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Evaluating the Impact of ESG Factors on Credit Ratings: A TOPSIS-Based Analysis with Entropy-Weighted Criteria

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ABSTRACT

This research looks at how Environmental, Social, and Governance (ESG) factors are being used in credit rating assessments, particularly noting a move from strictly financial metrics—like profitability, leverage, and liquidity—to a broader inclusion of non-financial aspects. However, considering the current and emerging issues related to sustainability and ethical corporate governance, ESG factors are now regarded as important components of business risk and resilience. This study uses a multi-criteria decision-making (MCDM) approach based on the TOPSIS model, along with entropy weighting, to measure how ESG factors influence credit ratings for companies within the Dow Jones Industrial Average. A set of 14 indicators, covering both financial and ESG elements, is used to generate relative rankings, which are then compared with actual credit ratings. This study also examines the ESG practices of major companies, assessing how their environmental, social, and governance initiatives influence credit risk and align with sustainable industry standards.

1. LITERATURE REVIEW

This literature review will be divided into four sections to guarantee that all of the important works in the field are covered.

1.1 will discuss the inception of ESG and the different ways it has been amalgamated

1.2 will be covering selection and ranking of stocks based on ESG criterion.

1.3 will include a robust overview of MCDM techniques being utilised in this field of research

1.1 The inception of ESG and the different ways it has been incorporated

*"*ESG stands for Environmental, Social & Governance.(Georgiev et al. 2023) The concept of ESG that we are so familiar with today can be dated back to the mid-2000's but the principles that govern it are definitely decades old. A 2004 report from the United Nations titled "Who Cares Wins " is known to carry the first mainstream mention of ESG in the modern context and this report was a pioneer in advocating business' and all their stakeholders to embrace ESG long term. Governments world-wide have acted on the same with many governments passing laws on the same for example the UK government passed the Companies Act (2006) to form the primary source of company law and essentially set standards in the "G" category."

"(https://www.thecorporategovernanceinstitute.com/insights/lexicon/what-is-the-history-of-esg/#:~:text=A%202004%20report%20from%20the,to%20embrace%20ESG%20long%2Dterm.)"
"ESG investing has become a prominent theme in financial markets, with recent research examining how ESG factors impact portfolio performance among UK securities from 2003 to 2020. Findings indicate that lower ESG scores are associated with higher returns, while high ESG scores correspond with lower returns. Breaking down ESG into its components—environmental (Env), social (Soc), and governance (Gov)—the study reveals that Env and Soc have stronger impacts on returns than ESG overall, whereas Gov has an insignificant effect. The results suggest that liquidity also plays a role, with high-liquidity stocks generally having higher ESG scores. Notably, the ESG premium is significant only for low-liquidity stocks, implying that ESG's influence on returns may be closely linked to liquidity levels. These patterns hold similarly when analyzing portfolios based on individual Env, Soc, and Gov factors. (Luo 2022)"

1.2 Stock Selection and ranking based on ESG criterion

When we consider stock selection and portfolio optimisation ESG ratings are an upcoming choice of indicators considered by investors to do the same. But considering sector specific characteristics becomes an integral part when interpreting ESG scores.

With convincing evidence, the authors find that choosing companies from the best-performing sectors and indexes based on the highest overall ESG scores is associated with better portfolio performance. However, relying alone on these ratings does not ensure benchmark outperformance; consequently, taking into account additional criteria in addition to these ESG scores can result in even better outcomes. (He and others, 2023)

Therefore, the authors work on this research gap by considering multiple other factors as will be discussed in the upcoming analysis, in addition to ESG scores to come up with a ranking of **30 Companies in the DOW JONES Industrial Average** using MCDM – TOPSIS (The Technique for Order of Preference by Similarity to Ideal Solution).

1.3 Robust overview of MCDM techniques being utilised in this field of research

MCDM is a subfield of operations research that enables its users in decision making problems that involve multiple possible criteria. A variety of MCDM methods have been developed and extensively applied in empirical research to aid complex decision-making. Each method ranks alternatives through its unique approach, and while these rankings occasionally align, they frequently produce differing outcomes. This variation highlights the distinct criteria and weightings that each MCDM technique prioritizes, underscoring the need for careful selection of the method best suited to specific investment or evaluation contexts. (Poklepović and Babić 2014)

The stock market has implemented Multi-Criteria Decision-Making (MCDM) techniques to resolve the intricacy of assessing numerous stock features, assisting investors in locating high-performing assets based on a range of non-financial and financial variables. Robust decision-making is made possible by MCDM techniques such as the Analytical Hierarchy Process (AHP), PROMETHEE, TOPSIS, and Best-Worst Method (BWM), which rank and evaluate stocks according to market performance, risk, and return. To evaluate sectoral stock indexes on India's National Stock Exchange, for example, Gupta et al. (2021) employed a hybrid MCDM technique. This allowed for a methodical ranking that emphasizes the significance of numerous performance measures (such as EPS, P/E, and ROA) in company evaluation. Similarly, Mills et al. (2020) combined various MCDM techniques to assess the Shanghai Stock Exchange's asset allocation, underscoring the utility of MCDM methods in complex financial landscapes where decisions must balance return optimization and risk mitigation.

Further applications demonstrate how MCDM techniques enhance stock selection by allowing investors to weigh both quantitative and qualitative factors. Techniques such as Fuzzy AHP, as applied by Galankashi et al. (2020), integrate financial indicators like net profit margin and non-financial factors like governance quality to optimize portfolio selection, especially under uncertainty. By incorporating MCDM methods, decision-makers can analyze and rank stocks not only by traditional performance metrics but also by strategic indicators, making MCDM essential for modern investment frameworks. These methods have become increasingly valuable, particularly in emerging markets, where volatility demands adaptive and comprehensive evaluation models. (Alsanousi et al. 2024)

2. INTRODUCTION

Credit ratings serve as a critical tool in the financial markets, providing a structured evaluation of a company's creditworthiness and influencing decisions regarding lending, investing, and risk management (Wadhwani, 2022). Traditionally, these ratings have relied heavily on financial indicators such as profitability, leverage, liquidity, and historical repayment performance to assess the likelihood of default. While these measures remain essential, the financial landscape has evolved, and non-financial factors—particularly environmental, social, and governance (ESG) criteria—are now playing an increasingly pivotal role in determining a company's risk profile and long-term viability.

In recent years, ESG factors have gained significant traction in the financial world due to rising concerns over sustainability, ethical governance, and social responsibility (Bazmi & Zahedi, 2011). Environmental risks such as climate change, resource scarcity, and pollution can lead to operational disruptions and regulatory penalties, negatively impacting a company's financial performance. Similarly, social factors like labour practices, community relations, and diversity policies can affect

a firm's reputation and operational efficiency. Governance practices, including corporate ethics, board structure, and transparency, are also scrutinised, as poor governance can lead to fraud, mismanagement, or instability. As these risks increasingly translate into financial repercussions, credit rating agencies have started integrating ESG considerations into their methodologies (Frouté et al., 2007).

The inclusion of ESG in credit ratings is not just a response to regulatory pressure but also to investor demand for a more comprehensive view of risks that transcend traditional financial metrics. Companies that fail to address ESG issues may face heightened risks, including legal challenges, supply chain disruptions, and loss of market share, which could impair their ability to meet debt obligations. On the other hand, strong ESG performance can signal good risk management practices, operational resilience, and alignment with future regulatory trends, which may improve a company's access to capital and lower the cost of borrowing (Vezeteu & Stănciulescu, 2024).

This research paper seeks to examine the growing impact of ESG factors on credit ratings, investigating how and to what extent these non-financial factors are being incorporated into traditional credit risk models. Specifically, it aims to address several critical questions: What role do ESG factors play in influencing creditworthiness and overall financial stability? How are credit rating agencies adapting their methodologies to integrate ESG risks? What are the challenges and benefits of this integration for lenders, investors, and companies alike? Additionally, this study will explore the extent to which ESG considerations can enhance the predictive power of credit ratings and improve decision-making processes within financial institutions (Miao, 2024).

By analysing these questions, this paper aims to contribute to the ongoing discourse on sustainable finance and the intersection between financial and non-financial risk factors in the credit rating process. As ESG continues to reshape the global financial landscape, understanding its implications on credit ratings will be crucial for both policymakers and market participants seeking to mitigate risk and promote long-term, sustainable economic growth (Rossi et al., 2024).

3. RESEARCH OBJECTIVES

1. To evaluate the relationship between ESG performance and credit ratings of companies.
2. To apply the TOPSIS method with entropy-based weights to rank companies based on 14 ESG and financial criteria.
3. To assess the relative importance of different criteria in determining company rankings.
4. To compare the TOPSIS rankings with actual credit ratings of companies.
5. To analyse the implications of the findings for investors, credit rating agencies, and companies.
6. To explore the advantages and limitations of using TOPSIS with entropy-based weights in ESG and credit rating evaluations.

4. RESEARCH METHODOLOGY

For this research, companies and criteria were ranked using MCDM techniques such as TOPSIS. A multi-criteria decision analysis technique called TOPSIS aids in choosing the optimal option from a range of possibilities. The option that is most similar to the ideal solution and most dissimilar from the negative ideal alternative is chosen by TOPSIS (Technique for Order Preference by Similarity to the Ideal Solution).

This analysis was carried out in Excel, evaluating a dataset of **30 companies in the Dow Jones Industrial Average**.

We ranked the companies on the basis of the following criterions (as shown in Fig. 1):

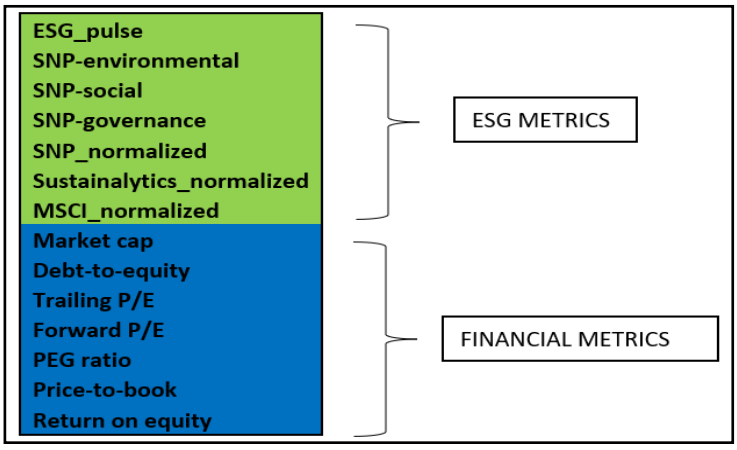

Fig.1 Criteria for Ranking of Companies

Given the need for weighted factors in AHP (Analytic Hierarchy Process), we adopted **Entropy-based weighting** to enhance objectivity and minimise bias in assigning weights. The Entropy-based weighting method helps set weights by looking at how information is spread out across different criteria.

The Formula used for the calculation of weights using Entropy – based weighting method was:

$$Ej = -k \sum_{i=1}^{m} Pij \ln(Pij)$$

where Pij represents the probability distribution of the j-th criterion over all alternatives, and k is a constant.

5. RESULTS AND OBSERVATION

The following is the final ranking of the Dow Jones Industrial Average using Entropy- based weighting and TOPSIS w.r.t the 14 criterion previously mentioned.

RANKING OF COMPANIES:

RANKINGS	COMPANY
1	Verizon Communications Inc
2	Walmart Inc
3	Salesforce.com, Inc
4	Visa Inc
5	The Home Depot, Inc
6	The Travelers Companies, Inc
7	UnitedHealth Group Incorporated
8	The Walt Disney Company
9	American Express Company
10	The Boeing Company
11	The Procter & Gamble Company
12	NIKE, Inc
13	Intel Corporation
14	Merck & Co., Inc
15	Johnson & Johnson
16	Honeywell International Inc
17	McDonald's Corporation
18	3M Company
19	International Business Machines Corporation
20	Dow Inc
21	Caterpillar Inc
22	The Coca-Cola Company
23	Apple Inc
24	Goldman Sachs BDC, Inc

25	JPMorgan Chase & Co
26	Cisco Systems, Inc
27	Microsoft Corporation
28	Amazon.com, Inc
29	Chevron Corporation
30	Amgen Inc

Companies like Verizon, Walmart, and Salesforce had the smallest distance from the ideal solutions across all criteria, meaning they performed well on the factors considered. This suggests that these companies align closely with the ideal standards we evaluated. In contrast, companies such as Amazon, Chevron, and Amgen exhibited the largest distance from the ideal solutions, indicating they fell short in certain areas. This could highlight weaknesses in specific ESG or financial factors, which prevented them from ranking closer to the ideal across all criteria.

The following is the final ranking of the 14-criterion mentioned previously, which were also evaluated using TOPSIS.

RANKING OF CRITERION:

1	**Price-to-book**
2	**Debt-to-equity**
3	**Trailing P/E**
4	**Forward P/E**
5	**PEG ratio**
6	**ESG_pulse**
7	**MSCI_normalized**
8	**SNP-environmental**
9	**SNP-governance**
10	**SNP_normalized**
11	**SNP-social**
12	**Sustainalytics_normalized**
13	**Market cap**
14	**Return on equity**

ESG CRITERIA MEANINGS:

ESG_pulse	Summarizes a company's ESG performance metrics.
MSCI_normalized	Normalized ESG score from MSCI.
S&P Environmental	Score for environmental initiatives.
S&P Governance	Governance quality score.

S&P Normalised	Combined S&P ESG score, normalized.
S&P Social	Score for social responsibility.
Sustainalytics_normalized	Sustainalytics ESG score, normalized.

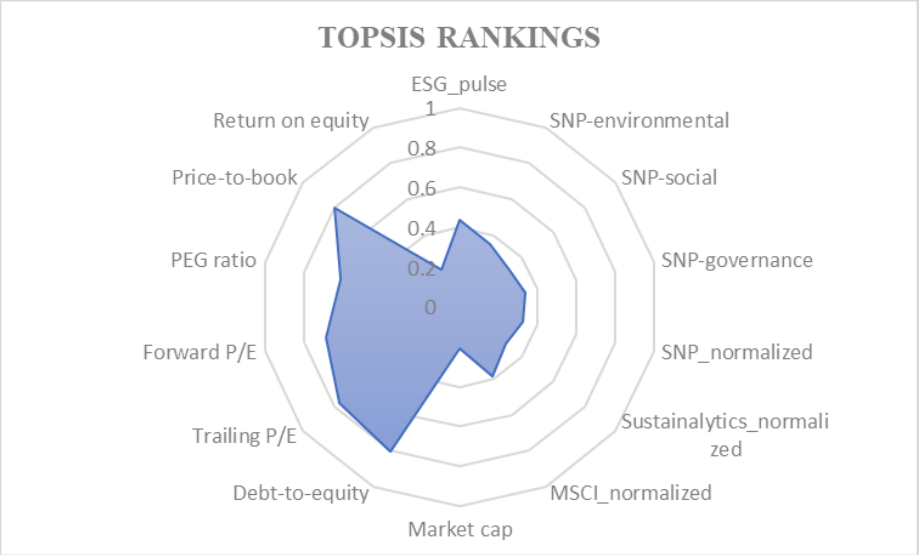

Fig.2 Weight and Influence of each factor in TOPSIS Rankings of Companies

This ranking illustrates the weight and influence of each factor on a company's overall score, highlighting the diverse mix of financial and ESG considerations in our analysis.

COMPANY	CREDIT RATING
3M Company	AAA
Amazon.com, Inc	AAA
American Express Company	AA
Amgen Inc	AA
Apple Inc	BBB
Caterpillar Inc	A
Chevron Corporation	A
Cisco Systems, Inc	AA
Dow Inc	AA
Goldman Sachs BDC, Inc	AA
Honeywell International Inc	AA
Intel Corporation	AA
International Business Machines Corporation	AA
JPMorgan Chase & Co	A

Johnson & Johnson	A
McDonald's Corporation	BBB
Merck & Co., Inc	AA
Microsoft Corporation	AAA
NIKE, Inc	BBB
The Boeing Company	BBB
The Coca-Cola Company	AAA
The Home Depot, Inc	AA
The Procter & Gamble Company	A
The Travelers Companies, Inc	A
The Walt Disney Company	A
UnitedHealth Group Incorporated	AA
Verizon Communications Inc	AA
Visa Inc	A
Walmart Inc	BBB
salesforce.com, inc	AA

One of the major objectives of this paper was to determine the impact that ESG has on companies' credit ratings. Using TOPSIS, we discovered that ESG's criterions do not have as much of an impact on companies compared to financial metrics. We realised the following:

1. **Top-ranked companies (1-10)** are generally a mix of **AAA** and **AA-rated companies**:
    - AAA and AA companies.
    - This suggests that these companies may face more financial volatility or operational challenges, affecting their rank in your analysis and their credit ratings.
2. **Higher credit ratings correlate with better rankings**:
    - Companies such as **3M** (Rank 18), **Amazon** (Rank 28), **Microsoft** (Rank 27), and **Coca-Cola** (Rank 22) generally have **AAA ratings**. While some are ranked lower than expected, the key insight here could be that even the lowest-ranking AAA companies are still considered relatively risk-free, but face specific operational challenges or market conditions that hinder their higher ranking in this particular TOPSIS analysis.
3. **Companies ranked in the middle (11-20)**:
    - Companies like **Procter & Gamble** (Rank 11), **McDonald's** (Rank 17), **Merck & Co.** (Rank 14), and **Intel** (Rank 13) are ranked in the middle and tend to have **AA to A credit ratings**.
    - These companies are stable but face more competition or risks compared to the top-ranked firms. They generally exhibit solid performance but could be at a slight disadvantage when compared to the top-tier companies.
4. **Companies ranked at the lower end (21-30)** tend to have **lower credit ratings** (BBB, A):
    - **Apple** (Rank 23) has a **BBB** rating, as do **McDonald's** (Rank 17) and **Nike** (Rank 12), which indicates they are perceived to carry more financial risk compared to the AAA and AA companies.
    - This suggests that these companies may face more financial volatility or operational challenges, affecting their rank in your analysis and their credit ratings.

AAA-rated companies like **3M**, **Amazon**, **Microsoft**, and **Coca-Cola** have a **broadly strong financial base**, but their rankings may be influenced by non-financial factors such as market conditions, strategic challenges, or specific operational factors in the analysis. Even with a strong credit rating, their lower ranking suggests that there are other criteria in the TOPSIS method that could be affecting their relative performance.

In conclusion, the ranking closely reflects the companies' **financial strength and stability**, but other factors, such as sector volatility and strategic positioning, likely play a role in the rankings based on the multiple criteria in your TOPSIS analysis. **Verizon Communications** (Rank 1), **Walmart** (Rank 2), **Salesforce** (Rank 3), **Visa** (Rank 4), and **Home Depot** (Rank 5) all have strong credit ratings (mostly AA or A).

These companies are among the best in your analysis, implying solid financials and stability, which aligns with their AA and A credit ratings. They rank high due to their financial strength, market position, and operational success.

6. ESG IMPACT ON CREDIT RATINGS

The analysis of the impact of Environmental, Social, and Governance (ESG) factors on credit ratings reveals an interesting trend. Despite many companies performing poorly on ESG criteria in comparison to the ideal scores, they still maintain strong credit ratings, including those in the AA and AAA ranges. This suggests that ESG performance, while increasingly relevant, does not have a substantial immediate impact on credit ratings.

Credit ratings are predominantly driven by financial metrics such as profitability, debt levels, cash flow, and overall financial stability, which remain the most significant factors considered by rating agencies. As such, companies with robust financial performance and effective risk management practices are able to uphold strong credit ratings, even if their ESG scores are subpar.

Furthermore, ESG factors are often perceived as long-term risks, and while they can affect a company's sustainability and potential for future growth, their influence on short-term creditworthiness appears to be limited for many established companies. It is also important to note that sector-specific dynamics play a role in how ESG is factored into credit assessments, with some industries placing more emphasis on financial health than on ESG performance.

Overall, while ESG considerations are becoming more important and may have a greater role in future credit rating assessments, financial strength continues to be the dominant factor in determining credit ratings. As the landscape evolves, it will be important to monitor how ESG factors are increasingly integrated into credit rating methodologies, especially in light of growing regulatory pressures and shifts in market expectations.

Analysing the Top Performers and Challenges Among Major Companies

According to the analysis of the ESG rankings, 3M, Amazon, and American Express Company stand out among their peers due to their strong governance standards, social responsibility, and environmental sustainability.

1. 3M Company

Environmental Initiatives: 3M Company is known for its strong commitment to environmental sustainability. The company has laid out some objectives like becoming a carbon neutral company by 2050 and cutting greenhouse gases by 50% by 2030. It has invested in renewable power and energy-efficient production systems to minimise its emission of carbon. Third, 3M has a sustainable product generation and responsible chemical use policy which makes the company’s impact to the environment beneficial.

Social Initiatives: The Company has a number of social causes that are focused on community welfare as well as its employees. It operates initiatives, which seek to increase awareness of STEM, and support those in need. It also provides a safe and diverse working environment for its employees to guarantee organisational commitment and output.

Governance Initiatives: 3M has proper corporate governance systems, which make it operate with the highest levels of integrity. It adopts zero tolerance to corruption and has a well-developed procedure for managing risks. These measures are in the interest of the long run and the stability of investors.

Credit Rating: As a result of its good ESG performance and good operational performance, 3M has retained high investment grade credit ratings from credit rating agencies such as Moody and S&P. These ratings focus on its financial strength and management, which are the following.

2. Amazon.com, Inc.

Environmental Initiatives: However, amazon has made serious efforts towards environmental sustainability, where recently amazon declared that they will be able to achieve net zero carbon by 2040 through The Climate Pledge. It is also one of the leading companies investing in corporate renewable energy with ambitious onsite use of large-scale power projects. Some of the steps Amazon is taking include planning for an electrically charged delivery fleet and promoting packaging with less waste.

Social Initiatives: For the most part, Amazon’s social activities are oriented toward human capital development and

occupational health – skill enhancement and safety. The company also undertakes corporate social responsibility activities like the Amazon Future Engineer that seeks to increase participation of students in computer science programs in schools across the country.

Governance Initiatives: This paper has noted that Amazon has recently strengthened its governance structure to improve board independence and promote ethical supply chain management. The company has adopted high levels of transparency, accountability and sound ethical standards, hence increasing the stakeholders' confidence in the company.

Credit Rating: This proactivity in ESG standards makes Amazon have high credit ratings from these agencies. The sound earnings generation backed by a sustainable business model leads to robust and consistent credit metrics and investment grade ratings which depict low risk profile and operating leverage.

3. American Express Company

Environmental Initiatives: To address environmental issues, the American Express Company has integrated environmental sustainability initiatives and has set objectives within a particular time frame, for instance, to reach net-zero carbon emissions by the year 2035. The firm operates a policy of environmental conservation by implementing the use of renewable energy as well as reducing energy consumption. It is environmentally conscious in its products as well as in its card material.

Social Initiatives: Leveraging on the DEI strategies, American Express aims to promote and support the growth of a diverse workforce. It provides Diversity Equality Inclusion training and recognizes and supports employee led diversity associations. The company is also involved in social responsibility and responsible for the promotion of financial education and support for other small businesses and companies.

Governance Initiatives: American Express complies fully with international standards of business conduct in corporate management and operation. The board of the company makes sure that there is set and agreed upon an ethical and a risk management framework hence stability and trust from stakeholders.

Credit Rating: The company enjoys a healthy credit rating from large rating agencies like Moody's and S&P. These positive views are backed by good governance practices and robust risk management frameworks from the company, meaning good health and sustainable growth.

The following companies show that sound ESG policies improve companies' credit profiles and financial resilience:

- 3M
- Amazon
- American Express.

There is evidence to show that high levels of ESG are associated with lower operational risks, greater investor confidence and more favourable credit ratings. While on the scale of environmental and social performance Amazon is ahead, 3M and American Express have better results on the governance and community levels. They support them to sustain a competitive edge, attract the investors interested in ESG and to get cheaper funding.

Walmart is one of the most popular companies that fall at the lowest ESG ranking lists because of several unresolved issues regarding environmental and social responsibilities and governance. Although Walmart has improved in the last few years – it has, for instance, invested in renewable energy and committed to delivering zero emissions by 2040 – this has largely been accompanied by a massive carbon footprint of its global supply chain.

On the social aspect, Walmart has continued to be accused of poor treatment of employees paying them little and not recognizing their right to unionise, which affects the scores. Also, supply chain ethics and board independence have been concerns for the company as to its governance. Conversely, companies such as Amazon and Microsoft have left Walmart behind due to showing higher sustainability plans, better employee care measures, and better corporate governance structures which all contribute to better ESG ratings.

LIMITATIONS OF PROJECT

1. **Data Availability and Quality**: A major challenge in ESG analysis is the availability and quality of data. Companies often disclose ESG data at varying levels of detail, and inconsistencies across datasets can affect the reliability of the analysis
2. **Dynamic Nature of ESG and Credit Ratings**: ESG performance and credit ratings are both dynamic and can change quickly. This means that historical ESG data may not fully capture current trends or developments that could affect credit ratings, potentially reducing the robustness of my analysis over time.
3. **Risk of Oversimplification**: While MCDM techniques like TOPSIS offer a structured approach to evaluation, they might oversimplify the complexity of real-world decision-making. ESG performance impacts are often nuanced, and while TOPSIS helps rank alternatives, it might not fully capture all of the contextual factors influencing credit ratings.

FUTURE RESEARCH AGENDA

Research Agenda	Input	Process	Outcome
Dynamic ESG Impact Assessment	The research would require comprehensive historical ESG performance datasets spanning 5-10 years, including detailed credit rating transitions and changes. Market volatility indicators would be essential to control for external factors. Additionally, regulatory change data would help contextualise ESG performance shifts.	The analysis would employ sophisticated time series analysis techniques to track ESG impact evolution. Event study methodology would identify critical turning points. Machine learning algorithms would detect subtle patterns in ESG-credit rating relationships. Cross-sectional regression would examine varying impacts across different company types.	This research would yield a dynamic understanding of how ESG impacts evolve and mature over time. It would identify specific lag effects between ESG changes and subsequent rating adjustments. The outcome would include predictive models capable of forecasting potential rating changes based on ESG trends.
Sector-Specific ESG Materiality	Input data would focus on industry-specific ESG metrics that capture unique sector characteristics. Sector vulnerability assessments would provide context for risk exposure. Competitive analysis data would help benchmark performance. Supply chain risk data would complete the picture of sector-specific challenges	The process would involve detailed materiality mapping to identify sector-relevant ESG factors. Industry comparative analysis would highlight key differentiators. Stakeholder impact assessment would determine relevance. Value chain analysis would reveal critical dependencies.	Results would include sector-specific ESG weighting frameworks that reflect industry realities. Industry-specific risk matrices would guide assessment. Customised rating methodologies would emerge for different sectors. Best practice guidelines would help standardise approaches.
Integration of Alternative Data	Research would utilise non-traditional data sources including social media sentiment analysis, satellite imagery for environmental monitoring, IoT sensor data for real-time performance tracking, and comprehensive news sentiment analysis. Supply chain metrics would provide operational insights.	Processes would leverage Natural Language Processing for text analysis, computer vision algorithms for image processing, and real-time data processing capabilities. Multi-source data fusion techniques would integrate diverse data streams.	The research would produce enhanced early warning systems for ESG risks. More accurate risk assessments would emerge from broader data incorporation. Real-time ESG monitoring capabilities would improve responsiveness. Predictive accuracy would increase through diverse data inputs.

Regulatory Impact Analysis	This agenda would require comprehensive global ESG regulation databases, detailed compliance cost data from various jurisdictions, historical enforcement action records, and upcoming policy proposals across major markets.	Analysis would include thorough regulatory gap assessment, detailed cost-benefit evaluation of compliance measures, impact modelling of various regulatory scenarios, and strategic scenario planning for future developments.	Outcomes would include robust regulatory risk frameworks, optimised compliance strategies for different regulatory environments, clear policy effectiveness measures, and refined rating methodology adjustments reflecting regulatory impacts.
Stakeholder Value Creation	Research would incorporate detailed investor preference surveys, systematic customer feedback data, comprehensive employee satisfaction metrics, and quantitative community impact assessments from multiple stakeholder perspectives.	The process would involve comprehensive stakeholder mapping exercises, detailed value creation analysis across stakeholder groups, systematic impact measurement protocols, and structured multi-stakeholder engagement frameworks.	Results would produce stakeholder-aligned rating criteria reflecting diverse interests. Value creation metrics would quantify stakeholder benefits. Impact measurement frameworks would standardise assessment. Enhanced reporting standards would improve transparency.

7. CONCLUSION

This study has shed light on the connection between credit ratings and ESG performance by evaluating companies using 14 financial and ESG criteria using the TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) method with entropy-based weights. According to the report, financial indicators continue to be the primary predictors of creditworthiness in the short term, despite the growing emphasis being paid to ESG aspects.

The key findings from the TOPSIS rankings indicate that companies with strong financial health and stable operations tend to maintain higher credit ratings, regardless of their ESG performance. This suggests that, although ESG factors have become significant in evaluating corporate sustainability, they do not yet substantially influence credit ratings in a way that would alter investors' or rating agencies' perspectives. Companies that performed poorly in ESG rankings were still able to maintain high credit ratings, primarily due to their solid financial performance.

The ranking of the individual criteria also highlighted that financial metrics (e.g., profitability, debt ratios, cash flow stability) consistently held more weight in determining company rankings compared to ESG factors. This supports the notion that financial strength continues to be the primary driver of credit ratings, with ESG considerations being of secondary importance in the current credit rating models.

The methodology employed in this research, using TOPSIS with entropy-based weights, provided an objective and systematic way to assess and rank companies across multiple dimensions. However, while the approach has its strengths—such as minimising bias in assigning weights and handling multiple criteria—it also has limitations. Notably, the static nature of the model, reliance on available data, and the assumption of independence between criteria could affect the robustness of the results.

In conclusion, while ESG factors are important for assessing a company's long-term sustainability and potential risks, they currently do not exert a strong influence on short-term credit ratings, which are still primarily based on financial stability. This finding suggests that ESG considerations, though valuable, are not yet sufficiently integrated into credit rating systems to alter creditworthiness assessments in the immediate term. As ESG considerations continue to evolve, further research is needed to explore how these factors might play a larger role in the future, especially as regulatory frameworks and market expectations shift.

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