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# How are ESG scores and cost of debt related? A quantitative analysis based on companies' fundamentals.

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# Introduction

1.1 - Overview on ESG

Over time we have seen many trends affecting corporate activities like technological advancements and shifts in customer behavior. Nowadays we are in the middle of another important change that no one knows how long will last and how predominant will be in shaping corporate actions: environmental and social concerns.

The first time climate, nature and health were officially mentioned was in 2006 in the United Nation's Principles for Responsible Investing[1], a network of financial institutions working together to accomplish six aspirational principles[2]: 1) to incorporate ESG issues into investment analysis and decision-making processes; 2) to be active owners and incorporate ESG issues into our ownership policies and practices; 3) to seek appropriate disclosure on ESG issues by the entities in which we invest; 4) to promote acceptance and implementation of the Principles within the investment industry; 5) to work together to enhance our effectiveness in implementing the Principles; 6) to be active towards implementing the Principles.

The meaning of the acronym "ESG" stands for:

- Environmental: dealing with environmental risks and natural resources management is probably the most relevant aspects to pivot climate change and ensuring a healthy life to

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[1] www.forbes.com/sites/betsyatkins/2020/06/08/demystifying-esgits-history--current-status/?sh=3eebdd0f2cdd.
[2] https://www.unpri.org/about-us/what-are-the-principles-for-responsible-investment#:~:text=Principle%201%3A%20We%20will%20incorporate,entities%20in%20which%20we%20invest.

future generations. Renewable energy usage, waste management, and production efficiency are among relevant Environmental aspects that corporates are considering.

- Social: dealing with individuals, groups, and society is another pillar in the United Nations investment framework. Companies are extremely entwined with the surrounding society, from employing people to investing in local community development, positive corporate actions can have a relevant effect on worker health, safety standards, and anti-slavery.

- Governance: this is the most internal-corporate related aspect of ESG, and deals with the governance factors of decision-making, from sovereigns' policymaking to the distribution of rights and responsibilities among different participants in corporations. As we can imagine, this is the starting point in a proper ESG-oriented organization as decisions on how to invest, and how much capital to deploy are always made by the governance body.

1.2 - Financial Industry Converging Toward ESG

When a new trend comes into play, financial institutions and financial markets are directly involved in it, and by consequence companies are affected. The most relevant financial activity that influences corporate actions is borrowing, as capital provision is essential for companies to invest and thrive.

To incentivize companies in environmental and socially friendly investment, banks are issuing more and more environmental and social related loans. There are different types of loans, among the most issued we have sustainability linked and green loans, the difference is that in the first

one the financing is given for general corporate purposes, whereas the second one for a specific
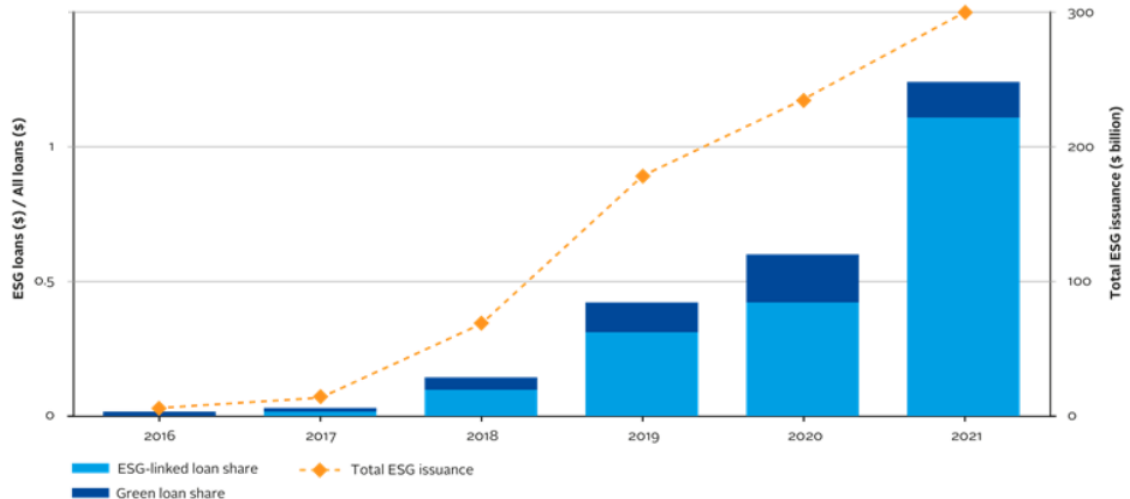
green project[3].



*Figure 1: Detailed breakdown of ESG-linked loans and green loans over total loan issuance as of September 2021. In the chart is also displayed the total ESG issuance Source: www.unpri.org*

As we can see in figure 1, the total ESG issuance in the US has soared over time to more than $ 300 billion, and the ESG-linked loan represents the largest portion given the broader corporate purpose it can be referred to. Figure 2 explains the distribution of green and ESG loans among industries, as it is easy to understand, specific project-related loans are issued in industries with a high environmental impact like utilities.

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[3] https://www.unpri.org/pri-blog/sustainability-linked-loans-a-strong-esg-commitment-or-a-vehicle-for-greenwashing/10243.article
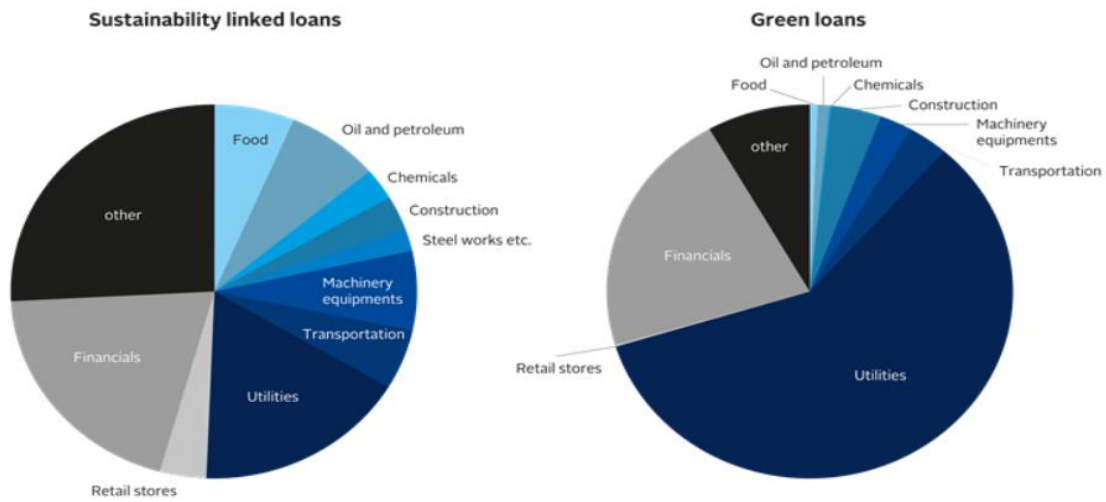
**Sustainability linked loans**

Oil and petroleum
Chemicals
Construction
Steel works etc.
Machinery equipments
Transportation
Utilities
Retail stores
Financials
other
Food

**Green loans**

Oil and petroleum
Food
Chemicals
Construction
Machinery equipments
Transportation
other
Financials
Retail stores
Utilities

*Figure 2: sustainability linked loans and green loans issuance per sector as of September 2021. Source: www.unpri.org*

The total ESG loans issuance is continuously increasing as this is a way borrowers signal their ESG commitment. But as we know, there are also bond issuance that make up a significant part of a company source of financing.

● Green  ● Sustainability  ● Social  ● Sustainability-linked

$600 bln

400

200

2015   2016   2017   2018   2019   2020   2021   2022

*Figure 3: ESG bond issuance breakdown over the period 2015-2022. Source: www.reuters.com*

There are different reasons a company can choose both loan and bond or prefer either the former or the latter. Loans are generally less expensive than bonds, but the company would have a specific amortization plan and less contractual power. Anyway, the histograms in picture 3 depict how the ESG bond issuance is on the rise, with a correction in 2022 given the higher cost of borrowing that slowed down bond sales[4].

1.3 - The Determinants of The Cost of Debt

After introducing the relevance of ESG in the financial industry, especially in the borrowing activity, it is now the case to share my research question: *does a higher ESG score generate a lower cost of debt?* This question arises to me after analyzing different papers concerning the determinants of the cost of debt for companies. In the corporate finance field of research, it is common knowledge that companies' fundamentals are the primary aspects that a bank, or the market itself, price into the cost of the bond. Ian Cooper and Sergei Davydenko [1] prove how the expected default probability is the main aspect that lenders look at when investing in a company debt. However, to understand the default probability, an in-depth look at the fundamentals is required. Blackwell and Kidwell [2], and Easterwood and Kadapakkam [3] give importance to the fixed costs by looking at the amount of the long-term debt outstanding. In fact, a highly indebted company will be more dependent on external capital, and consequently is riskier. Shane A. Johnson [4] proves different relevant variables that justify the cost of debt: firstly, that the volatility of earnings growth is central for lenders, as the borrowers must pay back principal and

debt service over time, and this will be riskier if earnings are not stable. Shane A. Johnson demonstrates also that the higher the collateral value, the lower the cost of debt, as lenders can rely on a high-quality asset that pledged as a collateral of the lending agreement. Moreover, Johnson shed importance on the investment opportunities that the company has: the brighter the prospects, the lower the risk and so the cost of debt. As an example, companies that borrow money to invest in return-yielding assets will be seen better than companies that borrow to pay back another debt.

But there is more in addition to the traditional metrics, in fact Diamond [5] measures the company reputation, using years since incorporation as a proxy of it, to understand whether other non-financial variables can influence borrowing contract conditions. Following this point of view, my goal is to try to figure out how another non-financial variable – ESG score – can give us interesting results and so being introduced in future models for cost of debt determination.

# Literature Review

The literature review concerning ESG and the cost of debt is limited, given the recent introduction of this new financial element. As a first step in my research process, I figured out what are the branches of the literature concerning ESG that were relevant to me. I identified three main areas that I am describing below: effect of ESG and CSR on credit rating, how the credit rating agencies define ESG, and the pricing of green bonds.

## The ESG and CSR effect on credit ratings

As concern the first main area, I believe that having an overview of what is the effect of ESG and CSR (Corporate, Social, and Responsibility) on the corporate credit rating is relevant as it gives us a clue on the likelihood of the companies' failure. Lenders pay a lot of attention to the credit rating the company is assigned to, and normally the higher the credit score the lower the premium required by lender. Michalski and Yew Low [6] focused on both US and global samples ranging from 1982 to 2019 and studied the inclusion of ESG variable into multi-class corporate credit rating prediction using random forests and extremely randomized trees, with mean decrease impurity, mean decrease accuracy and SHapley Additive exPlanations feature. According to their study, environmental and social variables are relevant for both US and global sample, particularly environment pillar score, environmental innovation score, resource use score, emissions score, and CSR strategy score. They find that ESG variables are important across investment-grade and speculative-grade classes. Always on the same research field, Dorfleitner,

Grebler, and Utz [7] included corporate and social performance (CSP) into a credit rating prediction model. Firstly, they estimate credit risk using corporate and social variables, then they compare it with the ex-post effective credit rating. They show that CSP is a relevant variable for predicting credit ratings: in the North American sample both environmental and social performance have an explanatory impact, but only the social performance increases the explanatory power in the European sample while environment performance does not.


The evolution of ESG ratings

Moving forward, the second main area I investigated was how the credit rating agencies defined the ESG ratings. This is such an important aspect to consider as this score is my main independent variable, so it represents the pivot of my study. Berg, Kolbel, and Rigobon [8] analyzed the ESG rating divergence between KLD, Sustainalytics, Moody's, S&P Global, Refinitiv and MSCI. Firstly, they identified a taxonomy of categories generally included in the ESG rating definition. Secondly, they decomposed the divergence into contribution of measurement, scope, and weight, and determined that measurement, hence how different rating provider practically measure a certain fact, contributes the most to the divergence. In addition to ESG provider divergence, we need to factor in our analysis the rating rewriting. As we know, ESG ratings are on the rise and there are no strict guidelines on that, and Berg, Fabisik, and Sautner [9] proved that the scores are subject to rewriting over time. They ran the same analysis on the same ESG rating of the same providers in different periods and found that the ratings were subject to important rewriting, probably to demonstrate their alignment with the companies' performance. This is the

reason why, as I will describe later in the next two chapters, I use a fixed effect on the time variable.

Green bonds and the "greenium"

The literature on green bonds, debt issued to finance a specific green project, is rapidly expanding and focused on the comparison between green and brown bonds. Gianfrate and Peri [10], Kapraun, Latino et al. [11] show that green bonds trade at a premium either in the primary and in the secondary market, this implies that comparing a green bond with a similar brown bond, the former has a higher price and so a lower yield to maturity. According to their findings, some investors are willing to pay a small premium for bonds that finance a green project, so the green transition can come without an higher cost of financing for companies. By contrast, Haciomeroglu, Danisoglu and Guner [12], and Karpf and Mandel [13] find that issuer do not enjoy any cost advantage when issuing green bond, and sometimes market prices green bond at an even lower price than brown ones.

# Research purpose

Environmental, Social, and Governance are getting more and more popular across the financial industry. Financial institutions are supporting investments in this area thanks to different contractual conditions offered to clients, and given this clear trend, I wanted to go deeper into it. After being aware of what were the most relevant topics that the literature was concentrated on, I formulated my research question following a critical approach. I wanted to know if an increase in the green and social score may effectively lead a company to better access to finances, all of this being sure to consider ESG scores in a way to consider a possible rewriting. But the uniqueness of my research is that I focus on the companies' fundamentals and not on specific bond issuances. Fundamentals are what really drives the companies' cost of debt and access to finance and analyzing specific bonds on primary and/or secondary market may have led to biased analysis given the widely different market condition that can affect the bonds issuance and trading, such as the 2022 stagflation. In the following chapters, I will introduce the sample, the variables considered, the analysis, and the results. All of this was thought of with the goal to have an idea, based on a different analysis, on whether higher ESG should effectively lead to a reduction in the cost of debt.

# Data and descriptive statistics

After a careful analysis of the literature review outlined in the previous section, in this part I am going to describe data collection, cleaning, and analysis structure. The results will be covered in the following chapter.

4.1 - Samples selection

The first step was to choose the data structure required for the analysis and given that I am interested in analyzing a phenomenon – relation of cost of debt and ESG – for different companies over time, the most accurate data structure is a panel dataset. Secondly, it was crucial to define the companies to analyze. Given the broad international commercial relations, the presence of different foreign companies, and deeper data availability, I selected US companies as the main ingredient of this study.

To be more specific, I picked the S&P 500 index excluding financials and utilities. The reason why I filtered out these two industries is because of their peculiar operational structure: financials are highly exposed to debt -the debt/asset ratio for banks can be around 95%- thanks to the easy access to debt they have, moreover some standard industry analysis metrics, like EBITDA, are useless for banks. As concern utilities, they offer an essential product to the community, and despite highly exposed to environmental concerns, they are highly regulated, and their operational activities are not completely "free".

To run the tests, I choose 2011 – 2021 as a period to analyze (from now on "first sample") and 2015 – 2021 as a robustness check (from now on "second sample"). My decision is given by the fact that 2011 – 2021 covers a broader range of events, whereas 2015 – 2021 has more companies labeled with an ESG score. The 2011 – 2021 period covers 330 companies, and the 2015 – 2021 covers 428 companies. The higher number of companies is justified by the fact that the ESG score, the main independent variable that will be explained later, is a recent introduction in the financial industry and it was not commonly used around 2011.

The companies were identified using the Bloomberg Terminal: starting with the command EQS (equity screening) and applying the filters we want – S&P 500 ex financials and utilities – I identified a set of S&P 500 companies. Then, I uploaded the companies CUSIP codes to Compustat databank to download the fundamental variables, and on Refinitiv to download the ESG score. The main variables identified are cost of debt, leverage, assets, market-to-book, gross margin, and Z score. The explanation for each one follows.

4.2 - Variables explanation

Cost of debt is the most important variable in this analysis, I use it as a dependent variable in my regression analysis. I build it computing the companies' interest on short-term debt plus the interest on long-term debt expressed in dollar value, over the total short plus long-term debt always expressed in dollar values. According to the definition found on Compustat, with short term debt I refer to obligations due within one year, whereas with long term debt I refer to obligations due in more than one year. In this way I am looking at the weight of the interest on

the debt and I believe that the companies' fundamentals is the most reasonable proxy of how much the company pays each year on its debt. Leverage is a relevant independent variable used to understand the level of dependence from banks' and investors' borrowed money, it is well known as a company riskiness indicator as the higher the leverage, the more the company must be able to generate money to pay the debt back. To compute leverage, I use the following formula: (current debt + long debt) / (stockholders' equity – common equity + market capitalization). Going forward, assets are essential in understanding the company size and safety level for creditors, in fact the higher the companies' assets, the more likely the company has more stability and collaterals to be pledged. Another measure of the companies' asset intensity is the market-to-book value of them. This relevant independent variable measures the market value of the assets over the book value of them, and from a creditor standpoint it is important that the companies have high-value assets for two main reasons: firstly, this should be a sign of companies' strength and future prosperity, secondly, high-value assets mean high value collateral in specific lending contracts. This variable is computed as (short debt + long debt + preferred stock – deferred taxes + market capitalization) / asset. After a deep explanation of the balance sheet variables – essential when the cost of debt is analyzed – we need to include the income statement as well. Thanks to the income statement we can understand the companies' efficiency in income production, crucial if a company must pay back its debt. Gross margin is defined as (revenue – cost of goods sold) / revenue, and I personally prefer this to the EBITDA / revenue as the former is more focused on the companies' operating activity. The Z score, also known as Altman Z score, is a number used to understand the likelihood of the company failure, the higher the score, the higher the failure probability. It is computed as 1.2 * working capital / total assets + 1.4 * retained earnings / total

assets + 3.3 * earnings before interest and tax / total assets + 0.6 * market value of equity / total liabilities + 1.0 * sales / total assets.

| Score range | Grade | Description | |
|---|---|---|---|
| 0.0 <= score <= 0.083333 | D - | 'D' score indicates poor relative ESG performance and insufficient degree of transparency in reporting material ESG data publicly. | **ESG laggards** |
| 0.083333 < score <= 0.166666 | D | | |
| 0.166666 < score <= 0.250000 | D + | | |
| 0.250000 < score <= 0.333333 | C - | 'C' score indicates satisfactory relative ESG performance and moderate degree of transparency in reporting material ESG data publicly. | |
| 0.333333 < score <= 0.416666 | C | | |
| 0.416666 < score <= 0.500000 | C + | | |
| 0.500000 < score <= 0.583333 | B - | 'B' score indicates good relative ESG performance and above-average degree of transparency in reporting material ESG data publicly. | |
| 0.583333 < score <= 0.666666 | B | | |
| 0.666666 < score <= 0.750000 | B + | | |
| 0.750000 < score <= 0.833333 | A - | 'A' score indicates excellent relative ESG performance and high degree of transparency in reporting material ESG data publicly. | |
| 0.833333 < score <= 0.916666 | A | | **ESG leaders** |
| 0.916666 < score <= 1 | A + | | |

*Figure 4: Refinitiv ESG score breakdown. Source: www.refinitiv.com*

The last but not the least, our main independent variable is the Refinitiv ESG score[5]. Refinitiv uses more than 186 metrics to create this comparable score, it has a global coverage, and it is bounded between 0 and 1, where 1 represent a company highly involved into ESG concerns. Table 4 summarizes the Refinitiv ESG score interpretation.

After downloading the data, improving procedures were required to have a functional dataset. First, I merged Compustat fundamentals with Refinitiv ESG scores using the company CUSIP, RStudio was used to perform this procedure. Then, I moved the datasets in Stata and winsorized cost of debt and leverage (high only, 0.1 level), Z score (high only, 0.05 level), gross margin (high and low, 0.05 level). The winsorization[6] is a statistics technique used to limit the

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[5] https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf
[6] https://www.sciencedirect.com/topics/mathematics/winsorization

extreme values to reduce the effect of outliers. Moreover, I computed the logarithm of assets.

Thanks to the tables below we have an initial overview of mean, standard deviation, minimum, maximum and correlation for each variable. As we can see the two samples have similar descriptive statistics, and it is interesting to emphasize that the leverage is the only variable with a negative correlation with cost of debt, as the higher the debt burden the riskier the company, and so the higher the interest rate charged.

*Table 1: 2011 – 2021 sample descriptive statistics*

| Variables | Observations | Mean | Standard deviation | Min | Max |
|---|---|---|---|---|---|
| Cost of debt | 3483 | 0.0427 | 0.0166 | 0 | 0.0705 |
| ESG score | 3713 | 0.5327 | 0.2019 | 0 | 0.9352 |
| Leverage | 3642 | 0.2911 | 0.2469 | 0 | 0.8036 |
| Log asset | 3996 | 9.0579 | 1.3517 | 4.4376 | 13.4808 |
| Market to book | 3421 | 1.9706 | 1.5139 | 0.2893 | 23.2655 |
| Gross margin | 3625 | 0.4151 | 0.2019 | 0.1146 | 0.8156 |
| Z score | 3476 | 3.9067 | 2.4308 | 0.6908 | 9.9814 |

| Variables | Observations | Mean | Standard deviation | Min | Max |
|---|---|---|---|---|---|
| Cost of debt | 2892 | 0.0399 | 0.0163 | 0 | 0.0665 |
| ESG score | 3146 | 0.4989 | 0.2048 | 0 | 0.9352 |
| Leverage | 3046 | 0.2694 | 0.2417 | 0 | 0.7805 |
| Log asset | 3120 | 8.5411 | 1.4104 | 4.8251 | 13.0978 |
| Market to book | 2909 | 2.11 | 1.6068 | 0.3002 | 18.2502 |
| Gross margin | 3022 | 0.3966 | 0.1917 | 0.1185 | 0.7980 |
| Z score | 2916 | 4.4341 | 2.9129 | 0.8754 | 12.0130 |

*Table 2: 2015 – 2021 sample descriptive statistics*

*Table 3: 2011-2021 sample variables correlation matrix*

|  | Cost of debt | ESG score | Leverage | Log asset | Market to book | Gross margin | Z score |
|---|---|---|---|---|---|---|---|
| Cost of debt | 1 |  |  |  |  |  |  |
| ESG score | -0.2465 | 1 |  |  |  |  |  |
| Leverage | 0.1974 | -0.0792 | 1 |  |  |  |  |
| Log asset | -0.2432 | 0.5693 | 0.0699 | 1 |  |  |  |
| Market to book | -0.2263 | 0.1082 | -0.4805 | -0.1219 | 1 |  |  |
| Gross margin | -0.1889 | 0.0462 | -0.3528 | 0.0862 | 0.3718 | 1 |  |
| Z score | -0.2226 | 0.0574 | -0.6893 | -0.1763 | 0.6760 | 0.2525 | 1 |

*Table 4: 2015-2021 sample variables correlation matrix*

|  | Cost of debt | ESG score | Leverage | Log asset | Market to book | Gross margin | Z score |
|---|---|---|---|---|---|---|---|
| Cost of debt | 1 | | | | | | |
| ESG score | -0.1685 | 1 | | | | | |
| Leverage | 0.2025 | -0.0018 | 1 | | | | |
| Log asset | -0.1423 | 0.6147 | 0.2055 | 1 | | | |
| Market to book | -0.2605 | 0.1366 | -0.5178 | -0.0682 | 1 | | |
| Gross margin | -0.1609 | 0.1497 | -0.2922 | 0.1009 | 0.3901 | 1 | |
| Z score | -0.2299 | -0.0682 | -0.6628 | -0.2603 | 0.7192 | 0.2091 | 1 |

# Analysis and results

My analysis is structured to have a thorough overview of the effect of ESG on cost of debt. Firstly, I run a regression using cost of debt as explained variable and ESG score as explanatory one. This first analysis relates the two variables alone, without adding other control variables and without including fixed effects. As we can see from column A, tables 5 and 6, the results are encouraging for ESG policies supporter, in fact both samples have a negative and significant coefficient that seems to imply that a higher ESG score reduces the cost of debt by almost 191 basis point in the first sample and 132 basis point in the second period sample.

However, this analysis is not enough to draw straight meaningful conclusion, and I can Identify two reasons for this. The first one is that companies that heavily invest in ESG can have the means to do that: stronger company fundamentals, greater company reputation, so easier access to capital markets. This can reduce the cost of debt even more than the simple commitment to ESG activities. The second reason is typical for the new trends: ESG rating agencies are screening more and more companies over the last decade, and the criteria to deliver a specific ESG score change over time. Given this, a company can be assigned two different scores in two consecutive years even if its operational activities and its effort toward ESG investments are not changed. Moreover, companies in different industries can have a different approach toward ESG and so be assigned an ESG score in a different way. To overcome this problem, I run a second analysis including the control variables mentioned before: leverage, assets, market-to-book, gross margin, and Z score. This is a way to consider the company financial and economic situation, both impacting the cost of debt for companies.

The results of the improved analysis, showed in column B of the tables 5 and 6, depict a similar situation between the two samples: leverage is the only variable that has a positive coefficient, and this is already known as the higher the leverage, the riskier the company. Then, assets, market-to-book, gross margin, and Z score have a negative coefficient as the higher, the more solid and reliable the company is. In our case, it is important to have an in-depth look at the ESG score coefficient and significance: this confirms what we saw in the simple regression analysis: the higher the ESG score, the lower the cost of debt. This result is highly significant in the first sample, and moderately significant in the second one.

At this point, it seems that ESG score is a variable we must factor in when we determine the cost of debt, but the second issue I raised before comes into play: is the increasing ESG score coverage trend affecting our results? Is the increasing and continuously changing number of ESG factors used in determining the score determinant in what we see? Do differences in industries bias our view of this phenomenon? To answer these questions, we can upgrade our model and include fixed effects[7]. Using fixed effects allows us to keep a specific external factor constant and see if our results are affected by this. More specifically, I use year fixed effect to understand if the increasing ESG coverage over time influences our results, and this can be seen from figure 5: it's clear that year after year, the ESG score tends to increase. This effect can be achieved by an effective companies' commitment, but also by different coverage by ESG rating companies. In addition, I downloaded NAICS (North America Industry Classification Code) to identify the specific

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[7] https://www.sciencedirect.com/topics/economics-econometrics-and-finance/fixed-effects

industry per each company, and I include industry fixed effect. In this way we can understand whether being part of an industry or the increasing ESG coverage over time influences the results.
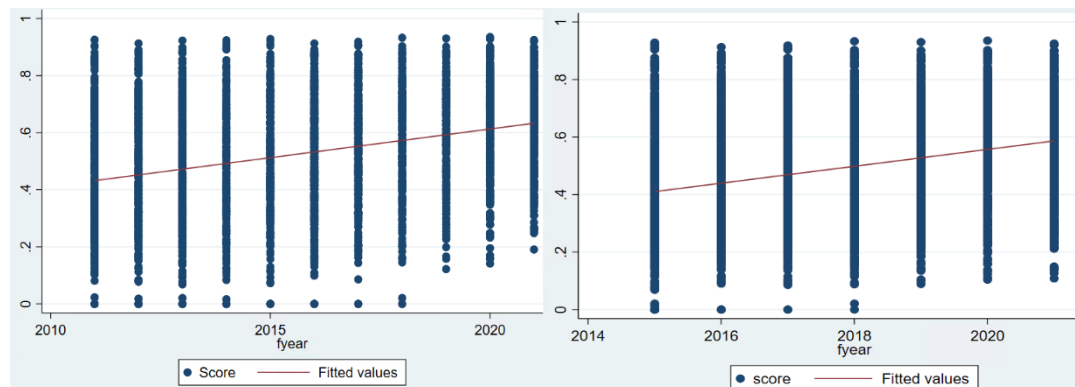


*Figure 5: 2011 – 2021 (left) and 2015 – 2021 (right) effect of time on ESG score.*

As I was imaging, using fixed effects has a strong effect on our results. As concern the traditional variables, only market-to-book value of the assets change the coefficient sign, but it is also highly insignificant. Assets, leverage, gross margin, and Z score are slightly changed compared to the previous results. The big difference is exactly in our main dependent variable, ESG score. In both our samples this variable becomes highly insignificant, especially in the first one. This results are shown in column C of tables 5 and 6. My explanation is that, if the ESG score became more popular over time, even its effect on cost of debt has been affected by different measurement metrics, or different companies' industry characteristics. Nevertheless, the results emphasized before are clear, and it seems that the ESG score, once we use different control variables and include year and industry fixed effect, is not significant anymore. The traditional variables continue to hold their relevance, in agreement with the existing literature.

*Table 5: This table summarizes the three different regression analyses on the 2011 – 2021 sample. The column A represents the simple regression using Cost of debt as dependent variable and ESG score as the only independent variable. Then, both the column B and C include ESG score, Leverage, Log asset, Gross margin, Market to book, and Z score, with the difference that column C includes year and Industry fixed effects.*

| Dependent variable | A - Cost of debt | B - Cost of debt | C - Cost of debt |
|---|---|---|---|
| ESG score | -0.0191*** | -0.0080 *** | 0.0027 |
|  | (0.0014) | (0.0018) | (0.0025) |
| Leverage |  | 0.0007 *** | 0.0007 *** |
|  |  | (0.0002) | (0.0002) |
| Log asset |  | -0.0028 *** | -0.0040 *** |
|  |  | (0.0003) | (0.0004) |
| Gross margin |  | -0.0066 *** | -0.0054 |
|  |  | (0.0015) | (0.0031) |
| Market to book |  | -0.0010 *** | 0.0001 |
|  |  | (0.0003) | (0.0003) |
| Z score |  | -0.0011 *** | -0.0008 ** |
|  |  | (0.0003) | (0.0003) |
| Observations | 3427 | 2979 | 2979 |
| Year fixed effect | No | No | Yes |
| Industry fixed effect | No | No | Yes |
| Adj. R square | 0.0520 | 0.1565 | 0.4938[*] |

(*) In this case this is a R square.

*Table 6: This table summarizes the three different regression analyses on the 2015 – 2021 sample. Column A represents the simple regression using Cost of debt as dependent variable and ESG score as the only independent variable. Then, both column B and C include ESG score, Leverage, Log asset, Gross margin, Market to book, and Z score, with the difference that column C includes year and Industry fixed effects.*

| Dependent variable | A - Cost of debt | B - Cost of debt | C - Cost of debt |
|---|---|---|---|
| ESG score | -0.0132 *** | -0.0051 * | 0.0054 * |
| | (0.0014) | (0.0020) | (0.0027) |
| Leverage | | 0.0008 *** | 0.0007 *** |
| | | (0.0002) | (0.0001) |
| Log asset | | -0.0019 *** | -0.0020 *** |
| | | (0.0003) | (0.0004) |
| Gross margin | | -0.0041 * | -0.0091 * |
| | | (0.0018) | (0.0039) |
| Market to book | | -0.0011 *** | 0.0003 |
| | | (0.0003) | (0.0004) |
| Z score | | -0.0010 *** | -0.0008 * |
| | | (0.0002) | (0.0003) |
| Observations | 2828 | 2471 | 2471 |
| Year fixed effect | No | No | Yes |
| Industry fixed effect | No | No | Yes |
| Adj. R square | 0.0302 | 0.1147 | 0.5047[(*)] |

(*) In this case this is a R square.

# Conclusions and suggestions for future researches

In contrast with most of the literature regarding cost of debt and ESG, this study finds that, after a careful analysis including all the relevant variables for the cost of debt determination and control for the time and industry aspects, there is no significant empirical relationship between ESG score and cost of debt. In my point of view, the result of this study makes even more sense if we consider that we are in a period of transaction toward green investments. Banks have a strong motivation to support ESG projects, often achieved by lowering the cost of debt for specific companies. This is why several other studies have identified a reduced cost of debt for green bonds. I personally feel this is only a political decision that has little to do with the companies' fundamentals, that is what really matters when a lender lends money. This paper has main strengths: firstly, it clears out companies in banking and utilities industry given their corporate operativity that can have influenced the results. Secondly, it homes in on crucial factors such as companies' balance sheet strength, income statement efficiency, and likelihood of default – precisely the elements lenders prioritize. Thirdly, the study employs a methodical quantitative approach, progressing from a basic regression to a more complex multiple regression, and ultimately integrating fixed effects. Fourthly, the inclusion of a rigorous robustness check solidifies and validates the findings. As said before, ESG is a trend getting more and more popular, and when we analyze such an incumbent mode, having a longer and wider sample is crucial. I feel that in five to ten years more robust analysis can be done, especially focusing on other areas of the world like developing countries. Another hint for future research is to run similar analysis on specific sources of finance. It would be interesting to understand if loans, bonds, and mezzanine

finance follow different pattern when it is about ESG, in this way companies involved in green

project can have a clue on how to finance their operations.

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