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"Should investors care about disagreement in ESG ratings? An analysis of the impact on selected financial metrics."

Master's Dissertation

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Chapter 1: Introduction

1.1 The ESG ratings market

It goes without saying that ESG topics are trending in recent years thanks to several factors which developed simultaneously.

The E pillar is supported by the growing awareness about the importance of achieving the NetZero level to slow down Climate Change. The understanding of the importance of this topic dates back to 1997 with the Kyoto Protocol, and more recently with the Paris Agreement, which was proposed for the first time in 2015 and ratified by the European Union in 2016.

Furthermore, there has been a recent shift in public opinion regarding diversity, which has led political leaders to incorporate these arguments into their agendas. Business have also recognized the importance of diversity. A McKinsey research[1] on diversity showed that companies with gender and ethnic heterogeneity have a higher likelihood of benefitting from better financial performances compared to the national median.

[Image 1 about here]

The importance of the Social pillar is emphasized also by Michael Porter's shared value theory, dated 2011. Porter argued that "the most powerful way in which any business can impact societal issues is through the business itself," which can result in higher returns for investors and the business itself.[2]

[1] McKinsey, Why diversity matters https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/why-diversity-matters

[2] Rotman: Questions for Michael Porter https://www.rotman.utoronto.ca/Connect/Rotman-MAG/IdeaExchange/Page3/Michael-Porter#:~:text=Shared%20value%20is%20fundamentally%20about,of%20the%20supporting%20community%20structure.

Moreover, market participants have always been well aware about the importance of the Governance pillar, which according to surveys, is seen as one of the most important in affecting the risk linked to a business. A high quality corporate governance is perceived as the fundament of trust for investors holding stakes in a company[3].

Moreover, the financial sector has great importance in bringing behavioural and social changes to the real economy, through a dual and reciprocal relationship.
Firstly, the movement of capital within one sector is driven by society's beliefs and values. If the society is increasingly seeking profitable opportunities that align with environmental and social issues, they create a new responsible market. This new demand will shape the investment landscape, driving capitals toward companies that follow or anticipate these trends.
At the same time, the movement of capital made by the financial leaders, can increase the understanding about the importance of these trends, affecting the attention the society gives to a given issue. **By providing resources, the financial sector plays a crucial role in effecting the changes needed to drive the real economy towards more sustainable and socially responsible practices.**

Additionally, as early as April 2006, the Principle for Responsible Investment (PRI) launched the 6 Principles for Responsible Investing, in which they established 6 guidelines for their fiduciary signatories to integrate the ESG issues into the investment process[4].

[3] Architas: Breaking down the E, S and the G – mixing the right ingredients https://www.architas.com/insights/news/esg/breaking-down-the-e-s-and-the-g-mixing-the-right-ingredients/
[4] PRI: What are the Principles for Responsible Investment? https://www.unpri.org/about-us/what-are-the-principles-for-responsible-investment

The alignment of these planets has created a market valued at USD 18.4 Trillion dollars, which is expected to reach USD 33.9 Trillion by 2026, with a CAGR of 12.9% according to PwC report[5].

These factors made popular the use of ESG ratings, which assess a company's compliance across the three different pillars, but again the popularity brought to the stage many issuers: MSCI ESG, Sustainalytics, Moody's ESG Solutions, Refinitiv, Thomson Reuters, Bloomberg ESG, Beyond Ratings and more[6].

Nevertheless, rating providers differs for various reasons, such as the existence there are different Taxonomies[7] worldwide, the conflict of interest for providers that also offer financial services to the companies they rate, and the implementation of different methodologies.

In the future, this misalignment will be likely solved since sustainability will become more important over time and ongoing research addresses this issue. As of now, however, investors should cohabit with rating disagreement, and navigate it. Thus, the only solution is to assess the effect and react accordingly.

1.2 Objective of this study

The objective of this thesis is to study and expand upon the results of the research paper by Gibson R., Krueger P., Schmidt S. P. (2021) *ESG Rating Disagreement and Stock Returns* published in the Financial Analyst Journal. Indeed, they study the effect of rating disagreement among seven different providers on stock returns, to assess whether this low correlation between rating agencies could have brought an impact on financial markets in the period from 2010 to 2017.

[5] PwC report on growth of ESG AUM : https://www.pwc.com/gx/en/news-room/press-releases/2022/awm-revolution-2022-report.html#:~:text=ESG%2Dfocused%20institutional%20investment%20seen,assets%20under%20management%3A%20PwC%20report

[6] Slides Thierry Roncally: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3773484

[7] KPMG: ESG Taxonomies https://kpmg.com/xx/en/home/insights/2021/10/esg-taxonomies.html

Following their methodology for assessing the disagreement, I focused on the period between 2015 and 2021, trying to evaluate the impact on other variables such as the Bid-Ask spread and on Credit Default Swaps spread, with a limited and distinct dataset from them.

What I found, is that the higher disagreement can significantly impact the transaction costs. Specifically, a 1% higher standard deviation in the disagreement about ESG and Environmental pillar could lower the average monthly bid-ask spread (as a percentage of the mid-quote) of respectively 1.93% and 2.58%.

A possible explanation for this could be related to the management of inventory by market makers. Indeed, the increased disagreement in the ratings could results in different valuations about the stock's real fundamental value. Consequently, this may balance the buy and sell side of an order flow, prompting market makers to offer better quotes.

For what concern the CDS spread, the results I obtained contradicted my initial expectations. Higher disagreement regarding the ESG and Governance pillar actually leads to lower levels of CDS spread.

1.3 Plan

In this thesis, I start by explaining the relevance that findings in this area can have in the industry, to then assess the reasons for disagreement among rating providers.

Secondly, I will analyse the dataset at my disposal as well as the set of variables utilized in the regressions. After that, a qualitative analysis of the methodologies implemented by the various providers in assigning the ESG ratings.

The following steps will be to comment the summary statistics and the methodology utilized to account for the disagreement among providers.

Lastly, I will present the results of the OLS regressions, as well as the results of the implementation of a simple strategy that allows to understand the impact of the disagreement on transaction costs.

Chapter 2: Industry relevance

Analyzing the effect of disagreement between rating providers is relevant nowadays for several reasons.

Firstly, the research conducted by Gibson R., Krueger P., and Schmidt S. P. (2021) highlights the implications that disagreement can have on the equity cost of capital. This finding is significant for equity analysts who should now consider these factors in their valuation. Additionally, according to the researchers, the disagreement about ratings in their sample has also a relevant impact on stocks returns.

Secondly, the increasing importance and market share of ESG funds underscore the usefulness of understanding the potential impact of uninformed decisions. Asset Managers implementing responsible investment strategies employ various approaches when building an ESG portfolio. For those utilizing an active quantitative strategy[8] and in certain passive investment strategies, the use of ESG ratings is of paramount importance.

Also, for index portfolio, which are gaining increased interest in the industry, the ESG rating disagreement can lead to different optimal portfolios, as revealed by Ehling, P., Lundeby, S., Sørensen, L. Q., (2023)[9].

[8] PRI - ESG integration in listed equity: A technical guide https://www.unpri.org/listed-equity/esg-integration-in-listed-equity-a-technical-guide/11273.article

[9] Ehling, P., Lundeby, S., Sørensen, L. Q., (2023) Portfolio Choice with ESG Disagreement: Customizing Sustainability Through Direct Indexing, Available at SSRN: https://ssrn.com/abstract=4328880

A survey conducted by the European Union[10] from April 4, 2022 to June 10, 2022 examined the ESG rating industry collecting responses among 168 participants. A breakdown of the respondents can be found in Image 2.

[Image 2 about here]

Most of the respondents use a combination of E, S, and G ratings, and in some cases also a more granular representation of them.

Although 81% of respondents reported a lack of correlation between the providers they use, 74% expressed support in using ratings from multiple providers. This approach allows for a better understanding of the differences and enables the consideration of a broader range of sustainability factors in their investment strategies.

This is corroborated by Raffaella Sommariva and Chiara Roccaro, who respectively serve as Senior Fund Manager and Senior Pension Fund Manager at Azimut Holding. According to them, Asset Managers hardly rely on a single ESG rating provider. The reason why they do so will become clearer as we delve into this analysis.

Indeed, they emphasize the importance of diversifying the sources of the ratings to specifically have a broader range of methodologies used and grades, which allow them to average accordingly the different scores considering their needs.

Therefore, knowing the impact that these differences among providers can have on variables such as the bid-ask spread, Returns or Credit Default Swaps can significantly bring a competitive advantage.

Thirdly, knowing the effects of disagreement can also be beneficial also for traders operating within shorter time frames and engaging in significant amounts of daily transactions. If higher disagreement is associated with lower transaction costs or has an

[10] EU: Targeted consultation on the functioning of the ESG ratings market in the European Union and on the consideration of ESG factors in credit ratings: finance-2022-esg-ratings (europa.eu)

impact on returns, considering findings related to this matter can significantly influence overall performance.

The purpose of this study, therefore, is to examine and address the potential effects arising from the high disagreement among ESG rating providers.

Chapter 3: Reasons for disagreement

But if there is an increasing attention to these topics, why the correlation between the different rating providers is that low?

As mentioned before, different are the reasons.
Gibson R., Krueger P. and Schmidt S. P (2021) have made significant contributions to understanding the variables that can impact the rating disagreement using the dataset at their disposal.
Among the variables used in their regression analysis, they include quantitative metrics such as industry or balance sheet-related variables and various performance ratios. Additionally, they include a dummy variable that indicates the presence of a credit rating.

One noteworthy finding is that firms with higher gross profitability tend to have lower disagreement. This confirms the hypothesis that rating providers may scrutinize profitable firms more closely due to the higher investor interest they attract. Yet, the Gross Profitability can allow the firm to invest more resources in disclosures about ESG Key Performance Indicators, making it easier for rating providers to assign scores based on observable measures. Furthermore, since most of the providers penalize companies with limited disclosures (*see Methodologies*), the greater investment in reporting matters can systematically lead to higher scores assigned to every company, given the enhanced transparency of metrics.

Another interesting finding of this research pertains to the presence or absence of a credit rating. Firms without a credit rating are subject to higher disagreement.
This is likely because of the lower information environment attached to these firms.

This last point also strengthens the interconnection between the two fields. The absence of a credit rating can influence the ESG rating, and conversely, the ESG rating can have a significant impact on the credit rating. The findings of Zanin L. (2022) support the second part of the relationship, indicating that the firms with higher ESG ratings, particularly in the Environmental pillar, tend to have higher credit ratings.
Furthermore, Chodnicka-Jaworska P. (2021) identifies a link between changes in credit ratings and changes in ESG risk. Specifically, the research highlights the Environmental pillar as the most important and impactful in this regard. This implies that improvement in the Environmental performance of a firm can influence the credit rating.

Among other reasons for the significant variation between providers, there are also possible conflicts of interest between the providers and the company, when the provider offers also financial services[11], the different taxonomies used worldwide[12] and the use of different methodologies among providers.
Moreover, differences can also arise even from the same provider due to changes in the computational methods applied over time.
Indeed, research by Berg F., Fabisik K. and Sautner Z.[13] shows that downloading ESG scores for the same firms and the same years, but at two different points in time (in 2018 and 2020) from Refinitiv, led to completely different data. This, of course, has important implications for professionals using historical data in building their portfolios.

[11] Bloomberg: EU Puts ESG Rating Firms on Notice as Major Overhaul Planned: https://news.bloomberglaw.com/environment-and-energy/eu-seeks-reform-of-esg-ratings-firms-in-sweeping-overhaul-1
[12] KPMG: ESG Taxonomies https://kpmg.com/xx/en/home/insights/2021/10/esg-taxonomies.html
[13] [13] PRI: Rewriting history II: The (un)predictable past of ESG ratings https://www.unpri.org/pri-blog/rewriting-history-ii-the-unpredictable-past-of-esg-ratings/7007.article

According to the European Union itself,[14] "the current ESG rating market suffers from deficiencies and isn't functioning properly." and the "confidence in ratings is being undermined".

As of now, the scoring of various rating providers is a black box, and the significant difference you can observe in some stocks may have some relevant implications in the market. For sure, the development of international regulation will improve the actual situation, but for the moment, understating the implications of disagreement can be of relevant importance: even if the disagreement will significantly diminishes in the future, uncertainties may persist for certain stocks due to various reasons. The framework proposed by Gibson R., Krueger P., Schmidt S. P. (2021) for studying the disagreement and re-proposed here can be useful in managing these differences.

The European Commission is taking steps to regulate the assignment of ESG scores, and its proposed framework is addressing specifically the issue of transparency and the conflict of interest[15].

Additionally, changes will be applied to rating methodologies as well, that should be "rigorous, systematic, systematic, objective, continuous, and subject to validation". These methodologies will also be reviewed annually to ensure accuracy and relevance.

[14] Bloomberg: EU Puts ESG Rating Firms on Notice as Major Overhaul Planned: https://news.bloomberglaw.com/environment-and-energy/eu-seeks-reform-of-esg-ratings-firms-in-sweeping-overhaul-1

[15] Clarity AI: Quick Take: The European Commission's Proposal on ESG Ratings and Potential Regulation https://clarity.ai/research-and-insights/quick-take-the-european-commissions-proposal-on-esg-ratings-and-potential-regulation/?utm_medium=email&utm_source=clarityai&utm_campaign=weekly-newsletter

Chapter 4: Dataset and dependent variables

For this study, I used ESG rating data from various providers available in Bloomberg and Refinitiv. However, in Refinitiv data were displayed on an annual basis, while for the purpose of running a linear regression, I used monthly data from Bloomberg.

Indeed, using annual data would have presented two challenges. Firstly, the availability of ESG data is relatively recent, with MSCI being the first issuer in 2010, as reported by Forbes.[16] This would have implied that there would have been only 13 data points available for a single provider up to the present day. Considering that other rating agencies started collecting ESG data later, the sample size would have been even smaller.

Secondly, the use of yearly data would have meant having a longer time horizon for the evaluation of the results, rendering the findings useless for shorter-horizon investors. Therefore, annual Refinitiv data were used as they would be issued at a point in time, specifically on the first month of the year. Considering those data makes it possible to consider whether or not there is a discrepancy with this provider, even if not considering the evolution throughout the year.

The providers in my sample were the following: (i) Bloomberg (ii) S&P Global (iii) Arabesque and (iv) IdealRatings and (v) Refinitiv.

Other data are used as control and dependent variable, with the purpose of assessing the impact of the disagreement on such variables.

[16] Forbes, Demystifying ESG: Its History & Current Status: https://www.forbes.com/sites/betsyatkins/2020/06/08/demystifying-esgits-history--current-status/?sh=18a1896f2cdd

Among the dependent variables studied in this analysis, the following were examined:

4.1 Dependent variables

4.1.1 Returns

The main reference paper of this thesis, Gibson R., Krueger P., Schmidt S. P. (2021) studies the impact of rating disagreement on returns.

They assess the monthly differences in ratings from 7 different providers for companies in the S&P500 index. They discovered that during the period 2010-2017, greater disagreement in the total pillar (ESG) and Environmental pillar had a statistically significant and positive effect on monthly returns. This finding can be attributed to investors demanding higher risk premiums for stocks with greater uncertainty in these areas, thereby indicating a heightened interest in the market.

However, my dataset of ratings differs from that used by Gibson et al. due to the utilization of different providers. Consequently, my analysis may either yield results that align with their findings or offer divergent insights.

Moreover, my analysis will focus on the period from 2015 to 2022, which includes the influence of the pandemic. Interestingly, the pandemic's impact can be advantageous for studying ESG-related arguments. In fact, Chodnicka-Jaworska P. (2021) suggests that some rating agencies incorporated additional factors into their risk assessments during the pandemic, including the non-financial condition of companies and risks associated with exposure to ESG factors. With these new risk considerations, we can anticipate a different impact on returns. Indeed, the market incorporates future expectations of performance in a particular pillar into stock prices.

4.1.2 Five Years Credit Default Swap spread

The other variable under consideration is the five years CDS spread for the company, derived by the Bloomberg Issuer Default Risk model[17] and quoted in basis points. Credit Default Swaps are instruments utilized by lenders to protect themselves against the risk of borrower default. It is thus a derivative transferring the probability of default to another investor. Therefore, the spread being analysed represents the cost for a lender to safeguard against the borrower's default event.

The expectation regarding the impact on this variable is unclear because the research has not yet addressed the influence of disagreement neither in CDS nor in credit ratings. The existing research only examines the impact of individual ratings on credit ratings.

However, a significant finding in this area would be relevant due to the recent investor attention directed towards these topics. Credit Rating Agencies (CRAs) are already being pressured to enhance transparency regarding the ESG factors that influence credit ratings.

Michael Ferguson[18], Senior Director and Analytical Manager at S&P Global Ratings, states that they have always incorporated this source of risk into their models and that the only difference is that now more transparency is required, to assess what impacts what.

Additionally, the European Commission notes that the growing interest in the ESG rating market is also driven by the changing nature of the risk associated with a company's business, as investors increasingly focus on the financial implications of ESG

[17] More about the methodology of computation in Bondioli, M., Goldberg, M., Hu, N., and Li, C., Maalaoui, O., Maalaoui, O., Stein, H. J., *The Bloomberg Corporate Default Risk Model (DRSK) for Private Firms* (2021). Available at SSRN: https://ssrn.com/abstract=3911330

[18] PRI: ESG in credit risk and ratings https://www.unpri.org/the-pri-podcast/esg-in-credit-risk-and-ratings-episode-10/10537.article

matters.[19] This is naturally connected to the importance of this market in considering credit risk.

To support these arguments, the literature seems to strongly agree on the importance of ESG ratings for credit risk scores, also on sovereign and corporate credit ratings[20].
Chodnicka-Jaworska P. (2021)[21] quantified the impact of EGS risk on credit ratings, with certain pillars affecting specific sectors more than others. For instance, the credit ratings for the energy sector are mostly influenced by the risks associated with the Environmental pillar, while the Social pillar affects companies primarily appertaining to the consumer non-cyclical industry.
Zanin L. (2021)[22] arrived at the same conclusion, albeit using a different dataset and employing ordinal logistic regression, thus further confirming this impact.

4.1.3 Average Percentage Bid-Ask spread

Data about the Bid-Ask spread are taken from Bloomberg and computed as an average of all bid-ask spreads and expressed as a percentage of the mid-price. The bid-ask points utilized for the computation correspond to the quotes received within the designated period. For a trading day to be included in the calculation, there must be at least ten valid bid/ask spread points on that day. This field returns values only if more than 50% of trading days in the period meet the eligibility criteria for calculation.

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[19] European Commission: Proposal for a regulation of the european parliament and of the council on the transparency and integrity of Environmental, Social and Governance (ESG) rating activities https://ec.europa.eu/finance/docs/law/230613-proposal-sustainable-finance_en.pdf

[20] Ekaterina M. Gratcheva, Bryan Gurhy, Andrius Skarnulis, Fiona E. Stewart, and Dieter Wang. (2021). *Credit Worthy: ESG Factors and Sovereign Credit Ratings*. EFI Insight-Finance. Washington, DC: World Bank. https://documents1.worldbank.org/curated/en/812471642603970256/pdf/Credit-Worthy-ESG-Factors-and-Sovereign-Credit-Ratings.pdf

[21] Chodnicka-Jaworska P. (2021) ESG as a Measure of Credit Ratings. Risks. https://doi.org/10.3390/risks9120226

[22] Zanin L., (2021) *Estimating the effects of ESG scores on corporate credit ratings using multivariate ordinal logit regression*. Empirical Economics, Available at SSRN: https://ssrn.com/abstract=3932137

Currently, there appears to be a lack of significant literature focusing specifically on the impact of disagreement in this variable, despite its potential relevance. Considering the growing significance of sustainability topics in the financial industry, if a significant impact exists, investors should consider these factors to mitigate high transaction costs and deal with illiquidity. Particularly for short-term traders, a significant finding in this regard would have relevance in managing transaction costs. Given that the bid-ask spread depends on various factors and is not always readily trackable during trading, having advance knowledge that a specific factor statistically signifies a higher bid-ask spread can help traders in constructing their watchlists.

Chapter 5: Rating providers scoring methodologies

One crucial source of differentiation is undoubtedly the utilization of different methodologies to compute the ESG score. In this analysis, I will examine the distinct methodologies employed by the providers in my sample.

5.1 Standard & Poor[23]

S&P Global assigns ratings to more than 10,000 listed companies, encompassing approximately 99% of the global market capitalization.

To 45% of the companies within their sample, they ask questions employing a questionnaire known as the Corporate Sustainability Assessment (CSA)[24], comprising an average of 130 questions per company, tailored to the respective industry.

Companies that either do not respond or are not comprised in the eligible sample[25] for the CSA, are assessed by analysts that fill in the questionnaire on their behalf.

Additionally, companies are continuously monitored to update monthly their rating, based on a daily screening of controversies arising. The metrics, questions and criteria constituting the final grade are weighted according to the specific sector in which the company operates.

After the completion of the CSA, points are assigned based on two criteria: transparency and performance. The first aims to penalize companies with limited disclosures, and the latter simply evaluate how a company is performing in each field.

[23] S&P Global: S&P Global ESG Scores: https://www.spglobal.com/esg/documents/sp-global-esg-scores-methodology-2022.pdf

[24] S&P Global: The CSA: CSA_Handbook.pdf (spglobal.com)

[25] S&P Global: List of companies invited to do the survey: Invited companies | S&P Global (spglobal.com)

The points assigned after the CSA phase, are then aggregated to create the final ESG score, which follows a three-step weighting process. Firstly, the points obtained from the questions are weighted based on the relative weight for each question. This initial number is further weighted by criteria, where, as an example, questions related to the Climate Strategy have a different weight with respect to questions related to the Environmental Policy & Energy System. Finally, the weighted score is further multiplied by the respective dimension (E, S, or G). The resulting value represents the overall ESG score.

The table below illustrates the weights assigned for different criteria and dimensions in three example sectors:

[Table A about here]

At the end, S&P assign a grade from 0 to 100 for every pillar.

5.2 Refinitiv[26]

Refinitiv has a database of 12,500 of both publicly traded and private entities.

Rather than relying on questionnaires, they employ a team of 700+ content researchers to gather publicly available data from various sources.

[Image 3 about here]

Their computational model consists of two steps. In the first step, a score is assigned based on observable and disclosed data, while in the second step, an ESG controversies metric is incorporated to address sustainability impact and company conduct over time.

The process begins by collecting over 630 data points which are Boolean (answered with "Yes", "No" or "Null") and Numeric values.

[26] Refinitiv: ENVIRONMENTAL, SOCIAL AND GOVERNANCE SCORES FROM REFINITIV: https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf

At this stage, data deemed non-relevant for a specific segment are excluded from the computation.

These more than 630 data inputs are then utilized to calculate median values for each category. For the Environmental and Social dimensions, these median values are assigned based on the performances of the industry. Each category is subsequently weighted to determine the final E, S, and G scores.

However, the methodology for assigning weights is complex, so an example is meaningful.

Let's say that we are building the score for the Environmental Pillar, and we are evaluating the Category "Emission" for two companies operating respectively in the Oil & Gas and Banking Services industries.

Multiple themes, each computed with a single data point input, are associated with a particular category. For instance, the themes "Emission," "Waste," and "Biodiversity" are part of the "Emission" category.

The first step involves defining the data input that represents the theme score (e.g., "Waste"). All themes' scores within the "Emission" category for companies in the Oil & Gas industry are averaged and scaled on a 1 to 10 scale. This means that themes such as "Waste," "Biodiversity," and others within the "Emission" category are assigned weights, averaged, and the resulting Category score is compared to the corresponding value in the Banking Services industry.

Certain industries may have a higher average value assigned to them, indicating a greater impact in the specified category. In our example, Oil & Gas companies will have a value for the "Emission" category higher than 5, because their impact in the category is substantial, while the Banking Services would have a value lower than 5 for the same category.

A different approach is used for the Governance pillar. In this case, all categories are considered equally important across industries. Consequently, both Oil & Gas companies and Banking Services companies will have the same value for categories as “Management” and “Shareholders”, for example.

Subsequently, these values ranging from 1 to 10, are transformed into percentages by dividing this number by the sum of the all the values (each of them assigned to a category).

This process aims to define the relative importance of a category for an industry by comparing the data with other industries and ranking the resulting values. For example, if we want to assign a weight to the "Emission" category, we compute the importance of the category in the Oil & Gas industry by comparing it to the importance of other categories, such as "Human Rights."

The resulting weights assigned are represented in Table B.

[Table B about here]

After this scoring process, the methodology incorporates controversies, which are categorized into 23 different topics. Additionally, the methodology takes into account the market capitalization bias, recognizing that larger companies tend to attract more news coverage and attention.

[Image 4 about here]

As a final result, they obtain scores ranging from 1 to 10. Image 5 provides a summary of all the abovementioned processes.

[Image 5 about here]

5.2.1 Differences

- In contrast to S&P, Refinitiv employs a different approach to data collection. Indeed, most of the observations in S&P are collected through the CSA

questionnaire, while Refinitiv makes extensive use of publicly available data, collected either by machine learning approaches or by employees.

This data collection method allows S&P to potentially access non-disclosed data through the questionnaire, which reduces the likelihood of downgrading a company's grade due to non-disclosure issues.

The Refinitiv's method may penalize smaller-dimension firms with limited disclosure resources.

- Both S&P Global and Refinitiv conduct industry comparisons, but the choice of industries to compare companies against is an important aspect of the methodology and may vary across different ESG rating providers.
- S&P directly incorporates the controversies into the ESG score, while Refinitiv addresses controversies separately by creating a distinct rating called ESGC (ESG Controversies).
- In the Refinitiv's methodology, data that are deemed irrelevant for a given industry are marked as Non-Relevant and are not considered in following computations, while S&P assign a lower weight to such values.

  Overall, there is judgment involved in the definition of which data could be relevant or not. Indeed, the major sustainability matters, such as emissions, are typically defined as relevant by NGOs, research and regulations. However, when it comes to other sustainability factors that are not as widely covered or regulated, there may be more discretion on the part of rating providers in determining their relevance.

5.3 Arabesque[27]

Arabesque's framework for ESG scoring involve three different layers: Input Layer, Features Mapping and Scoring. The data in the Input Layer are collected from publicly available reports or NGO campaigns.

In the second step, they map these inputs to various sustainability topics (called Features), and they then use these Features to produce Scores.

The final score is sector-specific, aiming to identify companies that are better positioned to perform well in the future by managing ESG risk effectively.

Regarding the weighting methodology, Arabesque aggregates the inputs collected in Layer 1 into 22 different sustainability topics.

Materiality, which represents the impact of each factor on the financial performance of a sector, is defined for these 22 factors.

To define the materiality, they construct sector and industry-level portfolios, creating 12 different portfolios that serve as an index and then perform a two-step process.

The first is assigning static materiality to each Feature in each portfolio, which is based on third-party research on the topic. This approach of using third-party research to determine the importance of sustainability topics is common among many providers in my sample.

After that, they incorporate a dynamic materiality factor, meaning that they by studying the returns of the portfolio index and analysing the impact that each feature has had on the portfolio over the considered time horizon. This allows them to adjust the weight assigned to each feature based on its impact on returns.

This methodology considers both qualitative and quantitative factors, making it more comprehensive than some other approaches.

[27] Glasslewis: Arabesque S-Ray: http://www.glasslewis.com/wp-content/uploads/2022/01/GlassLewis_FAQs.pdf

However, assigning the weights based on past returns may introduce a bias. Over time, the focus and relevance of sustainability topics can evolve. For example, while emissions may have had a significant impact in the past, as more companies reduce their CO2 footprint, other categories may become more relevant and shift the risk landscape of businesses. Therefore, relying solely on past returns may not capture the changing dynamics accurately.

5.3.1 Differences

- While Refinitiv in assigning importance to the different categories use a more quantitative framework, Arabesque utilizes a combined approach. They start by analysing third-party research to then incorporate a quantitative analysis, in which they analyse a Feature, and try to assess the portion of returns that can be explained by the variation of the Sustainability Feature. In a way, this approach can be more complete, since looking just at qualitative or quantitative factors can be misleading.

  However, the use of past returns may result in an extrapolation bias.
- In the case of Arabesque, their scoring is updated daily, reflecting a more algorithmic and dynamic approach.

5.4 IdealRatings[28]

IdealRatings ESG scores are built by screening the companies by researching and documenting answers to a series of qualitative questions, which require a "Yes", "No" or "In-Conclusive" answer.

These questions are designed to collect more than 200 data inputs, which are aligned with the International Norms such as the United Nations Global Compact (UNGC),

[28] Ideal Rating: ESG & Responsible Investment Solutions https://idealratings.s3.eu-west-1.amazonaws.com/Marketing/IdealRatings+Responsible+Investment+Product+Overview+2021.pdf

the Sustainable Development Goals (SDGs), or the Universal Declaration of Human Rights (UDHR).

The collected inputs are then categorized under KPIs relevant to the E, S or G pillar, and the sum of the inputs provides the score of every pillar, ranging from 0 to 100.
The weight assigned to each KPI contributing to the total score is based on IdealRatings' industry-specific materiality assessment.

The overall ESG rating is the sum of the scores for each pillar, with a maximum total score of 300. An AAA grade is assigned to the highest rating.

[Image 6 about here]

The qualitative data is supplemented by incorporating 40 quantitative indicators grouped into 10 KPIs, in addition to the 16 indicators to which the qualitative inputs are linked.

Reading their methodologies disclosure paper, the controversies seem not to be incorporated, but part of another rating, as other providers do.

5.4.1 Differences

- Overall, their methodology does not differ significantly from other providers.
- The range of companies they rate is larger, but they track a narrower range of data, consisting of a total of 240 data inputs, 200 of qualitative nature, and 40 quantitative.

5.5 Bloomberg[29]

The Bloomberg scoring system analyses the ESG performances of various companies, not by benchmarking each company to the common and usual industry of affiliation but using the Bloomberg ESG Classification system (BECS). BECS builds upon the classic Bloomberg Industry Classification System (BICS) to then consider more granular categories. It aggregates firms basing on their business models, supply chains, products, services, and clients exposed to similar material issues. As a result, it provides a more detailed segmentation compared to other providers.

In creating the peer group, Bloomberg also incorporate statistical analysis. For example, if statistical tests suggest that there are no significant differences in the data between two peer groups, the industries are pooled together, thereby enhancing the sample. However, for certain Inputs, as the Scope 1 Greenhouse Gas Carbon Dioxide Emissions, this process is not applicable.
The statistical analysis they perform on the dataset is possible because of the parametric approach they use. This approach approximates the empirical distribution given the data, to address some challenges that may not be considered with other percentile-based methods. It enables them to eliminate outliers and perform various statistical tests on the data.

However, it is worth noting that both the parametric-driven and the percentile-driven approach can lead to scores that may differ from the true representation. This is because both are sensitive to the overall score of the peer group.

For the Environmental and Social score, Bloomberg uses a three-part assessment to determine the importance of various Issues, where Issues are defined by International

[29] Bloomberg: the methodology framework is accessible through the Bloomberg Terminal

Standards as the Sustainability Accounting Standards Board, the GRI, or Task Force on Climate-related Financial Disclosures (TCFD).

The three-part assessment consists of defining (i) the *Probability* of the Issue materializing, (ii) the *Magnitude* that the materialization can have on financial dimensions and (iii) the *Timing*, indicating when the Issue can materialize.

Based on this assessment, Bloomberg defines the Issues by analysis which sustainability factors can be important in each pillar. They then further divide these Issues into Sub-Issues categories. Sub-Issues are made up of data points, called Fields, which similarly to other providers can be either Numerical or Boolean data.

These Sub-Issues scores are aggregated to form Issues scores which also reflect the level of disclosure. In fact, the Sub-Issues scores are averaged and then capped within a 0-3 range if the disclosure is not appropriate, as highlighted in Image 7.

[Image 7 about here]

[Image 8 about here]

For the G metric, the priorities are defined mostly by using proprietary human sources. Indeed, the decision-making process involves finalizing the output of internal discussions with Bloomberg Intelligence analysts, other internal analyses, and external academic and scientific studies.

The definition of Priorities plays a crucial role in determining the subsequent weights that are incorporated into the function for calculating the final Pillar score, which is a weighted generalized mean.

The definition of the priority establishes a natural ranking, indicating which Issues are more important than others for a given group of companies. This ranking, denoted with "k" letter, is then used as a dependent variable for the creation of the weights, defined by the formula below.

$$w = 1 + e^{0.5 \times (3-k)}$$

The weights do not decrease linearly. Indeed, lower important rankings have less effect on the pillar score (with higher "k" meaning less importance).

[Image 9 about here]

Various adjustments are then performed, to arrive to a pillar score comprised between 0 and 1.

5.5.1 Differences

- It is evident that Bloomberg leverages its expertise and in-house software to obtain a more detailed industry segmentation, examining more factors such as the supply chains, the business models, and the client base.
- In general, for all providers, it is not fully clear the treatment they use to fill in non-disclosed data. Reading the cited methodology framework, it seems that no use of filling techniques is done. Indeed, they mention that data which are not directly or indirectly derivable from publicly available information are not used. However, reading to other articles, it seems they are active in the research of Machine Learning techniques to provide a filling method of blank/non-disclosed data[30].
- Bloomberg aligns the approach on the use of qualitative factors to Refinitiv, Arabesque, and IdealRatings. They use such qualitative factors just to draw which issues can be relevant for a specific industry, looking at third-party research or regulation.

  On the other hand, S&P takes a slightly different approach by assigning a grade based on qualitative metrics, although it is not explicitly specified in detail. Indeed, according to their white paper, "Scores focus on quantitative, performance-driven metrics, as well as management programs and policies", the

[30] Bloomberg: Imputation of missing ESG data using deep latent variable models https://www.bloomberg.com/professional/blog/imputation-of-missing-esg-data-using-deep-latent-variable-models/

latter being considered qualitative. Indeed, "For qualitative topics, such as company policies and management approaches, points are awarded according to the contents and substance of policies and procedures", letting intend the use of judgment in assigning scores related to these topics.

5.6 Final remarks

From the assessment of the implemented methodologies, we can derive that it is crucial to carefully examine how points are assigned.

Indeed, when focusing on an upstream oil company with a good emission rating, one might think they excel in managing emissions, posing them as leaders in driving the industry change. However, in most cases ratings are created by comparing companies industry wise, and both the percentile and the parametric-driven approach, tend to give high grades to companies that are the best of a group, even if the group overall exhibit low performances in that specific field.

Another key insight is that using just one rating provider may not be sufficient. Different providers employ diverse methodologies, and relying solely on one provider may limit the incorporation of comprehensive and adequate factors.

For instance, if one tries to construct a portfolio by looking just at one provider that uses as peer group the industry of affiliation, his/her portfolio might overweight companies that are perceived as sustainable with respect to their peers, not fully responding to the needs of a portfolio that want to address a given topic.

A successful strategy instead, should consider the methodologies used by multiple providers with different classification systems, being able to address the desired objective.

Moreover, when investing with long-term horizons, one should embed his future view, but some providers, as MSCI, already incorporate the Management Effort[31] that consider also the sustainability efforts undertaken in the growth process.

[31] MSCI: MSCI ESG Ratings Methodology https://www.msci.com/documents/1296102/15388113/ESG-Ratings-Methodology-Exec-Summary.pdf

Chapter 6: Summary statistics

A table with summary statistics about the disagreement is provided in Table 1

[Table 1 about here]

The table indicates that the number of observations for the ESG total pillar is lower compared to other. This is because data from S&P Global regarding the total pillar were unavailable, despite having a broader dataset for the individual categories (E, S, and G).

Additionally, summary statistics are provided for the score assignments of different rating agencies.

[Table 2 about here]

What is interesting is the analysis of the correlation between the different providers. Gibson R., Krueger P., Schmidt S. P., (2021) found that the governance factor had the lowest correlation, while the Environmental dimension showed the higher correlation among providers.

The results obtained in this analysis align with their findings, where the ratings of the governance pillar from different providers had the lowest Pearson correlation of 0.13, while the environmental pillar had the highest correlation with a value of 0.5. This may be attributed to the increasing focus on the environmental pillar in recent years and regulatory efforts to establish a common valuation method.

Table 3, 4, 5, and 6 show the results regarding the average correlation for each pillar, as well as the correlation between providers.

[Table 3,4,5,6 about here]

It is important to note that there are some NAs (not available) due to the lack of data for the S&P ESG category, as well as the various pillars from IdealRatings.

Chapter 7: Methodology

As mentioned previously, the following analysis aims to assess the impact of the ESG rating disagreements between different providers on different stock variables, trying to further expand the methodology used by Gibson et al. to other dimensions, and particularly to the average Bid-ask spread and to the Credit Default Swap spread.

The analysis was conducted using R, which allowed for studying the pooled panel dataset with fixed effects.
A long-format dataset was chosen to ensure flexibility when handling missing elements and to simplify the merging process when adding new variables. Dealing with a large amount of data can introduce data integrity issues, but the long format helps avoid repeated variables across columns.
The usage of monthly data allowed me to have more observations about ESG ratings while still being able to consider variables that are typically collected and analysed in a shorter time window, such as the Bid-Ask spread.

To make data comparable across different providers, a percentile rank was used instead of simple rescaling. This is because different providers may use different scoring systems (e.g., letter grades or numbers) that require a more robust and non-parametric approach.
The percentile ranking considers the relative position of a rating within a sample, ensuring comparability and interpretability of the data while being robust to outliers.
Moreover, as pointed out by Gibson R., Krueger P. and Schmidt S. P. (2021), Investors often consider ratings in terms of rankings rather than absolute values. If you decided to Invest in a stock of a given Index and you want to address ESG ratings in the stock selection process, you will likely look at the position a company has within the index, rather than comparing it to companies worldwide.

Therefore, the grades are rescaled to a 0-1 basis depending on the position they have within the sample. This computational technique is implemented at each point in time, assigning an average rank to companies that have the same rating.

Finally, the datasets from different providers are merged based on the date and company, allowing for the integration of multiple variables for analysis.

7.1 Independent variables

As independent variables, I used the disagreement between rating providers about the ESG rating, as well as the E, S, and G pillar singularly.

The disagreement is computed as the standard deviation of the percentile rank assign to a company by each provider in the sample.

To facilitate panel regression analysis, all the data were transformed into a vector version using R. In this vectorized format, each element "i" represents the standard deviation of the rating for a specific stock in a given period. Once the vector reaches the element number 503 (number of stocks in the sample), the cycle restarts considering a different month.

Most of the standard deviations fall within the range of 0 to 30%, but the ESG disagreement distribution showed a slightly different pattern. This discrepancy is attributable to the limited availability of data specifically related to the total pillar, leading to a different distribution for this variable.

[Image 10 about here]

7.2 Dependent variables

The dependent variables used in the analysis are monthly returns, CDS spread, and average percentage bid-ask spread. The anticipated impact of the independent variables on Credit Default Swaps (CDS) and the average bid-ask spread are different.

Indeed, a higher rating disagreement may cause a higher CDS spread, since the cost of insuring against the default of a company may become higher if more uncertainty related to ESG factors is attached to the company. However, the calculation of CDS spread is derived from credit ratings, and while some credit rating agencies incorporate sustainability-related risks into their assessment of default risk, the effect of rating differences from various providers is not well-established in the literature.

Concerning the average bid-ask spread, my initial expectation is twofold. From a market maker's standpoint, a consistently higher disagreement among ratings may prompt them to widen the bid-ask spread as a precaution against potentially informed investors who possess accurate knowledge about a company's sustainability value.
However, at the same time, the opposite can apply, with a higher disagreement implying an overall mismatch between the valuations done by investors about the true fundamental value of a stock. This contrast in valuations may result in a more balanced order flow, without unexpected order imbalance on one side, since investors come up with different prices and different biases, being both buy and sell. As a consequence, the market maker may offer better quotes due to the lower standard deviation and reduced inventory risk they face.

7.3 Control variables

As control variables, industry month fixed effects were employed in the analysis. These fixed effects are commonly used in the literature to account for industry-specific factors that may influence the variables of interest across different time periods. By including industry month fixed effects, the analysis controls for any systematic variations in the dependent variables that are specific to particular industries in each month. This helps to isolate the impact of the independent variables (rating disagreement and ESG pillar scores) on the dependent variables (monthly returns, CDS spread, and average bid-ask spread) while controlling for industry-specific effects.

7.3.1 Control Variables for Returns.

- Size: According to Fama and French (1992)[32], there is a strong relation between average returns and size, therefore I consider the size of the company, intended as market capitalization (Mkt_Cap) for every month. Mkt_Cap data are taken from Bloomberg and computed as outstanding shares multiplied by the price of the single share at each point in time.
- Book-to-Market Equity: again, Fama and French (1992) found that the combination of size (Mkt_Cap) and book-to-market (BTM) seems to absorb leverage and Earnings/Price effects.
- Market-Sentiment: Baker and Wurgler (2007)[33] study the effect of market sentiment in stock returns. Among the many variables they identify as a proxy, one is widely used by the literature, and it is the Volatility Index (VIX). The VIX that measures the implied volatility in the S&P100 stock index.
- Lagged returns: Hasbrouck (1991)[34] studied the impact of a single trade on the subsequent returns, by using a bivariate autoregressive model. Even if he studied short time-frame data, theories about momentum are an open question in finance, therefore including a lagged variable for returns could be significant in cleaning the error term.
- Other variables: As in Gibson R., Krueger P., Schmidt S. P. (2021), I considered other firm-specific variables, such as the Current Ratio (CURR) computed as Current Assets/Current Liabilities and indicating the ability of a company to pay back its short-term liabilities using short-term assets, and the leverage ratio (LEV), computed as Average Total Assets/Average Total Common Equity, measuring the percentage of assets to Equity.

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[32] FAMA E.F. and FRENCH K.R. (1992), *The Cross-Section of Expected Stock Returns*. The Journal of Finance, 47: 427-465. https://doi.org/10.1111/j.1540-6261.1992.tb04398.x

[33] Baker M., Jeffrey. W. (2007) *Investor Sentiment in the Stock Market*. Journal of Economic Perspectives, 21 (2): 129-152. https://www.aeaweb.org/articles?id=10.1257/jep.21.2.129

[34] Hasbrouck J. (1991), *Measuring the Information Content of Stock Trades*. The Journal of Finance, 46: 179-207. https://doi.org/10.1111/j.1540-6261.1991.tb03749.x

7.3.2 Control variables for Bid-Ask spread:

- Stock-specific volatility: According to the Inventory model drawn by Stoll (1981)[35], the higher the stock volatility, the wider the bid-ask spread. This is due to the greater uncertainty attached to the management of the inventory in conditions of higher volatility.
- Broader market volatility: I also considered the broader market volatility, given that the spread could increase in a situation of higher uncertainty in the market as a whole.
- Liquidity: Stocks with higher liquidity tend to have narrower bid-ask spread (Stoll, 1978)[36]

  Given that I did not have access to data such as order flow or market depth, I decided to compute an Amihud measure for liquidity. The Amihud measure assesses the impact of trades on stock prices, with higher impacts indicating lower liquidity for the stock. It is important to note that liquidity encompasses a broad concept, but this measure specifically addresses only the concept of resiliency.

  To compute it, I utilized the Bloomberg's Volume data, representing the number of stocks traded within the monthly period. By computing the variation from the previous month, I obtained the change in trading activity and used it as the denominator of the formula. For the numerator of the formula, I used the simple monthly returns, which capture the price movement of the stock during the same period. Dividing the price movement by the change in volume allowed me to derive the Amihud measure for liquidity.

[35] Ho T., Stoll R. H., (1981) *Optimal dealer pricing under transactions and return uncertainty,* Journal of Financial Economics, Volume 9, Issue 1, Pages 47-73,https://www.sciencedirect.com/science/article/pii/0304405X81900209

[36] Stoll, H. R. (1978). The supply of dealer services in securities markets. Journal of Finance, 33(4), 1133-1151.

Please note that due to data limitations, this measure focuses solely on resiliency and does not consider other dimensions of liquidity, such as breadth, depth or velocity in absorbing trades.

- Company size: Larger firms tend to have a wider bid-ask spread.[37] Especially, the market capitalization of a company tends to have a negative impact on the bid-ask spread. Following Jelanti D., Fitriyah. (2022), a company with larger assets tend to have the ability to diversify the business, making it less risky. This could be related to lower inventory costs for the dealer, as a more diversified company can bring down the firm-specific standard deviation in the dealer's inventory portfolio. As a result, the dealer may require lower compensation for risk associated with holding a larger-size stocks in its portfolio leading to a decreased spread for such stocks.
- Other variables: Market-makers competition[38] and information asymmetry[39] can have an impact in the bid-ask spread. Specifically, higher competition, as seen in monopolistic markets with only one dealer compared to oligopolistic markets with more than one market-maker, has been shown to reduce the average bid-ask spread offered to market participants. On the other hand, information asymmetry widens the spread as the dealers safeguard themselves against potentially informed trades. Huang and Stoll (1997),[40] found that 9% of the bid-ask spread is driven by information asymmetry.

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[37] Jelanti D., Fitriyah. (2022). *The effect of company size, stock return, and trading volume on the bid-ask spread of stocks on lq45 companies listed on the IDX (2016-2020).* Journal of management, accounting, general finance and international economic issues, 2(1), 157–171. https://doi.org/10.55047/marginal.v2i1.368

[38] Mayhew S. (2002). *Competition, Market Structure, and Bid-Ask Spreads in Stock Option Markets.* The Journal of Finance, 57(2), 931–958. http://www.jstor.org/stable/2697763

[39] Huang R. D., R. Stoll H., (1997) *The Components of the Bid-Ask Spread: A General Approach.* The Review of Financial Studies, Volume 10, Issue 4, October 1997, Pages 995–1034, https://doi.org/10.1093/rfs/10.4.995

[40] Huang, R.D., Stoll H. R. (1997) *The components of the bid-ask spread: A general approach*, Review of Financial Studies 10, 995-1034.

However, this variable is not examined in the scope of this analysis, due to the limitation of available data.

7.3.3 Control Variables for Credit Default Swap spread

- Creditworthiness of a company: it is measured using the Bloomberg 5Y probability of default (which calculates the probability of default of the company over the next five years using the Bloomberg Issuer Default Risk Model) and the Bloomberg 1Y probability of default (which calculates the probability of default of the issuer over the next 1 year using the Bloomberg Issuer Default Risk model). The creditworthiness of a company can significantly impacts the CDS spread offered, as pointed out by Longstaff F. A., Mithal S., Neis E., (2005)[41]
- Broader market conditions and macroeconomic factors: Some market and macroeconomic factors can influence the CDS spread for a given company. Indeed, such broader economic conditions can have an impact on the market as a whole, leading to an increase in systematic risk. To account for these factors, I used interest rates (3-month treasury bills interest rates) and inflation levels.[42] Data on inflation is sourced from the US Bureau of Labor Statistics (https://www.bls.gov/), while interest rates are obtained from FRED at https://fred.stlouisfed.org/series/TB3MS . Additionally, the volatility of the single stock is considered to assess the specific risk component.

The use of fixed effects is important to consider the heterogeneity within the sample of companies in the S&P500 index, as well as to rule out the effects of omitted variables.

[41] Longstaff F. A., Mithal S., Neis E., (2005) *Corporate Yield Spreads: Default Risk or Liquidity? New Evidence from the Credit Default Swap Market*, The Journal Of Finance

[42] Elton J. E., Gruber J. M., Agrawal D., Mann C., (2001) *Explaining the Rate Spread on Corporate Bonds*, The Journal of Finance

Chapter 8: Results

8.1 Returns

Despite the effort made to align the results with those of Gibson R., Krueger P., Schmidt S. P. (2021), the utilization of a different datasets inevitably led to divergent outcomes.

[Table 7 about here]

Even if both ESG and SOCIAL had a positive coefficient, meaning that more disagreement lead to higher returns, they did not reach statistical significance. The only one being statistically significant was the governance pillar (GOV), with a positive coefficient.

In this case, I conclude that the dataset I used may have a limited and more specific application, leading to different results from Gibson et al.

According to the analysis conducted in this research, a 1% higher standard deviation between the providers regarding the Governance pillar corresponds to a 0.68% increase in monthly returns.

When comparing my findings to those of Gibson et al., it is worth highlighting that even if another pillar showed statistical significance, the direction of the coefficient was positive, aligning with their findings.

This suggests the same relationship between disagreement and returns hold, with higher disagreement leading to the requirement of an increased risk premium by market participants.

The MOM variable in this analysis captures momentum. It is a discrete variable that takes the value 1 if a positive return is followed by another positive return, -1 if a negative return is followed by another negative return, and 0 otherwise. Therefore, a positive value indicates the presence of momentum, where the previous month's positive returns have an impact in the same direction on the current month's returns. In this

particular case, the MOM variable is consistently positive and statistically significant, confirming the presence of momentum in the evaluation period.

8.2 CDS Spread

Regarding the impact of the disagreement on CDS spread, the initial expectations were that higher disagreement would result in higher Credit Default Swap spread. This expectation stemmed from the consideration that certain agencies incorporate ESG ratings into their Credit Risk models, and thus higher disagreement would imply increased uncertainty in determining the cost of insuring against default.

However, the results highlight that higher disagreement about the ESG and GOV pillars can lead to lower CDS spread.

[Table 8 about here]

Specifically, a higher standard deviation of 1% about the ESG factor between providers can result in a decrease of 0.22% in CDS spread.
For the GOV factor the impact is lower and negative at -0.113%.

It is worth mentioning that the ESG pillar had fewer observations (3,622) compared to the other pillars (approximately 35,000), which resulted in different magnitudes of the results and a lower adjusted R-Squared of 50%.

The interest rates and inflation variables together can be seen as indicators of the overall economic conditions, and they suggest that in worse economic conditions, the spread increases.
When inflation rates exceed the targeted level and interest rates are higher, there is the perception of a contraction in the economic environment. Higher interest rates signify difficulties in raising new capital for companies, which lead consequently to an increase in the CDSs. Similarly, high inflation levels result in a loss of purchasing power for both

companies and consumers, and it acts as a proxy for the expectation of higher future policy rate to control inflation and keeps it near to the targeted levels.

A 1% increase in inflation leads to a 0.0194 basis point increase in the CDS spread, indicating a positive relationship between inflation and the spread. On the other hand, a 1% increase in interest rates results in a larger increase of 0.1092 bps in the CDS spread, suggesting a stronger impact of interest rates on the spread.

8.3 Average Bid-Ask spread

The analysis of the impact of disagreement on the bid-ask spread yields contrasting expectations.

From a market maker's perspective, the bid-ask spread represent a remuneration for continuously providing liquidity to the market and a compensation for the risk associated to trading with informed parties and to hold an inventory of stocks.

In this case, the bid-ask spread can be widened for those stocks that have a consistently higher disagreement regarding the ESG ratings. This is done to protect himself/herself from the presence of possible informed investors who know the true sustainability value of the company and may seek to exploit this informational advantage.

However, at the same time the opposite can apply. A higher ratings' disagreement indicates an overall mismatch in valuations of the companies' real fundamental value. This contrast in valuations can imply a more balanced order flow, with both buy and sell from investors who have different prices and biases, without a significant order imbalance in one side.

For instance, one investor may value a company at 95, while another using different data may value the same company at 105. This disparity in valuations leads to a more

balanced order flow, reducing the occurrence of significant order imbalances on either the buy or sell side.
As a result, the market-maker may offer better quotes because of the lower standard deviation and the lower inventory risk he/she faces.

The abovementioned explanation is derived by Chordia T., Roll R., Subrahmanyam A., 2002).[43] Indeed, "Regardless of the cause, market makers can be expected to respond by worsening their offered terms of trade" due to adverse inventory reasons. Therefore, in an opposite scenario, the offered quotes can be improved.

The coefficients can be interpreted also from a liquidity perspective. The Bid-Ask spread is not just a proxy for the flow of information and the management of market makers' inventories, but also an indication of one dimension of market liquidity, named breadth. A positive impact of higher disagreement on the bid-ask spread could indicate that increased disagreement leads to lower liquidity. This could be because investors may prefer other stocks in a portfolio that consider quantitative ESG metrics, lowering the demand for those stocks.
On the other hand, the presence of a more balanced order flow resulting from differing valuations among investors can potentially contribute to overall market liquidity. If there is a mix of buy and sell orders at different prices due to varying biases, it may lead to enhanced and equilibrate trading activity.

Regardless of the underlying reason, the results of the analysis seem to confirm the hypothesis of negative coefficients, suggesting that higher disagreement among investors is associated with tighter bid-ask spreads.

[43] Chordia T., Roll R., Subrahmanyam A., (2002) *Order imbalance, liquidity, and market returns*, Journal of Financial Economics, Volume 65, Issue 1, Pages 111-130, (https://www.sciencedirect.com/science/article/pii/S0304405X02001368)

[Table 9 about here]

The analysis reveals that higher disagreement has a negative impact on the average bid-ask spread, except for the GOV pillar. ESG and ENV show statistical significance, with the Environmental (ENV) pillar contributing the most to the reduction in the bid-ask spread.

The analysis demonstrated that higher Volume is associated with lower average bid-ask spread. It is worth noticing that the coefficients are very small, in the order of 10^ (-10), because the Volume variable is represented in units. Therefore, the coefficient represents the effect on the dependent variable of a unitary increase in stock traded compared to the previous month.

The variable AMI_ILL shows the impact of a raw Amihud Illiquidity measure. The higher the variable, the higher the price impact that one trade have had on the price of the stock.
AMI_ILL is computed as follows:

$$AMI\_ILL = \frac{|Rets_i|}{Volume_i}$$

meaning that every month, the returns are divided by the volume traded in that month. The impact of this variable is positive and statistically significant, meaning that the increase in the AMI_ILL variable (to be intended as an increase in illiquidity) has caused an increase on the average bid-ask spread.

The small magnitude of the coefficient is due to the denominator, which represents stocks as unitary to guarantee comparability with the Volume variable.
To illustrate the impact, let's consider an example: if a 10% change in price in one month was generated by trading 10 stocks, the AMI_ILL measure would be 0.01.

Imagine that, in the following month, the liquidity conditions worsen, and the same 10% return is generated by trading only 9 stocks, the measure is now 0.011, therefore higher.

This shift will impact the bid-ask spread of approximately 0.000005%[44], which seems small, but it is caused by just one stock.

[44] The decrease in stocks traded has caused the AMI_ILL to change of 0.001. Considering that the numerator is made up of returns (with 0.01 corresponding to 1%), the correct interpretation of the coefficient considers that a 0.01 change in AMI_ILL would cause a 0.00005% change in bid-ask spread. In our case we had a 0.001 change in the AMI_ILL variable, have a 0.000005% impact.

Chapter 9: Portfolio Construction

9.1 Methodology

Given the results regarding the impact of disagreement on the average bid-ask spread, I aim to determine whether implementing a strategy in stocks with higher or lower disagreement can lead to potential cost savings.
To accomplish this, I have developed a simple strategy in R programming language.
The strategy involves purchasing selected stocks at the open price every day and selling them at the closing price.

It is important to note that this strategy does not have a logical basis and is not expected to significantly affect returns. The crucial aspect lies in the process of stock selection, and in the assessment of the impact on transaction costs.

Every month, I look at which are the stocks among the S&P 500 sample that exhibit the highest disagreement regarding ESG ratings, as well as those with the lowest disagreement.
To do this, every month I constructed a dataset with the stocks in the upper quartile (stocks above the 75^{th} percentile) in terms of ratings standard deviation, stocks in the lowest quartile (the stocks lying below the 25^{th} percentile) and stocks in the middle quartile (between the 25^{th} and 75^{th} percentiles).

Considering the findings about the impact on the bid-ask spread, the objective is to analyse whether implementing a strategy that daily invests in stocks with higher disagreement would result in a significant decrease in trading costs.
Thus, implementing daily transactions either for a trader or for individuals who frequently rebalance their portfolio can have a significant impact on expenses.

Since the strategy rely on daily data, the analysis is restricted to a shorter period to ensure smoother computation. Indeed, the dataset used consisted of 805 days and includes 503 stocks, with a total of 404,915 observations.

In light of this, the results of the regression presented in *Chapter 8: Results* are re-evaluated to match the timeframe of the daily price dataset. Specifically, the analysis is conducted for the period from December 2018 to December 2021. The revised results are then summarized in Table 10.

[Table 10 about here]

As the sign of the coefficient is the same for the longer period assessed previously (2015-end of 2022) and presented in Table 9, we can proceed analysing the effect of implementing the strategy.

The simplified approach consists of investing every day in selected stocks buying at opening price and selling at the closing price, to then assess the transaction costs at the end of the period, computed as roundtrip costs (the cost of buying at ask and selling at bid every day).

The selected stocks for each day are chosen based on their percentile ranking. For example, the stocks in the upper quartile represent the 25% of stocks with the highest rating disagreement, while the lower quartile includes the 25% for which the disagreement is the lowest.

The quartile assignment of stocks is evaluated on a monthly basis and remains constant throughout the month, as ratings' data are monthly.

However, it is possible that the number of stocks in a quartile, over time may slightly change due to missing observations at certain points in time. To ensure equal weighting of the investments and simplify computations, the wealth invested is recomputed for each period, adjusting the amount invested in the stocks accordingly. This ensures that

an equally weighted amount is maintained across the selected stocks throughout the assessment period.

$$Return_t = \frac{P_{A,t} - P_{A,t-1}}{P_{A,t-1}} + \frac{P_{B,t} - P_{B,t-1}}{P_{B,t-1}} + \cdots + \frac{P_{Zn,t} - P_{Zn,t-1}}{P_{Zn,t-1}}$$

With

$$t = day$$
$$A\,, B\,, \ldots Zn = Stocks$$

$$Tot.Return = \sum_{t=01/12/2018}^{31/12/2021} w_t * Return_t$$

With

$$w_t = amount\ invested\ in\ every\ stock\ in\ day\ t$$

Therefore, we obtain a vector of daily returns by investing in every company within the quartile and calculating the returns as the percentage difference between the opening and closing prices.

Afterwards, I computed the transaction costs associated with implementing this simplified strategy. These transaction costs are calculated as the round-trip costs of buying at the quoted ask price and selling at the quoted bid price. The difference between the ask and bid prices is considered as a percentage of the mid quote. The resulting expenses, in dollar terms, are obtained by multiplying the equally invested amount in each stock by the transaction costs expressed in percentage terms. This is shown in the formula below:

$$Mid\ Quote_{A,t} = \frac{ask_{A,t} + bid_{A,t}}{2}$$

$$Transaction\ costs_t\ (\%) = \frac{ask_{A,t} - bid_{A,t}}{Mid\ Quote_{A,t}} + \frac{ask_{B,t} - bid_{B,t}}{Mid\ Quote_{B,t}} + \cdots + \frac{ask_{Zn,t} - bid_{Zn,t}}{Mid\ Quote_{Zn,t}}$$

With

$$t = day$$
$$A, B, \ldots\ Zn = Stocks$$

$$Transaction\ costs_t\ (\$) = w_t * Transaction\ costs_t\ (\%)$$

$$Total\ Transaction\ costs\ (\$) = \sum_{t=01/12/2018}^{31/12/2021} Transaction\ costs_t\ (\$)$$

9.2 Results

To highlight the differences between the two quartiles, a comparison between the two portfolios' performances is presented in Table 11.

[Table 11 about here]

As shown in Table 11, the portfolio created by systematically investing in stocks with higher disagreement regarding the Environmental pillar exhibits lower transaction costs. However, the returns from this portfolio are also lower. It is important to note that we did not find any statistical significance in the field of returns, and therefore, we cannot draw any conclusions regarding the performance. Indeed, in the scope of this analysis, returns cannot be considered as a reliable measure since the implemented strategy lacks evidence of being successful.

Regarding the Governance aspect, the small magnitude of the coefficient makes it challenging to draw definitive ex-ante conclusions. With a low coefficient, the results can be sensitive to the chosen time frame, especially considering the discrepancy between the monthly data used for the regressions and the daily data used to build the portfolio.

The results are presented in Table 12.

[Table 12 about here]

For the ESG total pillar, however, we anticipate higher costs for the lower quartile, based on the regression results mentioned in *Chapter 8: Results*.

Indeed, as depicted in Table 13, the roundtrip costs of the daily buy and sell strategy are lower for the stocks in the upper quartile.

[Table 13 about here]

9.3 Key takeaways

The disagreement about ESG ratings among the providers in my sample did not yield noticeable results for what concerned the impact on returns or CDS spread. However, it did have an effect on the bid-ask spread.

Therefore, when implementing strategies that consider ESG ratings, it is crucial to take into account the transaction costs that may be incurred.

The monthly disagreements about ESG ratings play an important role even when systematically implementing a daily strategy, as the disagreement can influence the quotes offered by market makers.

Taking these factors into consideration can benefit the cost side of a short-term investor in the long run. By being mindful of the transaction costs and the potential impact of ESG rating disagreements, investors can make more informed decisions and optimize their trading strategies.

Chapter 10: Conclusions

In this analysis, I explored the reasons behind the disagreement about the ESG ratings, an industry that is growing at a fast pace. This growth can be attributed to factors such as the focus on energy transition by regulators and other societal trends that emphasize the importance of the Social dimension.

One of the key reasons for disagreement is the differences in methodologies used by different rating providers. I conducted a qualitative analysis of these methodologies to highlight the variations, which can be a significant factor contributing to the rating disagreements that the European Union is currently addressing.

I then implemented the methodology used by Gibson R., Krueger P., Schmidt S. P. (2021) in their research paper titled "ESG Rating Disagreement and Stock Returns". Their methodology consists in evaluating the disagreement about ESG ratings as the standard deviation between the percentile rankings derived from different rating providers, in order to assess the impact on various variables.

Regarding returns, which was also a variable studied in their research, I obtained different results, primarily due to the differences in the dataset used.
With the rating agencies at my disposal, covering the period from 2015 to 2022, just the disagreement about the Governance pillar had a statistically significant impact on returns. Specifically, a 1% increase in disagreement resulted in a monthly return increment of 0.6%.
It is worth highlighting that, even if I found another pillar to be significant in my sample, the direction of the coefficient was positive, aligning with the findings of Gibson et al. This suggests the same relationship between disagreement and returns for that particular pillar.

When it comes to CDS spread, the significant coefficients I found were different from my initial expectations.
According to the OLS regression, a higher standard deviation between ratings provided by different agencies for ESG and GOV pillars had a negative impact of respectively 22,9 and 11,3 bps on CDS spread. This implies a reduction in the cost of insuring against a default of the considered company.

However, what is particularly interesting is the impact on the bid-ask spread, computed as the average monthly spread between bid and ask, expressed as a percentage of the mid-price.
The results revealed that a higher 1% standard deviation about the ESG and ENV pillar decreased the Average Bid-Ask spread by 1.92% and 2.582% respectively.
This suggests that increased disagreement among rating agencies regarding these pillars had a favourable impact on the Bid-Ask spread, resulting in lower trading costs for investors.

To demonstrate the potential impact of the Bid-Ask spread findings on the costs associated with implementing a simple daily strategy, I constructed a portfolio that invested daily by buying stocks in the upper and lower quartiles at the opening price and selling them at the closing price.
The period examined spanned from December 2018 to December 2021, to facilitate the management of a large amount of data. The results of the regression restricted in this period were consistent, with ESG and ENV pillar coefficients being negative and statistically significant at 1% level. Additionally, the GOV coefficient demonstrated to be statistically significant, albeit with a smaller magnitude (0.8% monthly impact on bid-ask spread for a 1% increase in standard deviation).

The results show that considering the variation between rating providers can results in substantial savings in transaction costs when dealing with large numbers of daily transactions.
Indeed, as an example, investing in the stocks in the upper quartile of the Environmental pillar (stocks with a higher disagreement regarding the Environmental pillar), incurred costs of $28867 (28.9% of the total $100,000 considered as the amount invested) against the $30844 paid for implementing the considered strategy in the lower quartile.

Even if the result seems to be counterintuitive, it is aligned with the microstructure literature, as explained in *Chapter 8: Results*.

Concluding, the disagreement surrounding ESG ratings can lead to a more balanced order flow, as different investors may have varying interpretations of a stock's fundamental value. This balanced order flow prompts market makers to tighten the bid-ask spread, as the lower volatility associated with a balanced order flow makes inventory management easier.

What Gibson et al. concluded is that the consideration of ESG ratings' disagreement can have a significant impact on individuals implementing quantitative strategies of responsible investment. Furthermore, it can also benefit analysts who assess firm valuations, as rating disagreement can impact the cost of equity capital.
This thesis instead, sheds light on the significant impact of disagreement on the bid-ask spread, ultimately affecting transaction costs for traders with shorter time frames.

10.1 Further research

The topic warrants further research and exploration in this area. Building upon the results obtained, the opportunities to extend and improve the results are the following:

- Incorporating a larger number of providers into the dataset, potentially considering more source of disagreement and also a broader set of variables looked by market participants.
- Extending the period of evaluation, finding possible long-term trends.
- Utilizing a different sample of stocks rather than the ones populating the S&P 500 index.
- Assess the impact on a broader set of dependent variables, allowing to understand more market dynamics and investor behaviours.
- Incorporate information asymmetry as control variable for the bid-ask spread. This variable has already been demonstrated to have an impact on the bid-ask spread. Therefore, considering its impact can improve the results of the OLS regression analysis.

Link to the programming Code and Shiny app

The R code utilized as a supplement to write this Master's Thesis can be found at the following link: https://github.com/gabrielebonvicini/Thesis-code/tree/main

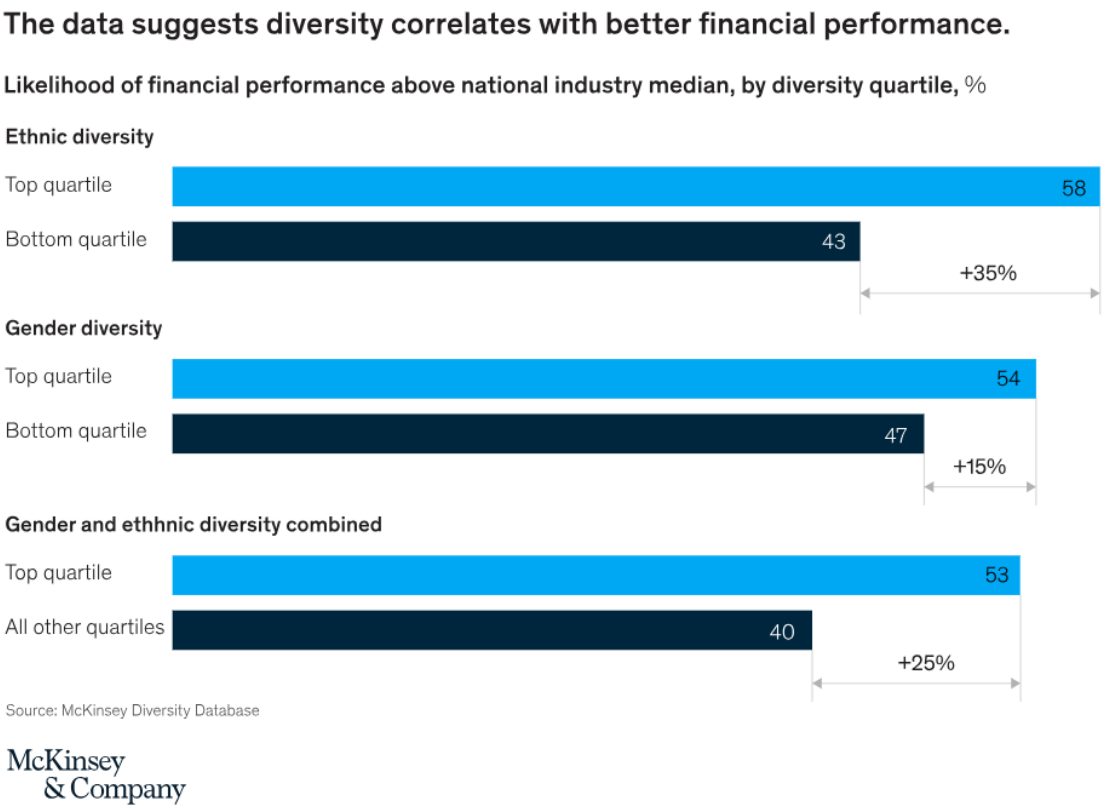
Please note that the code cannot be executed without the Excel files containing the datasets. As I am unable to share the data, the code should be intended as an example of the methodology implemented in the analysis of the disagreement, potentially aiding further research in the field.

In addition, the shiny application built to assess the impact of the disagreement on transaction costs and returns, and presented in *Chapter 9: Portfolio Construction*, is available at https://gabrielebonvicini.shinyapps.io/trade_cost_analysis/.

Tables and Images

Image 1

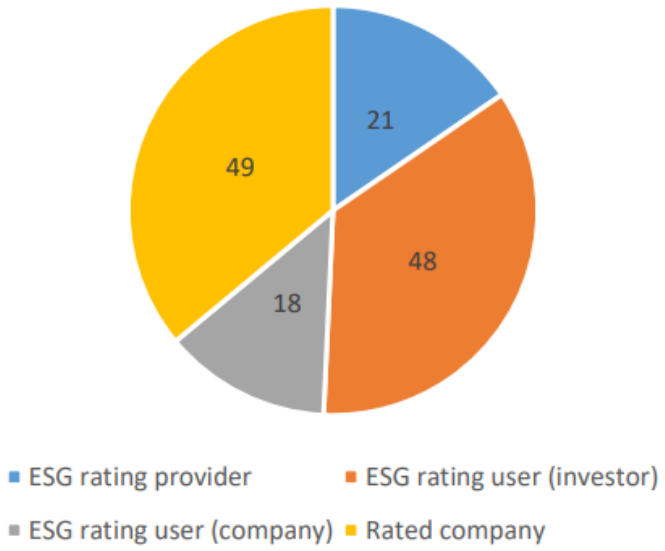
McKinsey diversity research



Source: McKinsey, Why diversity matters https://www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/why-diversity-matters

Image 2

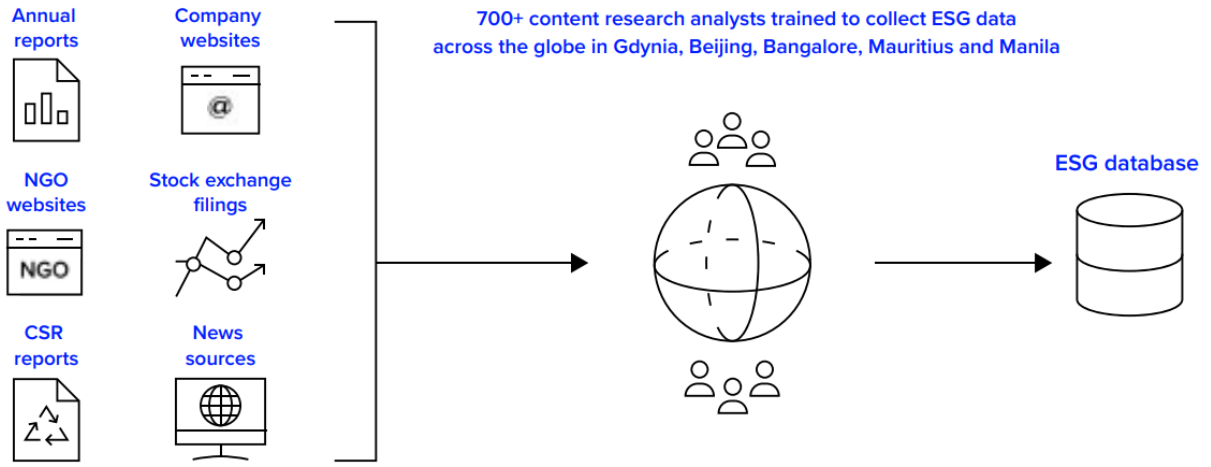
Roles of ESG rating utilizers



Source: EU: Targeted consultation on the functioning of the ESG ratings market in the European Union and on the consideration of ESG factors in credit ratings: https://finance.ec.europa.eu/regulation-and-supervision/consultations/finance-2022-esg-ratings_en

Image 3

Refinitiv Data sources



Source: Refinitiv: ENVIRONMENTAL, SOCIAL AND GOVERNANCE SCORES FROM REFINITIV: https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf

Image 4

Refinitiv: Incorporation of the Market Capitalization bias

Global benchmark	Cap class	Severity rate*
>=10 billion	Large	0.33
>=2 billion	Mid	0.67
<2 billion	Small	1

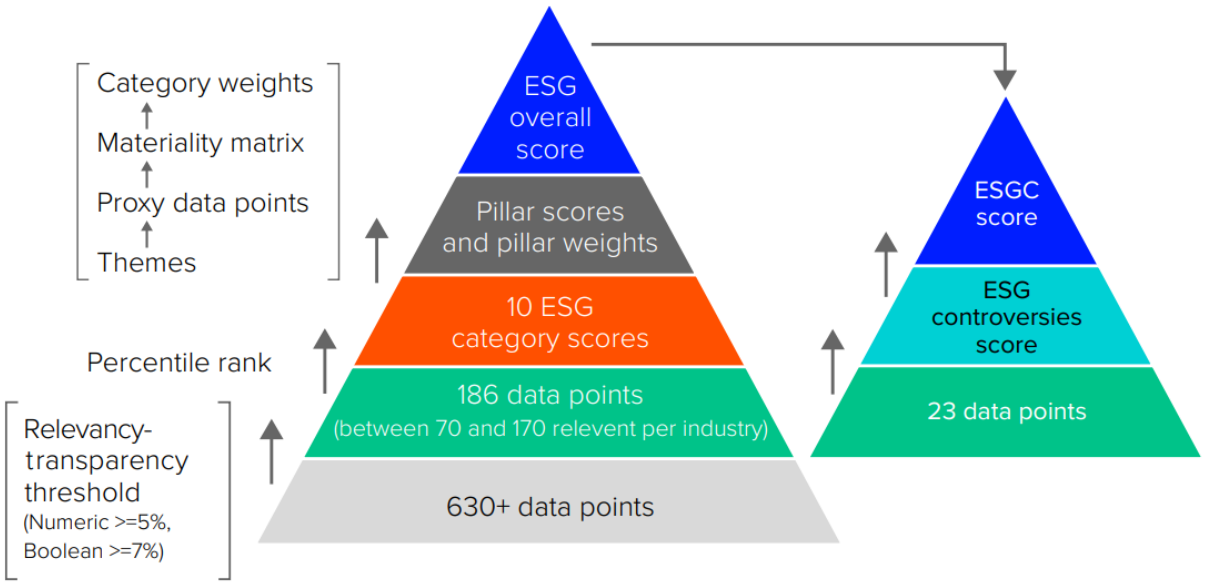
*Logic to derive weights: large = 1/3 or 0.33, mid = 0.67, small = 0.33+0.67 = 1.

Source: Refinitiv: ENVIRONMENTAL, SOCIAL AND GOVERNANCE SCORES FROM REFINITIV: https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf

Image 5

Summary of the Refinitiv ESG scoring methodology

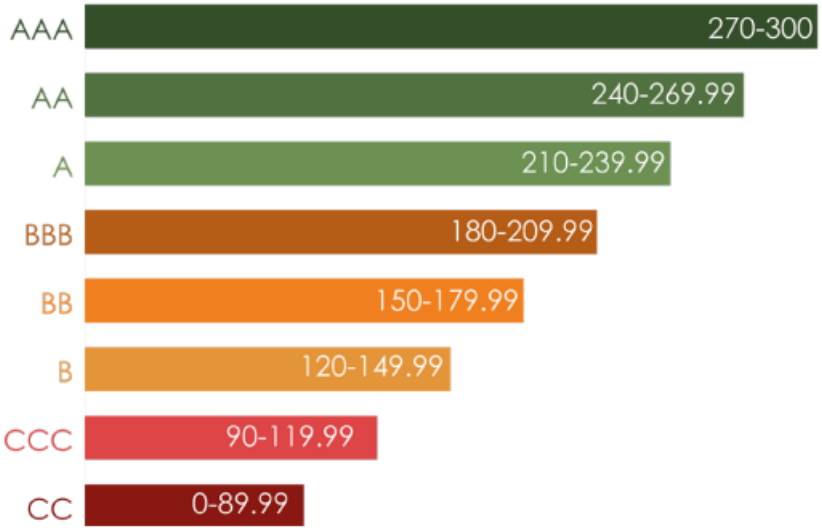
The Refinitiv ESG scoring methodology can be summarised and illustrated by means of a five-step process flow.



Source: Refinitiv: ENVIRONMENTAL, SOCIAL AND GOVERNANCE SCORES FROM REFINITIV: https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf

Image 6

IdealRatings Grades scale



Source: Ideal Ratings: ESG Scores & Ratings Data Set : https://www.idealratings.com/esg-scores-ratings-data-set/

Image 7

Bloomberg Disclosure factor

Disclosure Factor	Issue Score Range
0	0-3
1	0-10

Figure 11: Target Issue Score Ranges for Varying Levels of Disclosure

Source: Bloomberg Terminal

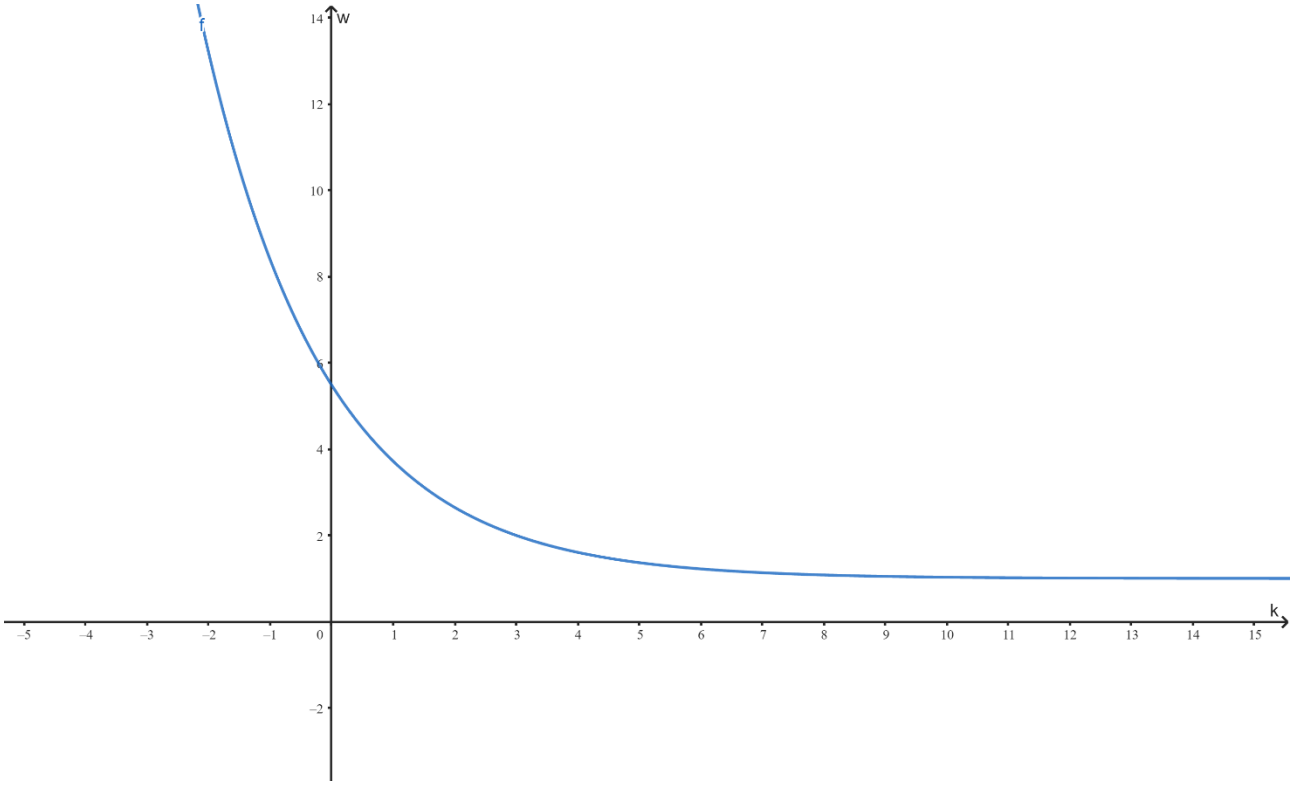
Image 8

Bloomberg Pillars, Issues and Sub-Issues example

Source: Bloomberg Terminal

Image 9

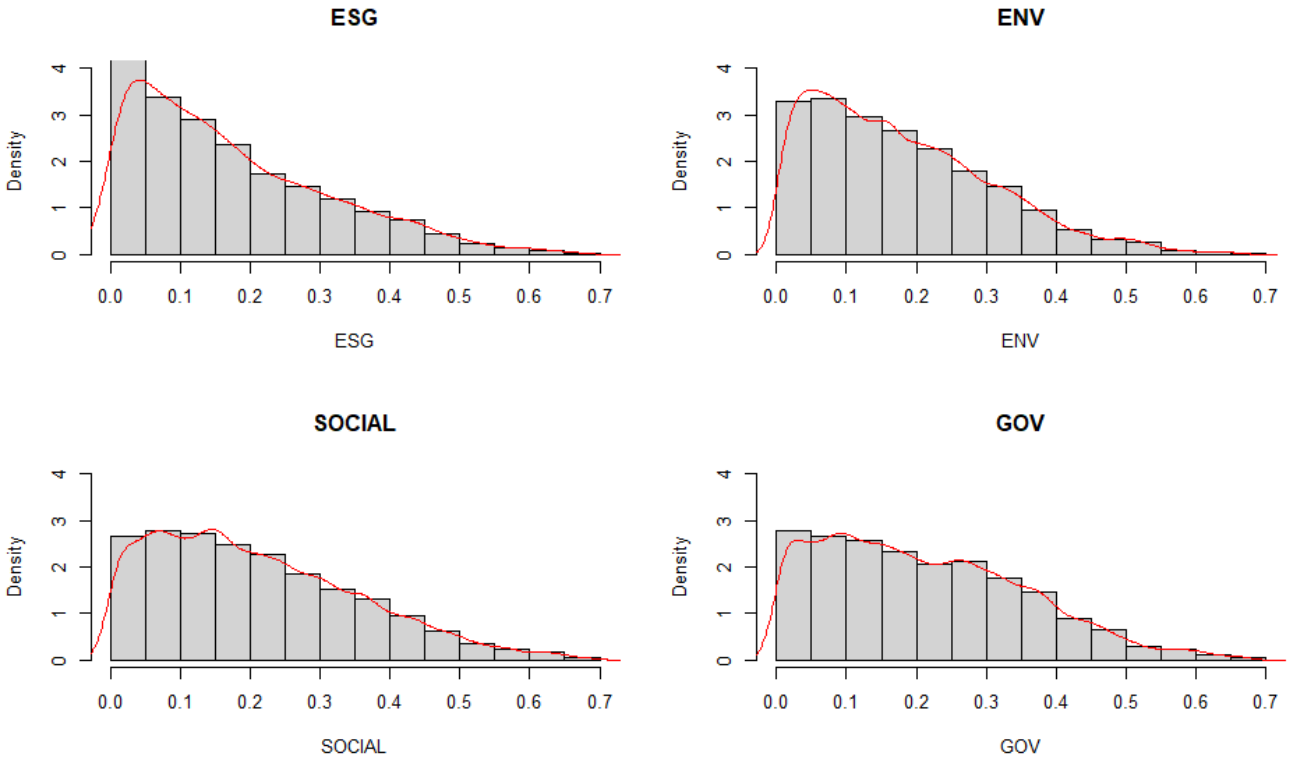
Bloomberg weight-importance dependence



Source: Bloomberg Terminal

Image 10

Distribution of the Standard Deviations among ratings' percentile ranks



Source: Personal analysis

Table A

S&P Global Dimension and Criteria weights

S&P Global Dimension and Criteria Weights - 2021 Banks, Electric Utilities and Pharmaceutical Industries CSA

S&P Global CSA Criteria Weights by Dimension	Banks	Electric Utilities	Pharmaceuticals
Environmental Dimension	**13**	**28**	**9**
Climate Strategy	7	6	2
Environmental Policy & Management Systems	-	5	2
Environmental Reporting	3	3	2
Operational Eco-Efficiency	3	7	3
Product Stewardship	-	7	-
Social Dimension	**32**	**28**	**41**
Addressing Cost Burden	-	-	4
Corporate Citizenship and Philanthropy	3	2	3
Financial Inclusion	4	-	-
Health Outcome Contribution	-	-	5
Human Capital Development	6	5	5
Human Rights	3	4	3
Labor Practice Indicators	4	4	3
Occupational Health & Safety	3	6	3
Social Reporting	3	3	2
Strategy to Improve Access to Drugs or Products	-	-	5
Talent Attraction & Retention	6	4	8
Governance & Economic Dimension	**55**	**44**	**50**
Anti-Crime Policy & Measures	4	-	-
Codes of Business Conduct	8	7	6
Corporate Governance	10	8	9
Customer Relationship Management	2	3	-
Financial Stability & Systemic Risk	2	-	-
Information Security/Cybersecurity & System Availability	3	2	2
Innovation Management	-	6	7
Marketing Practices	-	-	5
Materiality	3	3	2
Policy Influence	3	2	2
Privacy Protection	2	-	-
Product Quality & Recall Management	-	-	7
Risk & Crisis Management	6	4	4
Strategy for Emerging Markets	-	3	-
Supply Chain Management	-	6	4

Source: S&P Global ESG Scores: https://www.spglobal.com/esg/documents/sp-global-esg-scores-methodology-2022.pdf

Table B

Refinitiv Category weights

		Environmental			Social				Governance		
TRBC Industry Group Name	Industry Group code	Emission	Innovation	Resource use	Human rights	Product responsibility	Workforce	Community	Management	Shareholders	CSR strategy
Aerospace & Defense	521010	0.09	0.09	0.06	0.15	0.07	0.11	0.11	0.22	0.06	0.04
Automobiles & Auto Parts	531010	0.10	0.16	0.08	0.15	0.09	0.10	0.08	0.16	0.05	0.03
Banking Services	551010	0.02	0.10	0.02	0.10	0.09	0.19	0.12	0.24	0.07	0.05
Beverages	541010	0.12	0.04	0.13	0.15	0.12	0.10	0.08	0.17	0.05	0.03
Biotechnology & Medical Research	562020	0.09	0.03	0.14	0.03	0.12	0.08	0.13	0.26	0.08	0.05
Chemicals	511010	0.13	0.13	0.13	0.15	0.07	0.09	0.07	0.15	0.04	0.03
Coal	501010	0.20	0.02	0.19	0.06	0.02	0.10	0.10	0.20	0.06	0.04
Collective Investments	555010	0.03	0.03	0.03	0.03	0.08	0.09	0.17	0.34	0.10	0.07
Communications & Networking	571020	0.05	0.10	0.07	0.05	0.14	0.07	0.13	0.26	0.08	0.05
Computers, Phones & Household Electronics	571060	0.06	0.14	0.04	0.18	0.11	0.11	0.09	0.18	0.06	0.04
Construction & Engineering	522010	0.14	0.14	0.09	0.12	0.05	0.11	0.09	0.18	0.05	0.04
Construction Materials	512020	0.15	0.12	0.15	0.11	0.04	0.11	0.08	0.16	0.05	0.03
Consumer Goods Conglomerates	544010	0.11	0.15	0.11	0.15	0.08	0.09	0.08	0.16	0.05	0.03
Containers & Packaging	513020	0.13	0.09	0.14	0.16	0.07	0.09	0.08	0.16	0.05	0.03
Diversified Industrial Goods Wholesale	522020	0.06	0.14	0.08	0.18	0.02	0.12	0.10	0.20	0.06	0.04
Diversified Retail	534020	0.13	0.03	0.14	0.05	0.10	0.09	0.12	0.23	0.07	0.05
Electric Utilities & IPPs	591010	0.16	0.13	0.14	0.07	0.05	0.13	0.08	0.17	0.05	0.03

Source: Refinitiv: ENVIRONMENTAL, SOCIAL AND GOVERNANCE SCORES FROM REFINITIV: https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/refinitiv-esg-scores-methodology.pdf

Table 1

Summary Statistics for rating disagreement

Table 1: Summary statistics for rating disagreement

	N	Mean	SD	Max	Min
ESG	4130	0,29	0,14	0,66	4,17E-05
ENV	37594	0,29	0,13	0,67	7,59E-06
SOCIAL	37592	0,29	0,15	0,69	1,52E-05
GOV	37349	0,29	0,15	0,69	3,43E-05

Variables: (ESG, ENV, SOCIAL, GOV) are the standard devation of the percentile rank of the scores assigned by the various providers

Source: Personal Analysis

Table 2

Summary statistics between providers' scores (as percentile rankings)

Table 2: Summary statistics between providers' scores (as percentile rankings			
	N	**Mean**	**SD**
ESG	41209	0,52	0,29
ENV	93403	0,501	0,29
SOCIAL	93205	0,501	0,29
GOV	92589	0,501	0,29

Variables: (ESG, ENV, SOCIAL, GOV) are the percentile ranks assigned by various providers

Source: Personal Analysis

Table 3

Correlation analysis for the ESG pillar

Table 3: Correlation analysis for the ESG pillar					
	ESG				
	Bloomberg	**Refinitiv**	**IdealRatings**	**S&P Global**	**Arabesque**
Bloomberg	1				
Refinitiv	0,5	1			
IdealRatings	0,32	NA	1		
S&P Global	NA	NA	NA	1	
Arabesque	-0,0001	-0,02	NA	NA	1
Average correlation		**0,2**			

Source: Personal Analysis

Table 4

Correlation analysis for the ENV pillar

Table 4: Correlation analysis for the ENV pillar

	ENV				
	Bloomberg	**Refinitiv**	**IdealRatings**	**S&P Global**	**Arabesque**
Bloomberg	1				
Refinitiv	0,44	1			
IdealRatings	NA	NA	1		
S&P Global	0,41	0,61	NA	1	
Arabesque	0,39	0,66	NA	0,46	1
Average correlation		**0,5**			

Source: Personal Analysis

Table 5

Correlation analysis for the SOCIAL pillar

Table 5: Correlation analysis for the SOCIAL pillar

	SOCIAL				
	Bloomberg	**Refinitiv**	**IdealRatings**	**S&P Global**	**Arabesque**
Bloomberg	1				
Refinitiv	0,27	1			
IdealRatings	NA	NA	1		
S&P Global	0,25	0,56	NA	1	
Arabesque	0,22	0,39	NA	0,31	1
Average correlation		**0,33**			

Source: Personal Analysis

Table 6

Correlation analysis for the GOV pillar

Table 6: Correlation analysis for the GOV pillar					
	GOV				
	Bloomberg	**Refinitiv**	**IdealRatings**	**S&P Global**	**Arabesque**
Bloomberg	1				
Refinitiv	0,3	1			
IdealRatings	NA	NA	1		
S&P Global	0,24	0,22	NA	1	
Arabesque	0,02	0,01	NA	-0,02	1
Average correlation		**0,13**			

Source: Personal Analysis

Table 7

Returns and ESG rating disagreement, OLS estimation

Table 7: Returns and ESG rating disagreement				
OLS estimation				
Dependent Variable : Returns				
	ESG	**ENV**	**SOCIAL**	**GOV**
Intercept	0,01591 ***	0,01037 ***	0,00954 ***	0,008731 ***
	(4,050)	(7,664)	(7,081)	(6,492)
Pillar	0,01027	-0,003306	0,001295	0,006 **
	(1,348)	(-1,0338)	(0,466)	(2,121)
RETS_1LAG	-0,1432 ***	-0,129 ***	-0,1295 ***	-0,1289 ***
	(-9,724)	(-22,517)	(-22,520)	(-22,416)
RETS_2LAG	0,125 ***	0,1417 ***	0,1415 ***	0,141 ***
	(9,005)	(29,368)	(29,327)	(29,245)
VIX	-0,001246 ***	-0,000605 ***	-0,000609 ***	-0,0006182 ***
	(-7,326)	(-11,697)	(-11,782)	(-11,906)
Mkt_Cap	4,29E-15	4,94E-15 *	4,96E-15 *	5,04E-15 *
	(0,481)	(1,841)	(1,849)	(1,880)
CUR_RATIO	0,000281	0,001608 ***	0,001627 ***	0,001629 ***
	(0,328)	(5,811)	(5,888)	(5,885)
LEV	2,07E-06	1,49E-06	1,47E-06	1,51E-06
	(0,282)	(0,755)	(0,745)	(0,765)
MOM	0,064920 ***	0,0736 ***	0,07365 ***	0,07367 ***
	(38,219)	(108,658)	(108,644)	(108,315)
BOOK_TM	0,000025	-3,03E-06	-3,07E-03	-3,15E-06
	(1,057)	(-0,358)	(-0,362)	(-0,371)
N observations	2911	30006	30004	29896
Adj R-Squared	0,4658	0,398	0,3979	0,398

Sig. codes *** = 0,01; ** = 0,05; * = 0,1

Variables: (Pillar) is the rating disagreement relative to the mentioned pillar; (RETS_1LAG) are one lag monthly return and (RETS_2LAG) are two lags monthly returns; (VIX) is the VIX index in every period of time; (Mkt_Cap) is the stock market capitalization in Million USD; (CUR_RATIO) is the current ratio, computed as the Current Assets / Current Liabilities; (LEV) is the leverage ratio, computed as Total Assets / Total Common Equity; (MOM) is a discrete variable for momentum; (BOOK_TM) is the book value of equity measured as Total Common Equity / Number of Shares Outstanding

Source: Personal Analysis

Table 8

CDS spread and ESG rating disagreement, OLS estimation

Table 8: CDS spread and ESG rating disagreement				
OLS estimation				
Dependent Variable : CDS spread				
	ESG	**ENV**	**SOCIAL**	**GOV**
Intercept	0,2405 ***	0,25310 ***	0,2471 ***	0,2747 ***
	(10,97)	(44,671)	(42,984)	(48,199)
Pillar	-0,2292 ***	-1,42	1,618	-0,113 ***
	(-4,861)	(-0,976)	(1,262)	(-8,757)
Inflation	0,019400 ***	0,02589 ***	0,02587 ***	0,02536 ***
	(5,856)	(34,022)	(34,010)	(33,488)
Int_rate	0,109200 ***	0,1115 ***	0,1115 ***	0,114 ***
	(20,437)	(65,324)	(65,330)	(65,556)
Mkt_Cap	-2,05E-11 ***	-1,27E-11 ***	-1,27E-11 ***	-1,26E-11 ***
	(-3,585)	(-10,107)	(-10,142)	(-10,062)
Default_prob_1Y	-0,00108 ***	-1,12E-03 ***	-0,00112 ***	-0,00112 ***
	(-8,913)	(-23,404)	(-23,382)	(-23,385)
Default_prob_5Y	0,001474 ***	0,001935 ***	0,001934 ***	0,001932 ***
	(34,761)	(136,972)	(137,196)	(137,643)
ROA	-0,77 ***	-0,3499 ***	-0,3481 ***	-0,3475 ***
	(-7,807)	(-12,546)	(-12,473)	(-12,523)
ROE	2,207 ***	0,002167	0,002156	0,002427
	(3,089)	(1,147)	(1,142)	(1,292)
LEV	0,01152 ***	0,000661	0,000639	0,000649
	(3,433)	(0,873)	(0,844)	(0,863)
CUR_RATIO	1,612 ***	0,1659	0,1717	0,1937
	(2,793)	(1,205)	(1,249)	(1,416)
BETA	0,1123 ***	0,1117 *	0,1107 *	0,1182 **
	(6,918)	(1,862)	(1,846)	(1,981)
N observations	3622	35673	35671	35608
Adj R-Squared	0,5076	0,6155	0,6156	0,6173

Sig. codes *** = 0,01; ** = 0,05; * = 0,1
Numbers should be intended as basis points. For example 0,77 means that the impact is of 77bps (0,77%)
Variables: (Pillar) is the rating disagreement relative to the mentioned pillar; (Inflation) is the monthly CPI, annualized and quoted in percentage; (Int_rate) are the interest rates on 3 months T-Bills, quoted in percentage; (Mkt_Cap) is the company market capitalization, in USD Millions; (Default_prob_1Y) is the Probability of default of the company over the next year calculated by the Bloomberg Issuer Default Risk Model and; (Default_prob_5Y) is computed over the next 5 years; (ROA) is the Return on Total Asset, quoted in percentage; (ROE) is the Return on Total Common Equity, quoted in percentage; (LEV) is the leverage ratio computed as Average Total Asset/ Average Total Common Equity; (CUR_RATIO) is the current ratio computed as Current Asset/ Current Liabilities; (BETA) is the Adjusted Beta

Source: Personal Analysis

Table 9

Bid-Ask spread and ESG rating disagreement, OLS estimation

Table 9: Bid-Ask spread and ESG rating disagreement				
OLS estimation				
Dependent Variable : Bid-Ask spread				
	ESG	**ENV**	**SOCIAL**	**GOV**
Intercept	0,03917 ***	0,01948 ***	0,01542 ***	0,01486 ***
	(13,813)	(23,508)	(18,449)	(17,8)
Pillar	-0,01927 ***	-0,02582 ***	-0,0016	0,00161
	(-3,376)	(-12,260)	(-0,853)	(0,849)
Volume	-1,37E-10 ***	-1,42E-10 ***	-1,43E-10 ***	-1,43E-10 ***
	(-7,149)	(-29,065)	(-29,214)	(-29,220)
VIX	0,0005907 ***	0,001891 ***	0,00188 ***	0,00187 ***
	(3,847)	(46,166)	(45,716)	(45,518)
Vol_30day	0,05241 ***	0,05304 ***	0,05296 ***	0,05289 ***
	(8,248)	(28,834)	(28,731)	(28,648)
Mkt_Cap	-2,61E-14 ***	-1,94E-14 ***	-1,85E-14 ***	-1,86E-14 ***
	(-3,345)	(-9,412)	(-8,927)	(-8,982)
AMI_ILL	1,16E+06 ***	5,96E+05 ***	5,63E+05 ***	5,63E+05 ***
	(25,620)	(65,417)	(65,786)	(65,702)
N observations	3940	35960	35958	35839
Adj R-Squared	0,2079	0,267	0,2639	0,2638

Sig. codes *** = 0,01; ** = 0,05; * = 0,1

Variables: (Pillar) is the rating disagreement relative to the mentioned pillar; (Volume) is the average volume traded in the month, represented as single units ; (VIX) is the Volatility Index; (Vol_30day) is hte monthly volatiliyt of one stock, quoted in percentage; (Mkt_Cap) id the Makret Capitalization, quoted in USD Million; (AMI_ILL) is a monthly representation of the Amihud Illiquidity measure, computed as the monthly returns/Volume

Source: Personal Analysis

Table 10

Bid-Ask spread and ESG rating disagreement (12/2018 – 12/2021)

Table 10: Bid-Ask spread and ESG rating disagreement (12/2018-12/2021)				
OLS estimation				
Dependent Variable : Bid-Ask spread				
	ESG	**ENV**	**SOCIAL**	**GOV**
Intercept	0,03477 ***	0,02080 ***	0,01472 ***	0,0132 ***
	(10,702)	(16,686)	(11,77)	(10,413)
Pillar	-0,02338 ***	-0,03232 ***	0,00072	0,00807 ***
	(-3,754)	(-10,189)	(0,254)	(2,825)
Volume	-1,32E-10 ***	-1,51E-10 ***	-1,52E-10 ***	-1,53E-10 ***
	(-6,247)	(-22,801)	(-22,739)	(-22,787)
VIX	0,0007158 ***	0,002208 ***	0,0022 ***	0,0022 ***
	(4,531)	(39,520)	(39,320)	(39,209)
Vol_30day	0,05646 ***	0,03648 ***	0,03617 ***	0,03606 ***
	(9,077)	(15,946)	(15,762)	(15,696)
Mkt_Cap	-1,06E-14	-1,70E-14 ***	-1,60E-14 ***	-1,59E-14 ***
	(-1,277)	(-6,154)	(-5,773)	(-5,724)
AMI_ILL	9,81E+05 ***	4,56E+05 ***	4,62E+05 ***	4,62E+05 ***
	(20,820)	(44,921)	(45,394)	(45,405)
N observations	2125	18177	18164	18116
Adj R-Squared	0,2663	0,2792	0,2751	0,2753

Sig. codes *** = 0,01; ** = 0,05; * = 0,1

Variables: (Pillar) is the rating disagreement relative to the mentioned pillar; (Volume) is the average volume traded in the month, represented as single units ; (VIX) is the Volatility Index; (Vol_30day) is hte monthly volatiliyt of one stock, quoted in percentage; (Mkt_Cap) id the Makret Capitalization, quoted in USD Million; (AMI_ILL) is a monthly representation of the Amihud Illiquidity measure, computed as the monthly returns/Volume

Source: Personal Analysis

Table 11

Upper and Lower quartile portfolio comparison (ENV pillar)

Table 11: Upper and Lower quartile portfolio comparison (ENV pillar)

	ENV			
	Upper quartile		Lower quartile	
	Value	Date Occurred	Value	Date Occurred
Returns ($ Cumulated)	$-16267,52		$-21032,62	
Transaction costs ($ Cumulated)	$28867,55		$30844,37	
Highest daily return	6,67%	20/03/2020	5,99%	20/03/2020
Lowest daily return	-6,58%	26/03/2020	-5,72%	24/03/2020

Notes: (i) the upper quartile refers to the stocks with the higher disagreement regarding ENV ratings, while the lower quartile refers to the ones with the lower disagreement; (ii) ENV pillar means that the disagreement is considered for the ENV pillar.

Source: Personal Analysis

Table 12

Upper and Lower quartile portfolio comparison (GOV pillar)

Table 12: Upper and Lower quartile portfolio comparison (GOV pillar)

	GOV			
	Upper quartile		Lower quartile	
	Value	Date Occurred	Value	Date Occurred
Returns ($ Cumulated)	$-16166,1		$-12623,39	
Transaction costs ($ Cumulated)	$31062,54		$32392,61	
Highest daily return	6,06%	20/03/2020	6,42%	20/03/2020
Lowest daily return	-5,83%	26/03/2020	-6,90%	24/03/2020

Notes: (i) the upper quartile refers to the stocks with the higher disagreement regarding GOV ratings, while the lower quartile refers to the ones with the lower disagreement; (ii) GOV pillar means that the disagreement is considered for the GOV pillar.

Source: Personal Analysis

Table 13

Upper and Lower quartile portfolio comparison (ESG pillar)

Table 13: Upper and Lower quartile portfolio comparison (ESG pillar)				
	ESG			
	Upper quartile		**Lower quartile**	
	Value	**Date Occurred**	**Value**	**Date Occurred**
Returns ($ Cumulated)	$3874,05		$12292,47	
Transaction costs ($ Cumulated)	$16041,51		$19579,92	
Highest daily return	2,97%	01/12/2021	2,88%	04/12/2018
Lowest daily return	-3,97%	26/12/2018	-4,03%	26/12/2018

Notes: (i) the upper quartile refers to the stocks with the higher disagreement regarding ESG ratings, while the lower quartile refers to the ones with the lower disagreement; (ii) ESG pillar means that the disagreement is considered for the ESG pillar.

Source: Personal Analysis

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