scores and the cost of debt during and before the Covid-19 crisis. The results that were obtained from analysing the data are for a large part consistent with the results that were expected based on the evaluation of the relevant literature. The data suggest that the relationship between the cost of debt and the consolidated ESG scores as well as the relationship between the cost of debt and the stand-alone E, S and G scores was negative before the Covid-19 crisis. Regarding the period during the Covid-19 crisis, the results only show a significant negative relationship between the cost of debt and the Social pillar score. The negative relationship that is present before the Covid-19 crisis confirms hypotheses 1 and 3, that state that the relationship between the cost of debt and consolidated ESG scores as well as the relationship between the cost of debt and the stand-alone E, S and G scores were negative before the Covid-19 crisis.

The findings concerning the period before the Covid-19 crisis are in line with the results presented in the studies performed by Aboud et al. (2021), Ge & Lui (2015) and Oikonomou et al. (2014) and contradict the results that are presented in the study by Amiraslani et al. (2018) that shows that there is no relationship between ESG scores and the cost of debt if there is no crisis. The findings are of great practical relevance since it can be stated that companies that have a higher consolidated ESG score as well as a higher stand-alone E, S or G score were able to borrow at a lower cost of debt during the 10 years prior to the Covid-19 crisis. With a median issue amount of 650 USDmln a small reduction in the cost of debt will save companies considerable amounts of money.

Regarding the period during the Covid-19 crisis, the results are not fully consistent with the results that were expected by analysing prior studies. Prior studies imply that the relationship between all measures of ESG scores and the cost of debt should be negative during a crisis. Contrary to the study performed by Amiraslani et al. (2018) this thesis only finds a significant negative relationship between the Social pillar score and the cost of debt but not for the consolidated, Environmental and Governance scores. The finding that there exists a significant negative relationship between the cost of debt and the Social pillar score during times of crisis

does however confirm the theory that states that social capital plays an important role during times of crisis. It can also be observed that the relationship between the cost of debt and the Social pillar score is stronger compared to all the relationships observed before the Covid-19 crisis. Hypothesis 4, which states that the relationship between the stand-alone E,S and G pillar scores and the cost of debt was negative during the Covid-19 crisis and that this relationship was stronger compared to the relationship before the crisis can partially be accepted, namely for the Social pillar score. It can therefore be stated that building up social capital by investing in corporate practices that improve a company's social pillar score pays off during times of crisis.

The relationship between the amount offered and ESG scores is also interesting to observe. The analysed data suggest that the relationship between the amount offered and consolidated ESG scores as well as the relationship between the amount offered and the stand-alone E,S and G pillar scores was non-significant before the Covid-19 crisis. During the Covid-19 crisis the relationship between the amount offered and consolidated ESG scores as well as the relationship between the amount offered and the Environmental pillar score were negative. This result contradicts the results found by Amiraslani et al. (2018) who found that firms with better ESG scores could issue more debt during times of crisis. The finding that a higher Environmental pillar score leads to a smaller amount of money that is offered during the Covid-19 crisis could be supportive of the neoclassical theory that states that spending valuable resources on CSR practices is undesirable and should be seen as redundant costs that are not in the interest of the debtholder. However, the Environmental pillar score caused the cost of debt to be lower during the period before the Covid-19 crisis. So the results concerning the Environmental pillar score are only in line with the neoclassical approach with regards to the period during the Covid-19 crisis.

The discussed results concern the sample as a whole. Observing the relationship between the cost of debt and the ESG/E/S/G scores for each industry separately leads to different conclusions. The direction of the relationship concerning the separate industries before the Covid-19 crisis is equal to the direction of the relationship concerning the consolidated sample before the Covid-19 crisis: all the significant relationships were negative. When observing the period during the Covid-19 crisis, a stronger significant negative relationship was found for the communication, consumer discretionary and real estate industry concerning the consolidated ESG score, a stronger negative relationship was found for the consumer discretionary and real estate industry concerning the Environmental pillar score, a stronger negative relationship was found for the consumer staples

and real estate industry concerning the Social pillar score and a stronger negative relationship was found for the communication and energy industry concerning the Governance pillar score. It is interesting to observe that the relationship between the cost of debt and the Social pillar score was stronger and positive during the Covid-19 crisis for the communication industry and the relationship between the cost of debt and the Governance pillar score was stronger and positive during the Covid-19 crisis for the utilities industry. Although the relationship between the cost of debt and the Governance pillar score for companies operating in the utilities industry was positive during the Covid-19 crisis, the relationship between the amount offered and the Governance pillar score was positive for firms operating in the utilities industry. This indicates that firms operating in this industry could issue more debt if they have a higher Governance pillar score. It might be interesting for further research to examine what determines which ESG/E/S/G score has the most impact on the cost of debt for different industries.

This thesis sheds light on the effect that the different E, S and G pillar scores can have on the cost of debt and the amount of debt offered before and during the Covid-19 crisis. The analysed data contribute to a clearer understanding of what the impact is of each E, S and G score in different industries. The finding that the Social pillar score leads to a lower cost of debt before and during the Covid-19 crisis while the Environmental pillar score only had a negative impact on the cost of debt before the Covid-19 crisis and decreased the ability of companies to borrow more during the Covid-19 crisis, may form an important insight for companies that are considering which CSR practice should be prioritised. The finding that the effect of the Social and Governance pillar score on the cost of debt is significantly positive during times of crisis for respectively the communication and utilities industry, might form an insight for firms that operate in these industries and are considering which ESG/E/S/G pillar score to prioritise.

Although this thesis provides interesting insights from a theoretical as well as from a practical perspective it is subject to certain limitations. The generalizability of the analysed data is limited by the fact that only firms that are listed in the United States were analysed. The obtained results are thus a reflection of the relationship between ESG scores and the cost of debt in the Unites States but cannot be generalized for all companies worldwide. Another limitation that impacts the generalizability of the study is that the loans that were analysed were all public bond issues. This indicates that the results that were obtained in this thesis only apply to public bond issues but not to private loan agreements between banks/shadow banks/other private debt funds

and companies. The fact that the analysed companies were all public companies implies that the companies have more incentive to have a good reputation compared to private companies. The fact that the distribution of ESG scores in the Appendix is tailed to the left indicates that the sample average ESG score is relatively high. Further research is required to understand the relationship between ESG scores and the cost of debt for private companies. This thesis furthermore recommends future research to include non-U.S. companies in their sample. It might be interesting for future research to examine how the relationship between the cost of debt and ESG scores was impacted by the Covid-19 crisis in European countries.

6. Conclusion

In recent literature there has been an enormous surge in the amount of research concerning ESG. This research is however mainly focused on the relationship between ESG scores and stock returns. This thesis investigates the relationship between the cost of debt of U.S. bonds and ESG scores before and during the Covid-19 crisis. It depends on the ESG measure how the research question, that asks whether the relationship between a company's ESG score and its cost of debt was stronger during the Covid-19 crisis compared to more stable times should be answered. When observing the consolidated ESG and the stand-alone Environmental and Governance scores it should be concluded that the relationship between these CSR measures and the cost of debt was not stronger during the Covid-19 crisis compared to more stable times. In the 10 years prior to the crisis the relationship was negative for the aforementioned ESG measures and there was no significant relationship during the Covid-19 crisis. However when observing the relationship between the cost of debt and the Social pillar score it should be concluded that the relationship actually was stronger during the Covid-19 crisis compared to the more stable period before the crisis. This indicates that the research question should partially be answered affirmatively, namely for the relationship between the cost of debt and the Social pillar score.

The results concerning the relationship between the cost of debt and the consolidated ESG scores as well as the relationship between the cost of debt and the stand-alone E, S an G scores before the Covid-19 crisis, are in line with the results that were expected after consulting the relevant literature. In the 10 years prior to the Covid-19 crisis all CSR measures lead to a lower cost of debt which supports the theory that higher ESG scores reflect a firm's ability to mitigate risks and the theory that states that ESG scores form a proxy for a firm's social capital which reduces the risk of asset substitution. The neoclassical theory that states that firms should only focus on the maximization of profits and all expenditures that do not contribute to a higher profit should be seen as redundant expenses does not hold for the 10 year period before the Covid-19 crisis.

Regarding the period during the Covid1-19 crisis the results partly differ from what was expected by reviewing the relevant literature. The finding that there was no significant relationship between the cost of debt and the consolidated ESG and the stand-alone Environmental and Governance scores is not in line with prior research that examines the relationship between ESG scores and the cost of debt during crises. This finding combined with the finding that there exists

a negative relationship between the amount offered and the consolidated ESG scores as well as between the relationship between the amount offered and the Environmental pillar score during the Covid-19 crisis, leads to the conclusion that the neoclassical theory holds for the consolidated ESG score and the Environmental ESG score during the Covid-19 crisis. However the observation that a higher Social pillar score leads to a lower cost of debt during the Covid-19 crisis is in line with the results that were found before.

When observing the relationship between the cost of debt and the consolidated ESG scores as well as the relationship between the cost of debt and the stand-alone E, S and G scores for the separate industries, a different answer should be given to the research question. During the Covid-19 crisis, a stronger significant negative relationship was found for the communication, consumer discretionary and real estate industry concerning the consolidated ESG score, a stronger negative relationship was found for the consumer discretionary and real estate industry concerning the Environmental pillar score, a stronger negative relationship was found for the consumer staples and real estate industry concerning the Social pillar score, a stronger negative relationship was found for the communication and energy industry concerning the Governance pillar score and a stronger positive relationship was found for the communication and utilities industry concerning respectively the Social and Governance pillar scores. The research question should be answered affirmatively for the relationships that became more negative during the Covid-19 crisis. It can therefore be concluded that the different ESG/E/S/G scores had a different effect on the cost of debt during the Covid-19 crisis for the separate industries.

Based on these conclusions companies that are planning to issue debt should pay attention to their CSR measures and should consider that prioritising the pillar scores that decreased the cost of debt during the Covid-19 crisis in the industry they operate in, might be beneficial for them in a future crisis.

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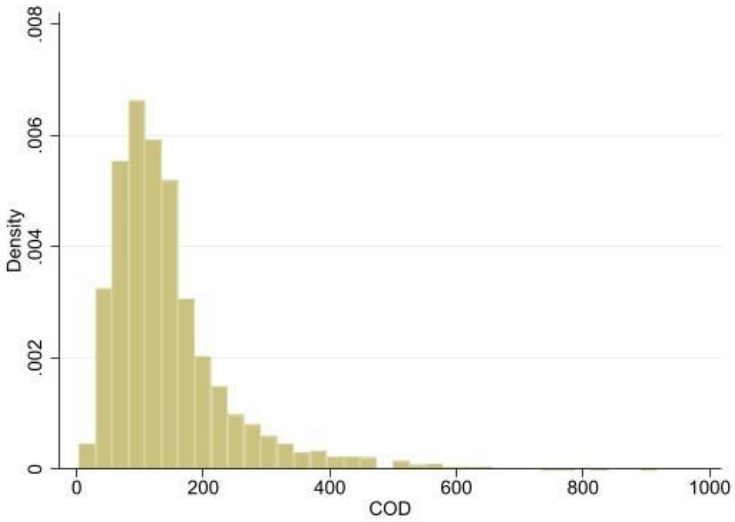
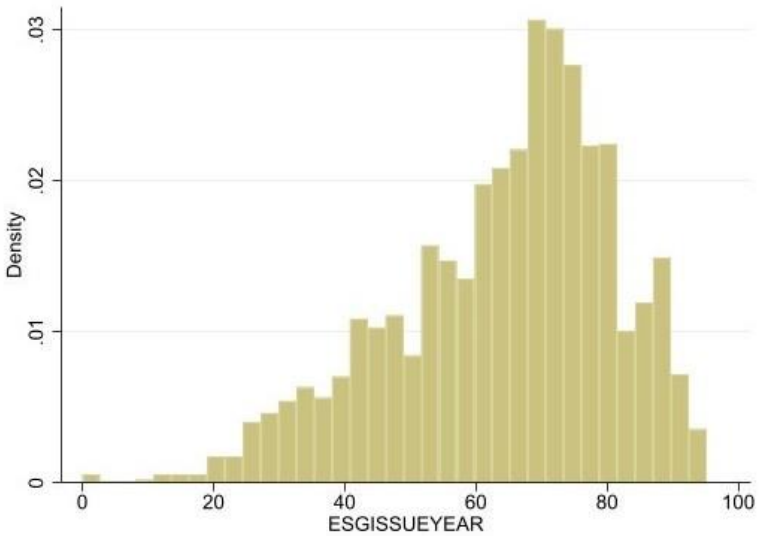
8. Appendix

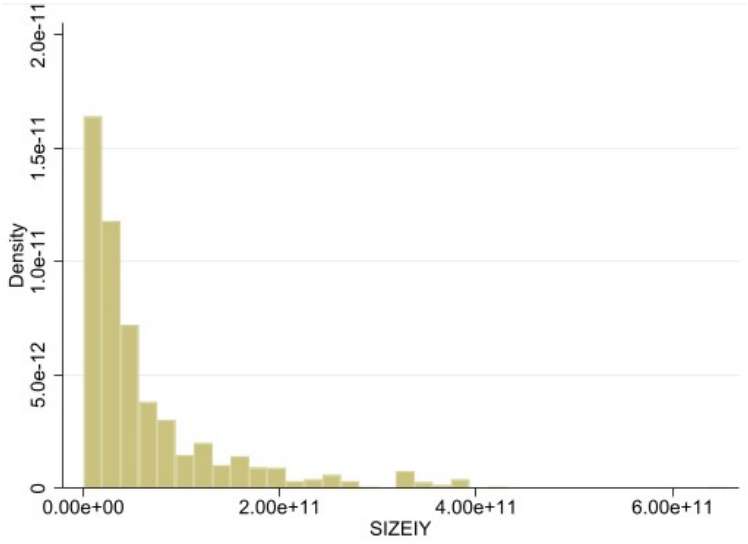
Graph A1
Histogram of the variable Yield Spread



Graph A2
Histogram of the variable ESG score



Graph A3
Histogram of the variable Size



Graph A4
Histogram of the variable Ln(Size)

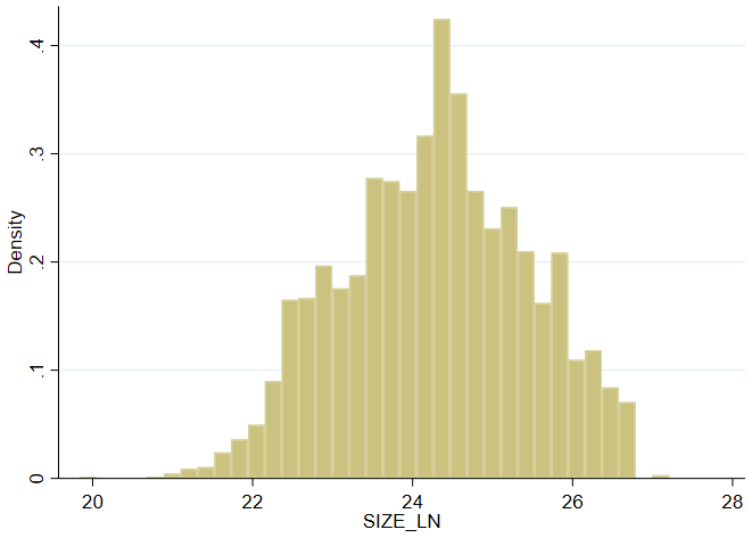


Table A1
Variance inflation factor

	VIF	1/VIF
D: Consumer Staples	4.42	.23
D: Information Technology	4.76	.21
D: Health	4.63	.22
D: Industrial	4.25	.24
D: Consumer Discretionary	3.51	.28
D: Utilities	2.52	.40
D: Energy	2.42	.41
D: Materials	2.30	.43
D: Communication	1.74	.57
Ln(Size)	1.76	.57
ESG score	1.42	.70
ROA	1.44	.69
Credit Rating	1.34	.75
Leverage	1.32	0.76
Maturity	1.03	.97
Interest coverage ratio	1.05	.95
Mean VIF	2.49	0.40

Table A2
Credit risk rating scale

Credit rating in models	Moody's rating	Description
10	Aaa	Prime
9	Aa1, Aa2 & Aa3	High grade
8	A1, A2 & A3	Upper medium grade
7	Baa1, Baa2 & Baa3	Lower medium grade
6	Ba1, Ba2 & Ba3	Non-investment grade speculative
5	B1, B2 & B3	Highly speculative
4	Caa1	Substantial risk
3	Caa2	Extremely speculative
2	Caa3 & Ca	Default imminent with little prospect for recovery
1	C	In default

Table A3

Fixed effects results before Covid:(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) Yield Spread	(2) Yield Spread	(3) Yield Spread	(4) Yield Spread
ESG Score	-10.15***			
	(3.45)			
Leverage	123.50***	120.03***	122.25***	119.50***
	(22.31)	(22.39)	(22.42)	(23.21)
Interest Coverage Ratio	-0.01	-0.01*	-0.01	-0.01*
	(0.01)	(0.01)	(0.01)	(0.01)
Credit Rating	-3.92***	-3.99***	-4.00***	-4.03***
	(1.08)	(1.08)	(1.14)	(1.13)
Ln(Size)	-41.84***	-44.80***	-43.22***	-44.55***
	(8.60)	(8.47)	(8.91)	(9.28)
Maturity	2.26***	2.25***	2.25***	2.24***
	(0.10)	(0.10)	(0.10)	(0.10)
ROA	-298.11***	-293.63***	-288.72***	-296.61***
	(54.51)	(53.83)	(55.11)	(55.79)
Environmental Score		-5.66**		
		(2.65)		
Social Score			-7.18**	
			(2.95)	
Governance Score				-4.04
				(2.63)
Constant	1,177.00***	1,232.10***	1,199.78***	1,222.73***
	(205.74)	(204.13)	(213.54)	(222.06)
Observations	2,543	2,543	2,543	2,543
R-squared	0.30	0.29	0.29	0.29

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A4

Fixed effects results during Covid:(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) Yield Spread	(2) Yield Spread	(3) Yield Spread	(4) Yield Spread
ESG Score	-99.79			
	(95.18)			
Leverage	-832.76	-700.24	-642.96	-954.51
	(681.56)	(778.12)	(756.83)	(733.13)
Interest Coverage Ratio	0.24	-0.28	-0.40	-0.11
	(0.62)	(0.32)	(0.25)	(0.33)
Credit Rating	2.37	2.41	2.73	2.39
	(9.85)	(9.85)	(9.79)	(9.84)
Ln(Size)	-411.67***	-432.38***	-378.06**	-388.45**
	(149.29)	(141.00)	(150.76)	(154.01)
Maturity	1.40***	1.41***	1.36***	1.39***
	(0.30)	(0.29)	(0.30)	(0.30)
ROA	-113.57	-188.33	-9.95	-132.83
	(322.46)	(580.82)	(325.67)	(350.24)
Environmental Score		14.20		
		(48.21)		
Social Score			-91.83*	
			(50.69)	
Governance Score				-39.61
				(38.35)
Constant	10,997.84***	11,031.15***	10,086.32***	10,236.17***
	(3,616.68)	(3,435.93)	(3,644.08)	(3,703.41)
Observations	634	634	634	634
R-squared	0.14	0.12	0.15	0.13

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A5

Fixed effects interaction:(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) Yield Spread	(2) Yield Spread	(3) Yield Spread	(4) Yield Spread
ESG Score	-11.01**			
	(4.47)			
Covid Dummy * ESG Score	-0.44			
	(8.61)			
Leverage	144.05***	140.56***	142.62***	142.59***
	(42.63)	(42.90)	(40.90)	(43.40)
Interest Coverage Ratio	-0.00	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Credit Rating	-5.92***	-6.10***	-6.04***	-6.10***
	(2.10)	(2.16)	(2.20)	(2.07)
Ln(Size)	-49.10***	-52.83***	-50.52***	-51.87***
	(9.23)	(9.69)	(9.71)	(9.15)
Maturity	1.97***	1.97***	1.96***	1.96***
	(0.11)	(0.11)	(0.12)	(0.11)
ROA	-456.69***	-458.77***	-452.35***	-461.01***
	(76.12)	(77.99)	(76.58)	(77.56)
Environmental Score		-4.21		
		(4.28)		
Covid Dummy * Environmental Score		-1.02		
		(5.44)		
Social Score			-7.53**	
			(3.74)	
Covid Dummy * Social Score			6.76	
			(10.20)	
Governance Score				-5.09*
				(3.07)
Covid Dummy * Governance Score				3.35
				(7.55)
Constant	1,385.35***	1,452.47***	1,408.22***	1,433.56***
	(223.95)	(234.22)	(233.87)	(223.69)
Observations	3,177	3,177	3,177	3,177
R-squared	0.31	0.31	0.31	0.31

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A6

Fixed effects with Ln(Amount Offered) as the dependent variable before Covid-19:(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) Ln(Amount)	(2) Ln(Amount)	(3) Ln(Amount)	(4) Ln(Amount)
ESG Score	-0.00			
	(0.02)			
Yield Spread	0.00***	0.00**	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)
Leverage	0.73***	0.73***	0.71***	0.72***
	(0.17)	(0.18)	(0.18)	(0.18)
Interest Coverage Ratio	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Credit Rating	-0.00	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Ln(Size)	0.34***	0.35***	0.33***	0.33***
	(0.02)	(0.02)	(0.02)	(0.02)
Maturity	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
ROA	0.21	0.22	0.18	0.20
	(0.27)	(0.26)	(0.27)	(0.27)
Environmental Score		-0.01		
		(0.01)		
Social Score			0.02	
			(0.02)	
Governance Score				0.02
				(0.01)
Constant	4.40***	4.29***	4.54***	4.51***
	(0.46)	(0.48)	(0.50)	(0.45)
Observations	2,543	2,543	2,543	2,543
R-squared	0.42	0.42	0.42	0.42

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Table A7

Random effects with Ln(Amount offered) as the dependent variable during Covid-19:(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) Ln(Amount)	(2) Ln(Amount)	(3) Ln(Amount)	(4) Ln(Amount)
ESG Score	-0.05			
	(0.03)			
Yield Spread	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Leverage	0.46**	0.46**	0.47**	0.46**
	(0.22)	(0.22)	(0.22)	(0.22)
Interest Coverage Ratio	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Credit Rating	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Ln(Size)	0.30***	0.30***	0.30***	0.28***
	(0.03)	(0.03)	(0.02)	(0.03)
Maturity	0.00**	0.00**	0.00**	0.00**
	(0.00)	(0.00)	(0.00)	(0.00)
ROA	-0.05	-0.01	-0.06	-0.10
	(0.40)	(0.40)	(0.41)	(0.41)
Environmental Score		-0.04**		
		(0.02)		
Social Score			-0.04	
			(0.03)	
Governance Score				0.01
				(0.02)
Constant	5.91***	5.75***	5.90***	6.08***
	(0.67)	(0.66)	(0.65)	(0.66)
Observations	634	634	634	634
R-squared	0.48	0.48	0.48	0.48

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Table A8

Fixed effects interaction model with Ln(Amount offered) as the dependent variable:(1) ESG score (2),(3) and (4) Stand-alone E,S and G Scores

Variables	(1) Ln(Amount)	(2) Ln(Amount)	(3) Ln(Amount)	(4) Ln(Amount)
Yield Spread	0.00***	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)
ESG Score	-0.02			
	(0.02)			
Covid Dummy * ESG Score	-0.02			
	(0.03)			
Leverage	1.06***	1.05***	1.05***	1.06***
	(0.12)	(0.12)	(0.12)	(0.12)
Interest Coverage Ratio	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Credit Rating	-0.01	-0.01	-0.01	-0.01*
	(0.01)	(0.01)	(0.01)	(0.01)
Ln(Size)	0.39***	0.41***	0.36***	0.36***
	(0.03)	(0.03)	(0.03)	(0.03)
Maturity	0.00	0.00*	0.00	0.00*
	(0.00)	(0.00)	(0.00)	(0.00)
ROA	0.18	0.26	0.13	0.10
	(0.24)	(0.24)	(0.24)	(0.24)
Environmental Score		-0.05***		
		(0.02)		
Covid Dummy * Environmental Score		-0.03		
		(0.02)		
Social Score			0.01	
			(0.02)	
Covid Dummy * Social Score			-0.04	
			(0.02)	
Governance Score				0.02*
				(0.01)
Covid Dummy * Governance Score				0.03
				(0.02)
Constant	3.77***	3.36***	4.17***	4.37***
	(0.78)	(0.78)	(0.78)	(0.78)
Observations	3,177	3,177	3,177	3,177
R-squared	0.12	0.13	0.12	0.13

Robust standard errors in parentheses
***p<0.01, **p<0.05, *p<0.1

Table A9
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity

Chi2	Prob > Chi2
923.43	0.00

Table A10
Hausman tests

Variables	Chi2	Prob > Chi2	FE/RE
Yield spread before Covid-19			
ESG	97.70	0.00	FE
E	111.01	0.00	FE
S	92.56	0.00	FE
G	98.92	0.00	FE
Yield spread during Covid-19			
ESG	56.25	0.00	FE
E	51.04	0.00	FE
S	61.63	0.00	FE
G			
Yield spread interaction			
ESG	71.94	0.00	FE
E	167.12	0.00	FE
S	66.62	0.00	FE
G			
Ln(Amount offered) before Covid-19			
ESG	29.50	0.00	FE
E	32.22	0.00	FE
S	28.81	0.00	FE
G	27.58	0.00	FE
Ln(Amount offered) during Covid-19			
ESG	12.20	0.09	RE
E	10.80	0.15	RE
S	10.44	0.24	RE
G	9.99	0.19	RE
Ln(Amount offered) during Covid-19			
ESG	51.06	0.00	FE
E	58.98	0.00	FE
S	50.94	0.00	FE
G	54.84	0.00	FE