On the Mechanics of sustainability: ESG Rating and company performance

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Abstract

ESG is the core concept in the field of green finance that has attracted much attention in recent years. Based on traditional financial indicators, ESG aims to integrate environmental, social, and governance factors. By examining the potential for long-term and sustainable value growth of the company, it can effectively help prevent and control downside risks, obtain long-term returns, and discover economic growth. However, there are currently many international ESG rating systems, lacking a unified framework, transparency of their rating methodologies, data sources, and a consensus on how to evaluate the ESG related risk profiles. This research intends to find how ESG Rating is constructed from company performance. In the study, we mainly did the review and illustration of MSCI & RepRisk ESG Rating. We can identify limited mechanisms that could hinder us to simulate ESG rating under various circumstances.

For RepRisk, we could only identify the formula in the last step of generating RepRisk Rating: Scale RRR = 0.5 · (country sector average + peak RRI). For MSCI, we could only identify the rating construction methodologies based on various factors. However, we believe that the blockchain is supportive of eliminating these limitations, and we aim to explore the possibility of constructing an ESG rating system for blockchain for our next step.

JEL Classification: G24, G30, M14, Q56

Keywords: ESG; ESG rating methodologies; MSCI & RepRisk; Simulation; Blockchain

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1. Introduction:

Sustainability is changing the way we manage our economies and interact with the ecological systems and the changing environments. The linkage between the society, economy, and environment was included in the definition of the sustainable development concept in the Brundtland Report in 1987 and accepted worldwide. It's closely related to the appearance of the concept of ESG. ESG represents Environmental, Social, and Governance. In recent years, many investors tend to include such nonfinancial elements into their analysis process to identify material risks and growth opportunities. In many cases, not only in mandatory financial reports but also in disclosures of companies' annual reports, ESG metrics are becoming commonly contained as a part (CFA Institute 2020).

In recent work, in the supply chain domain, Rajesh (2019) incorporates this perspective into the enterprise's view. He also claims that, for a firm's business, the sustainability risk would be considered as a crucial aspect, as well as that of other risks, such as economic risks and financial risks. Thus, a firm should consider adopting a business sustainability strategy, while protecting the ecological system and preserving the natural resources for future generations.

The Global Reporting Initiatives considers the term economic sustainability of firms as the impacts of an organization on the economic circumstances of its stakeholders and the economic system at all levels of governance. It is generally measured by economic performances, financial indicators, market opportunities, and future financial benefits. The combination of the firm's capabilities to reduce the planet's carbon footprint in the products that it trades provides an indication of environmental sustainability (Brodowicz 2017). The above capabilities are also emphasized in the firm's contribution, through a life cycle assessment, to monitoring the changes occurring in the use of natural resources and the compensations that they receive from the human environment (i.e., recycling activities) (Gehman 2011).

There are many emerging institutions that study ESG related issues and generate corresponding ESG Ratings and indexes. For example, two of the most representatives, MSCI and RepRisk. For MSCI, they claimed them as a leading provider of critical decision support tools and services for the global investment community (MSCI 2020). They mainly studied each company's exposure and management capability to 35 key issues and focused on three dimensions – risk, opportunities, and controversies. For RepRisk, they claimed them as a provider of transparency on business conduct risks to help drive accountability and responsible behavior of companies, thus creating positive change (RepRisk 2020). However, their rating methodology is closely correlated with risk, they collected information about risk incidents and made further analysis.

Thus, we can see that different agencies may have different rating methodologies. In addition, different companies may need to focus on different aspects for improving and investors must ensure the approach taken by the rating provider they rely on is consistent with their ESG preferences or they risk constructing portfolios that do not align with their ESG views. However, most providers of ESG ratings, as well as formulators of ESG rankings, are not transparent, or only transparent to a degree about their data sources, weighting, and methodologies (Hawley, 2017). For example, some of them only expose their rating categories and weighting to the public, instead

of explaining how these elements are selected or generated; and some even do not reveal corresponding weights for various categories (Abhayawansa and Tyagi 2021). As a result, on the one hand, it's difficult for other individuals or institutions to simulate their ESG rating; on the other hand, the investors may have trouble in selecting the appropriate rating provider to rely on as well.

The risk exposure & management to ESG related issues is an interesting and crucial point in evaluating a company. ESG-related risk—just like a company's competitive advantage—is always in flux. Just as companies must adapt to protect their moats, companies also must adjust to changing ESG risks, such as new regulations, stakeholder demands, and technology. ESG-related-risk can foretell changes in a company's competitive advantage (Miller, Sherwood, and Fulop 2020). Warren Buffett's famous quip, "Only when the tide goes out do you discover who's been swimming naked," also applies to ESG risk. To be effective, risk management systems need to consider ESG risks when assessing portfolios. For investors, risk management is the main motivation to consider ESG in their investment decisions. However, a lack of quantitative ESG data which is comparable, easily accessible, and of high quality slows the integration of ESG (CFA Institute, 2020). Also, there's not a consensus on how to evaluate the risk profiles.

2. Methodology:

In this section, ESG Rating methods of MSCI and RepRisk are first elaborated. Then, the corresponding pros and cons are discussed. In addition, for RepRisk, based on the historical data, the formula of constructing RepRisk Rating (RRR) by country sector average and peak RepRisk Index (RRI) was discovered as well.

2.1 MSCI

2.1.1 Rating Methodology

MSCI designed their ESG Rating in order to provide references about ESG risks and opportunities for investors. They access more than 1000 data points on ESG policies, programs, and performance. With these data points, they designed exposure metrics and management metrics and have 35 key issues that draw attention to the intersection between the industry issues and a corporate's core business. Furthermore, for each key issue, they generate corresponding key issue scores and set different weights for each based on their rating algorithms. Then, they synthesize the key issue scores and weights to generate the overall ESG Rating, along with E scores, S scores, G scores separately.

For key issue scores, 35 key issues are divided into 3 fractions - Environmental, Social, and Governance. They consider various indicators, such as business segments, strategy programs, when constructing each corresponding key issue score, ranging from 0 -10. Then, all Environmental key issue scores and homologous weights are combined to generate an overall E pillar score, the same principle for Social and Governance. With pillar scores from three dimensions, the weighted average key issue score is calculated by taking the average of each pillar score. Being adjusted relative to industry peers, the final ESG Rating will be exposed.

We intended to explore the relationships between the final MSCI ESG Rating with 35 key issues and how the final rating would be generated with homologous key issue scores. However, on the one hand, we did not find an exposed data source of historical key issue scores; on the other hand, detailed rating methodology including the weight metrics set for key issues is not shown to the public.

On the side, MSCI has completed its acquisition of a Zurich-based environmental fintech and data analytics firm specializing in climate change scenario analysis, Carbon Delta AG ("Carbon Delta"). The agreement was originally announced on September 9, 2019. Remy Briand, Head of ESG at MSCI, said that they would further expand MSCI's climate risk assessment capabilities through this acquisition, enabling global investors to better evaluate the investment risks associated with climate change and comply with climate risk disclosures and requirements.

Therefore, there are existing opacity issues of data and current ESG rating construction methodologies, which made it hard to do the simulation and further analysis.

2.2 RepRisk

2.2.1 Rating Methodology

RepRisk has two major assessment criteria, the one is RepRisk Index, which can seize and quantify reputational risk exposure correlated to ESG issues; the other one is the RepRisk Rating, which helps facilitate benchmarking and synthesis of business conducts and ESG risks.

In this study, we mainly studied and tried to simulate the RepRisk Rating (RRR). RepRisk Index only depends on a single corporate's performance, for instance, on corresponding ESG risk incidents. However, RepRisk Rating depends not only on an independent company's performance but also on the country and sector that a company is located in.

2.2.2 Dataset

The dataset was obtained from Wharton Research Data Services[2]. This dataset contains RepRisk's exposed data of RepRisk Rating (RRR), Peak RepRisk Index (RRI), Date, Country sector average, etc.

Table 1. Panel data summary**.**

Variable	Description	Type
RepRisk_ID	Internal RepRisk ID.	numerical
country_sector _average	Calculated by The Headquarters ESG Risk Exposure value (weighted 50%) and	numerical

[2] Wharton Research Data Services provides the data source. Wharton Research Data Services (upenn.edu)

	The International ESG Risk Exposure value (weighted 50%)	
peak_RRI	The highest level of the RepRisk index over the last two years – a proxy for overall ESG and business risk exposure.	numerical
RepRisk_rating	It facilitates corporate benchmarking against a peer group and the sector, as well as integration of ESG and business conduct risks into business processes.	numerical
date	Date of the month-end value (day, month, year)	string

2.2.3 Data Processing:

Data cleaning has been done before doing data visualization. For example, the date was standardized to the format of "year-month-day" and the given dataset was sorted by the standardized date, to make it convenient for drawing the time series animations in the following part.

Although RepRisk updates its exposed ESG Rating once a month, the dataset is still too large. We pick two companies, whose RepRisk_ID are 10 and 100 separately, to make a sample data visualization for illustration purpose.

According to RepRisk's description, RepRisk Rating (RRR) is a letter-grading, ranging from AAA to D in descending order. Figure 1, 2 and 3 shows the scatter plot of RRR respective to Dates, Country Sector Average and Peak RRI for the company with RepRisk ID=10; and Figure 4, 5, 6, shows those for the other company.

RepRisk_ID = 10:

Figure 1. RepRisk rating distribution along with date (ID = 10).

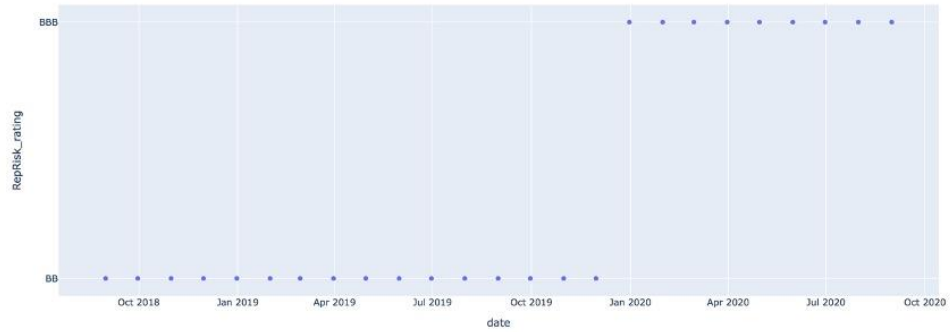


Figure 2. RepRisk rating distribution along with country sector average (ID = 10).

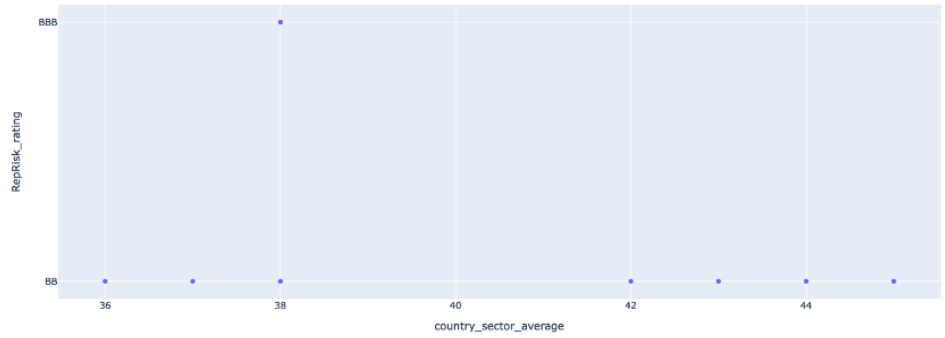
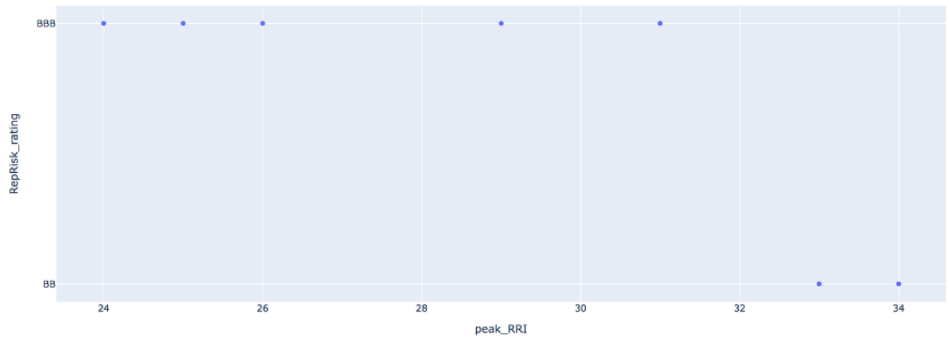


Figure 3. RepRisk rating distribution along with peak RRI (ID = 10).



RepRisk_ID = 100:

Figure 4. RepRisk rating distribution along with date (ID = 100).

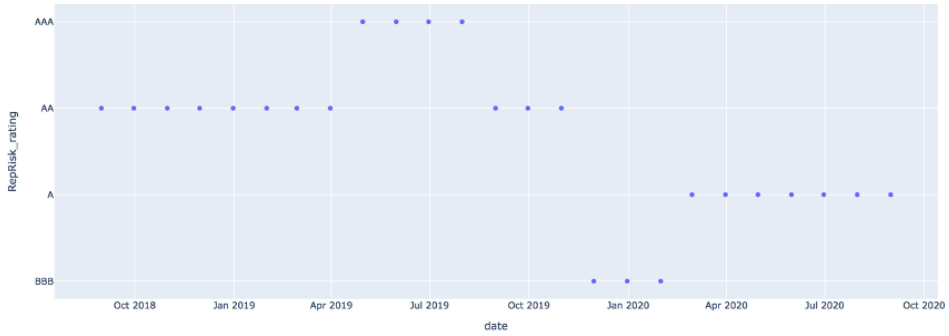


Figure 5. RepRisk rating distribution along with country sector average (ID = 100).

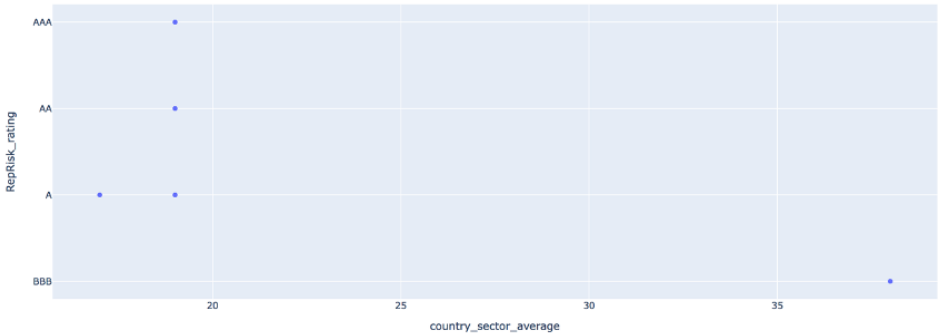
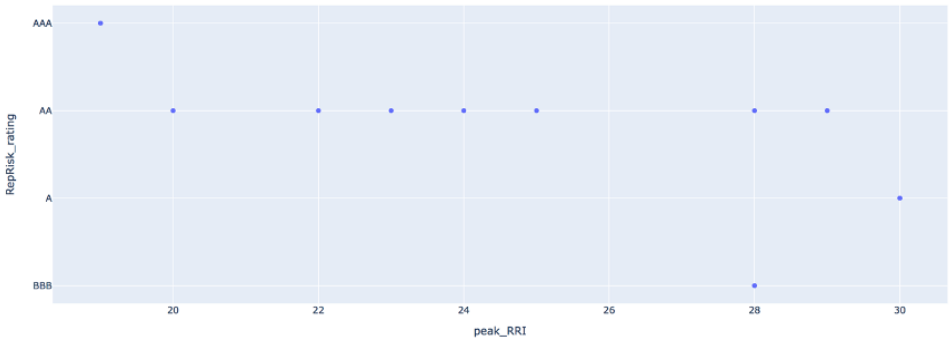


Figure 6. RepRisk rating distribution along with peak RRI (ID = 100).



From the plot, we can see the timeseries change of RRR for each company and correlation with other indexes.

2.2.4 Simulation:

Based on the exposed methodologies of RepRisk Rating (RRR) from RepRisk, RRR is calculated considering two factors: The one is Company-specific ESG risk, which is provided by the Peak RepRisk Index (RRI) (the highest record of RepRisk Index in the last two years); The other one is Country-Sector ESG risk, which is provided by the Country-Sector Average of the company. Country-sector average is calculated by: The Headquarters ESG Risk Exposure value, which

represents the Country-Sector value of the company's country of headquarters and primary sector and takes 50% weight; the other element is the international ESG Risk Exposure value, which stands for the average of all Country-Sector values of the country-sector combinations where the company has ever been correlated to incidents of ESG risks and takes 50% weight correspondingly.

The exposed data and methodologies are not transparent enough, on the one hand, we have no access to the original data of country sector value; on the other hand, we have no access to the computational formula with provided data. Therefore, only three variables were used to investigate the principle of RepRisk Rating, which are *RepRisk Rating, Country sector average, Peak RRI*.

According to the disclosed rating methodology, the mathematical formula and corresponding weight of two factors are not known. Thus, we set 50% weight correspondingly to country sector average and peak RRI and compare with the original data of corresponding RepRisk Rating (RRR) to verify.

Another problem was that although RepRisk claimed RRR as a letter rating, they set the data type of RRR as an int in the literature. Thus, we assumed each RRR level was correspond to a certain region of scales (the whole region is from 0 - 100).

Other companies' information was examined to test the rationality of the hypothesis. The finding was that the company with a lower average score of country-sector average and Peak RRI has a better rating.

Table 2 shows the scale region corresponding to different levels of letter RepRisk Rating (RRR).

Table 2. RepRisk Rating (RRR)**.**

RepRisk Rating (RRR) – Letter rating	Scale RRR Score (0 - 100)
AAA	**0 - 10**
AA	**11 - 20**
A	**21 - 30**
BBB	**31 - 40**
BB	**41 - 50**
B	**51 – 60**
CCC	**61 – 70**
CC	**71 – 80**
C	**81 – 90**
D	**91 – 100**

2.2.5 Mathematical Formula:

Also, based on the results, the mathematical formula of calculating RepRisk Rating (RRR) by country sector average and peak RRI is shown below:

***Scale RRR* = 0.5 · (country sector average + peak RRI)**

Based on the discovered mathematical formula, if the peak RRI remains unchanged, scale RepRisk Rating would keep a linear correlation with country sector average; if the country sector average remains unchanged, scale RepRisk Rating would keep a linear correlation with peak RRI.

3. Conclusion & Limitations:

Berg, Kölbel, and Rigobon (2019) proposed the problems of scope divergence and measurement divergence of ESG ratings in their paper, which respectively represent the situations where different ratings may use different attributes and different raters may use different indicators when measuring the same attribute. Comparing the methodologies from two ESG raters – MSCI & RepRisk, we can intuitively find that two raters have different measurements of ESG. For example, they have different key issues to evaluate, and under each pillar of key issue, there are diverse indicators to be assessed. Moreover, MSCI considers both positive and negative indicators when generating their ESG rating, but RepRisk only concentrates on negative incidents.

Second, from the previous visualization and simulation, we found that it's possible to use the historical data of ESG Rating from different companies to see their ESG moving trend, and to make predictions. We can also recognize different levels of RepRisk Rating when peak RRI and country sector average have different numerical values.

Third, based on the simulation and raw data, we discovered the scale RepRisk Rating (RRR) score region corresponded to a certain letter RepRisk Rating (RRR). In addition, we found and verified the mathematical formula of the RepRisk Rating calculation with the use of peak RRI and country sector average.

However, as a rudimentary study, our research is restricted by the access and transparency of the required data, including the required indicators for ESG rating from different ESG rating institutions, required info data of different companies in the stock market, as well as the detailed rating methodologies of those ESG rating institutions. Abhayawansa and Tyagi (2021) also stated in their article, agencies providing ESG rating and ranking are not transparent about the way ESG performance is measured, and data sources, weightings, as well as methodologies, also lack transparency. From our study, for example, for MSCI, we only have access to the indicators data from Environmental, Social, and Governance dimensions but cannot obtain the data of

corresponding key issue scores and methodologies of calculating it with those indicators. Also, for RepRisk, although we have access to most of the required raw data, we only have access to the general methodology of calculating RepRisk Rating with country sector average and peak RRI. The mathematical formulas and required data for calculating country sector average and RRI are still not given.

Therefore, the main impersonal restrictions of our research can be summarized as: (1) The difficult access of acquiring essential data (2) the opacity of ESG rating methodologies from various institutions. However, the second limitation is hard to be solved. The rating methodologies, including the chosen ESG indicators and weightings, are proprietary and regarded as intellectual property of the raters (Abhayawansa and Tyagi 2021), so that it is scarcely possible to disclose the details to the public. Apart from these limitations, unlike the data on the blockchain, almost all of the ESG Rating-related data are centralized, which may lead to the risk of data being modified.

4. Future Research:

Considering the issues above, the blockchain can be utilized to help resolve these issues. The blockchain is relatively open and transparent, with a capacity to record every transaction on it. Unlike the conventional database, it stores the data in blocks and these blocks will be chained together next. Thus, the new economy of blockchain can bring opportunities and solutions to the ESG ratings.

The first issue we met was the difficulty in accessing essential data. However, the data on the blockchain cannot be modified or deleted and are stored in a shared database that can be accessed by anyone. In addition, the blockchain can also be used to store various types of data, such as records of property or records of healthcare (Conway 2020). With these properties, the problem of having no access to the essential data or types of data can be resolved. Second, although the issue of non-transparent rating methodologies is hard to be solved, smart contracts on the blockchain can provide a promising solution. A smart contract will operate under a series of conditions the users agree to (Conway 2020). With an open-sourced smart contract, the raters can store the code into the smart contract, which makes the information of rating methodologies and algorithms transparent to the public.

Although blockchain is capable to provide promising solutions on ESG ratings, it may have some ESG-related issues for its own operation. For example, for bitcoin blockchain, without any policy interventions, “the annual energy consumption of the Bitcoin blockchain in China is expected to peak in 2024 at 296.59 Twh and generate 130.50 million metric tons of carbon emission correspondingly” (Jiang et al. 2021). This is only the environmental impact of bitcoin blockchain operation, regardless of social, governance impacts and other blockchains. Thus, considering the

issues above, we have an idea of constructing a sustainability framework on blockchain. With the power and the property of decentralization of blockchain, it has the potential to have an extraordinary impact on each field. Along with a sustainability framework as a measure, it would benefit the society even more. For the next step of our research, we will stay our focus on building the sustainability framework on blockchains.

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