Can we trust ESG Ratings?
Some insights based on a bibliometric analysis of ESG data quality and rating reliability

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Abstract

The aim of this research is to investigate the quality and reliability of ESG data provided by companies, as well as the accuracy and objectivity of ESG ratings produced by sustainability rating agencies (SRAs). Since SRAs use companies' non-financial information as input data when formulating their ESG ratings, these two topics appear to be strictly interconnected.

Drawing on the Shanon and Weaver (1949) model of communication, we have addressed these issues by means of a systematic literature review combined with a bibliometric analysis. In our investigation we run: *i*) the co-citation analysis to detect the seminal papers; *ii*) a keyword co-occurrence analysis to explore how the main features of the academic debate have unfolded in the last five years; *iii*) a keyword co-occurrence analysis to obtain a network visualisation map to explore how the research broad scope was articulated in different clusters (i.e., themes of research). Among the clusters that emerged from the mapping, we have decided to delve into the streams of research we consider most relevant and deal with: the relationships between ESG and Artificial Intelligence (AI). Namely, we deem that AI may allow us to process massive amounts of data that contain crucial information for ESG investing. However, even if computer algorithms are able to analyse all information available efficiently, and in a timely manner, managers and investors should be aware of their opportunities and criticisms, while scholars should list propositions for advancing the research on these topics.

Keywords: ESG ratings, Data quality, Theory of communication, Artificial Intelligence, Bibliometric analysis

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2. Theoretical background and purpose of study

ESG literature review or bibliometric analysis, extracted on SCOPUS database (years 2020-2023)

| Authors	Year	Topic/purpose of the study
Zioło *et al.*	2023	incorporating ESG Risk in Companies' Business Models: State of Research and Energy Sector Case Studies
Wang *et al.*	2023	to explore how do ESG practices create value for businesses
Pascoal *et al.*	2023	sovereign aspects of ESG based sustainable investment
Clément *et al.*	2023	to gather all definitions that were used by scholar when using ESG scores in their research
Poyser & Daugaard	2023	to explore the nexus between sustainable investments, ESG issues and indigenous community practices
Comoli *et al.*	2023	to explore accounting and reporting tools for ESG dynamics under conditions of disruption
Tsang *et al.*	2023	to provide a comprehensive review of the ESG disclosure literature in accounting research
Park *et al.*	2023	to understand and distinguish corporate responsibility approaches in the literature
Savio *et al.*	2023	to examine the combination of ESG and COVID-19 outbreak
Stolbov *et al.*	2022	to assess the impact of ESG-factors on corporate financial stability
Xia J.	2022	to explore how organisational learning enable ESG performance
Daugaard & Ding	2022	to explore the major drivers for ESG Performance
Baid & Jayaraman	2022	to amplify the importance of social responsibility in supply chain to promote ESG investing
Lee & Kim	2022	to examine the research targets and techniques of green infrastructure from the perspective of ESG
Robinson & McIntosh	2022	Commercial real estate literature related to ESG measures
Zyznarska-Dworczak	2022	to explore how financial and ESG reporting have changed under economic and business uncertainty
Pogodina *et al.*.	2022	to explore ESG-transformation of the textile industry
Abhayawansa, & Mooneeapen	2022	to explore ESG investing
Li T *et al.*	2021	to review and summarize ESG research i.e, the impact of ESG on the economic consequences, etc.)
Shang *et al.*	2021	to review and summarize ESG analysis
Huang *et al.*	2021	to explain the relationship between ESG performance (ESGP) and corporate financial performance (CFP
Li *et al.*D.	2021	to review and summarize ESG research
Widyawati	2020	to investigate socially responsible investing and ESG metrics

4.2. Development of the research field

4.2.1. Seminal papers

A valuable analysis that researchers may conduct using VOSviewer is the co-citation analysis in order to detect the main studies the topic we are investigating is based on. Hence, this investigation considers all authors that have been cited (in the references) within the documents selected and creates a network map by linking the pairs that have been both cited by the same document.

In our case, 5187 authors in total have been considered within the items selected, but we decided to keep only the most relevant ones in the analysis, that is to say, the ones who have been cited at least ten times (17 authors) (figure 4). The density analysis, by means of a stronger intensity of the yellow colour, shows that the research in the field of our topic of interest is mainly based on the studies of Friede *et al.* (2015), Chatterji *et al.* (2016), and El Ghoul *et al.* (2011) — in order of relevance.

Figure 4 - Density map. Co-citation analysis (based on cited references)
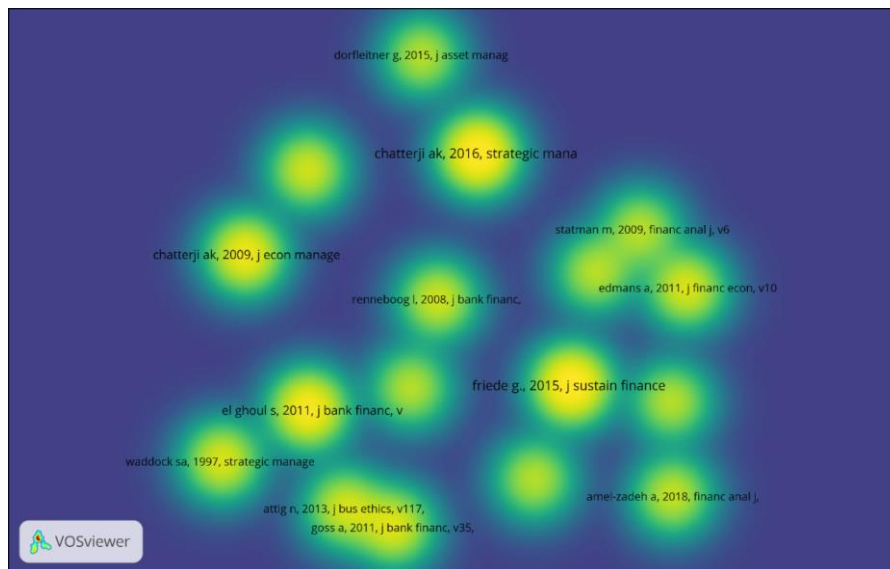
El Ghoul *et al.*'s seminal paper (2011) "*Does Corporate social responsibility affect the cost of Capital?*" (2011) examines the effect of corporate social responsibility on the cost of equity capital for a large sample of US firms. The results

show that firms with better CSR scores exhibit cheaper equity financing. In particular, investments in improving employee relations, environmental policies and responsible strategies substantially contribute to the reduction of firms' cost of equity.

Friede *et al.*'s paper (2015) "*ESG and financial performance: aggregated evidence from more than 2000 empirical studies*" deals with the problem of the fragmentation of knowledge on the relation between ESG criteria and corporate financial performance (CFP). To overcome this shortcoming, this study analyses all data provided by previous academic studies. The results show that roughly the 90% of the selected studies find a non-negative ESG-CFP relation. More importantly, the large majority of them reports positive findings which appear to be stable over time. To sum up, this is an essential study for the purpose of our analysis because it is by far the most exhaustive overview of academic research on the ESG-CFP relation.

Chatterji *et al.*'s article (2016) "*Do ratings of firms converge? Implications for managers, investors and strategy researchers*" addresses the issue of the lack of homogeneity between different ratings assigned by different rating agencies to the same company. This lack of consensus suggests that users of these ratings should be cautious in drawing conclusions about firms based on this data. The authors of this paper also encourage rating agencies to regularly validate their data in an effort to improve the assessment of CSR. This article is essential for the aim of our research since it deals with one of the main concerns of our research: the effective quality and reliability of ESG data and ratings.

4.2.2. The last five years

A keyword co-occurrence analysis was performed using VOSviewer to explore the main features of the academic debate in the last five years (2018-2022). This kind of analysis uses the keywords highlighted in the selected contributions to investigate the conceptual structure of the research on the topic under examination (Ji *et al.*, 2018).

Figure 5 - Chronological development of the topic under examination
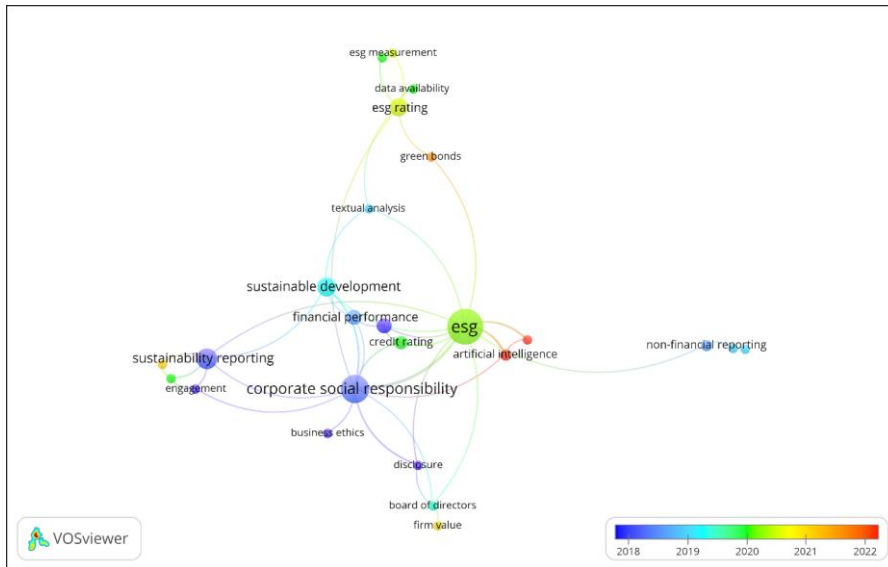
In carrying out our interpretative analysis, we first considered the development of the different issues characterising the topic under examination based on the keyword analysis present in the nodes of the map (see figure 5) and highlighted in italic in the following text. In the map, nodes are the containers for concepts, and relationships between nodes are depicted using linking lines. In addition, each year is typified by a different colour (i.e., blue in 2018 or red in 2022).

The extensive literature on the topic we are studying has evolved a lot over the last 5 years. More specifically, in 2018 the debate was centred around the concept of *corporate social responsibility* due to the growing awareness that mere profit maximisation could not be considered as the companies' main goal anymore (Dorfleitner *et al.*, 2018). Investors have become more oriented toward socially responsible investments leading companies to start thinking about *more ethical ways to do business* (Barman, 2018). Disclosure became a central topic in this framework (Al-Shaer *et al.*, 2018). By ensuring frequent and relevant *corporate disclosure*, companies enable their stakeholders to better monitor the management quality and performance of the firm itself, reducing the problem of information asymmetry (Watts and Zimmerman, 1986). Around the end of 2018, the debate around stakeholders' engagement and value added as part of *sustainability reporting* arose. The aim of this discussion was to orient firm's strategies and objectives on the basis of an appropriate trade-off between stakeholders' priorities and the ones of the firm itself (Haller *et al.*, 2018).

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At the *end of 2018/beginning of 2019*, as a result of the introduction of some new rules and guidelines concerning *non-financial information disclosure*, most companies started to pay greater attention to the formulation process of their sustainability reports. This particular care was further intensified by the new orientation of most stakeholders' investment decisions regarding ESG matters (Durand *et al.*, 2019; Landi, and Sciarelli, 2019). Hence, in order to pursue more sustainable development, in those years, many economic agents started to allocate most of their capital to more ethical and socially responsible companies and investment opportunities. In other words, this means that focusing on ESG aspects can help companies to reduce their cost of capital. In fact, since most investors have started to integrate ESG metrics into their investment decisions (Amel-Zadeh and Serafeim, 2018; Standard and Poor, 2019; Fitch Ratings, 2020), larger pools of capital have become available to the companies paying greater attention to environmental, social and governance issues.

At the *end of 2019/mid 2020*, in response to the rising demand for ESG data and scores, the sustainability rating market grew a lot (Munoz-Torres *et al.*, 2019). However, this brought with it several criticisms regarding (i) the way ESG aspects are measured and disclosed by the companies, and the respective quality (and quantity) of this non-financial information, (ii) the formulation process of ESG ratings undertaken by the rating agencies, and their respective reliability (Friede, 2019; Lin *et al.*, 2019; Rezaee and Tuo, 2019; Utz, 2019; Dimson *et al.*, 2020; Dorfleitner *et al.*, 2020; Macmahon, 2020).

Finally, the most *recent contributions (2021-2022)* deal with the relationship between ESG, Artificial Intelligence (AI) (Musleh Al-Sartawi *et al.*, 2022), machine learning (Sharma *et al.*, 2022) and in general technological innovations (Hughes *et al.*, 2021). The connection between these topics has not yet been explored in-depth, meaning that the selected contributions offer some insights and points of reflection rather than explicit solutions to the ESG issues presented above. In fact, it is possible that the use of new data processing technologies such as AI and machine learning in the field of ESG has not been broadly implemented by companies or rating agencies yet. However, it is certain that, in the future, ESG information and rating providers will expand the boundaries of ESG data to be disclosed (by the companies) and used (by rating agencies) for the formulation of ESG ratings, thus necessarily leading to the introduction of new efficient disclosure and computational techniques, including AI (Skapa *et al.*, 2022).

## 5. The state-of-the-art on ESG quality of data and rating reliability

Figure 6 - Network visualisation. Keywords co-occurrence analysis
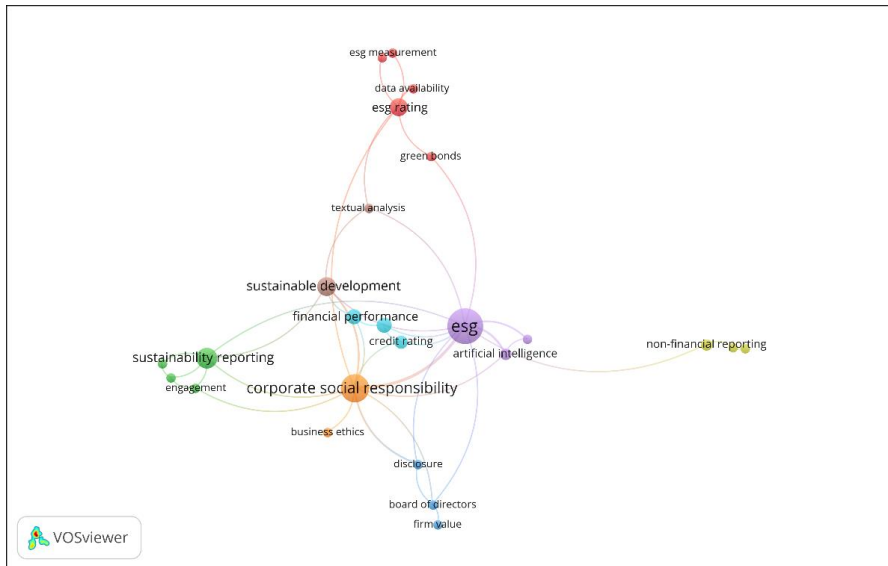
An analysis of the development of the research over time shows that, despite the existence of a "fil rouge" between topics, it is evident that our dataset includes academic contributions from multidisciplinary fields of study, mainly: accounting, finance and information systems. Thus, a keyword co-occurrence analysis was performed using VOSviewer to highlight the main themes representing the intellectual structure of our research topic. In our case, the map (figure 6) shows eight main clusters, each one distinguished by a different colour.

The eight clusters have been mapped in the light of our interpretative framework (see figure 7). While clusters n. 1-2 concern the information source and clusters 6-7-8 the destination of the message, clusters n. 3-4-5 are fundamental to investigate the quality and reliability of ESG data and ratings as they regard the encoding and decoding processes of ESG information.

Figure 7- Clusters emerging from the keywords co-occurrence analysis
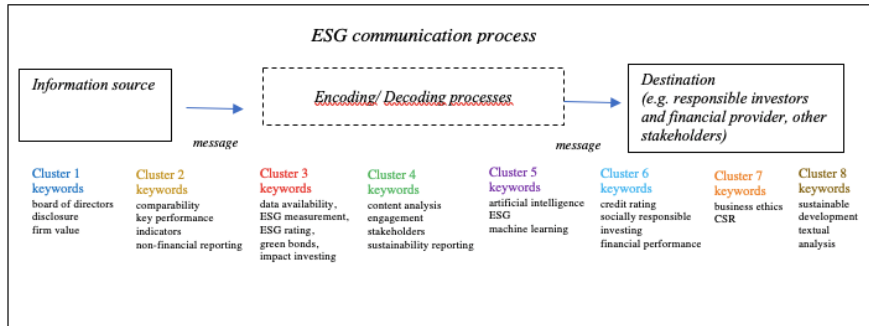
Cluster n. 1 Dark-blue (keywords: board of directors, disclosure, firm value)

The theme of this cluster deals with the relationships among the board of directors' attributes and the features of ESG disclosure. Among the most cited selected papers, the one by Cucari *et al.* (2018) investigates the association between ESG disclosure and the diversity of the Board of Directors (BoD) in Italian-listed companies. Here, diversity is intended in terms of gender diversity, corporate social responsibility committees, Board average age, and independent directors. This study has enabled shareholders and policymakers to understand which factors related to Board diversity drive or hinder voluntary ESG disclosure. A similar contribution by Bini *et al.* (2021) studied the relationship between governance quality and non-financial key performance indicators (NFKPIs) consistency. This article shows that, since NFKPIs disclosure is mainly based on managers' discretional choices regarding which indicators to disclose and how the quality of the Board (especially the experience in financial key roles) plays a key role in affecting companies' disclosure practices.

Cluster n. 2 Gold (keywords: comparability, KPI, non-financial reporting)

This cluster (like cluster n. 1) includes contributions dealing with non-financial information disclosure but not directly focusing on the quality of ESG data. A representative article is the one by Popelkova (2018) dealing with the introduction of the European Directive on the reporting of non-financial information (NFD) of large enterprises and groups. Despite the aim of NFD to achieve greater transparency and comparability of ESG information between companies belonging to different sectors and Member States, scholars demonstrate that companies often present a wide variety of non-financial information and KPIs in a manner that renders their effective comparison difficult (Krasodomska *et al.*, 2019).

Cluster n. 3 Red (keywords: data availability, ESG measurement, ESG rating, green bonds, impact investing)

Contributions included in cluster n. 1, dealing with the issue of ESG data and rating quality, objectivity, reliability, and rigorousness are central to answering our research questions. Hence, they will be carefully analysed in the following paragraph.

Cluster n. 4 Green (keywords: content analysis, engagement, stakeholders, sustainability reporting)

This cluster includes research dealing with sustainability reporting and stakeholders' engagement. Some contributions included in cluster n. 2 offer insights to overcome the critical issues connected with ESG data quality and rating reliability. For this reason, a deeper analysis will follow.

Cluster n. 5 Purple (keywords: artificial intelligence, ESG, machine learning)

This cluster includes important contributions to answer our research questions and the theme will be deeply analysed in the further paragraphs. It is also important to notice that the issues of "Artificial Intelligence" and "machine learning" are the most recent ones (2022), thus offering several points of reflection and new areas to explore that will be deepened later.

Cluster n. 6 Light-blue (keywords: credit rating, financial performance, socially responsible investing)

The main articles belonging to this cluster explore the relationship between credit rating, financial performance and socially responsible investing. However, among the main contributions, we found the article by Bhattacharya *et al.* (2019) proving that companies' overall good ESG performance has a positive impact on their creditworthiness. In particular, the Environmental dimension of sustainability contributes the most to a higher credit rating, especially for mining and quarrying firms (Zanin, 2022).

Noteworthy to mention is also the paper by Barko *et al.* (2021), which is one of the most cited and suggests that investors' activism regarding corporate social responsibility generally improves companies' ESG practices thus leading to stronger financial performance.

Cluster n. 7 Orange (keywords: business ethics, corporate social responsibility)

This cluster, connected to the light-blue one, as shown by the network map, includes publications addressing the relationship between business ethics and corporate social responsibility (CSR) referring to socially responsible financing. A paper that is worth mentioning is the one by Dorfleitner *et al.* (2018) showing

that companies with strong CSR significantly outperform those with weak CSR in the mid and long-run. This conclusion has important implications for asset managers who may expect higher returns by (i) investing in firms that exhibit a high level of CSR and (ii) holding the stocks for a longer period.

Cluster n. 8 Brown (keywords: sustainable development, textual analysis)

The documents, whose main keywords are included in this cluster, were mainly released in 2019 and deal with the concepts of sustainable development and textual analysis. As we can see from the node dimension, the first keyword has a greater prominence with respect to the other one.

The main contributions (within the framework of this cluster) to the topic we are investigating, are given by Lu *et al.* (2022) and Loughran *et al.* (2022). In particular, as global ecological degradation intensifies, an appropriate trade-off between environmental protection and production efficiency has to be found and disclosed to investors and stakeholders in general in order to guarantee the sustainable development of the environment and society.