

ORIGINAL ARTICLE**MULTI-CRITERIA SUSTAINABILITY PERFORMANCE ANALYSIS OF COMMERCIAL BANKS IN TÜRKİYE BASED ON MPSI AND RAWEC METHODS**

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Abstract

This study introduces a novel decision-making framework for assessing the sustainability performance of banks listed on Borsa Istanbul (BIST) by integrating the Modified Preference Selection Index (MPSI) and the Ranking of Alternatives with Weights of Criterion (RAWEC) methods. To evaluate the applicability and effectiveness of the proposed model, a case study was conducted for the year 2022, focusing on the comparative sustainability performance of selected banks. The MPSI method was employed to objectively determine the weights of selected financial and non-financial performance indicators, while RAWEC, a relatively new Multi-Criteria Decision-Making (MCDM) technique, was employed to rank the banks. The results indicated that return on equity (ROE) was the most influential indicator in evaluating sustainability performance. According to the RAWEC rankings, Akbank demonstrated the highest level of multi-dimensional sustainability performance among the banks analyzed. Furthermore, a series of sensitivity analyses were conducted to examine the robustness of the proposed MCDM algorithm. The outcomes confirmed the stability and reliability of the results under varying conditions, thereby supporting the validity of the integrated framework.

Keywords

Banking industry, Sustainability performance assessment, MCDM, MPSI, RAWEC.

JEL Classification

C54, G17, G22, G32, G41.

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1. INTRODUCTION

Banks, which play a significant role in the sustainable functioning of the financial market, are among the major institutions that support economic growth (Scholtens, 2006). By channeling funds from agents with surpluses to those with resource deficits, banks contribute not only to financing investment but also to maintaining the continuity of economic activity (Goss & Roberts, 2011). The financial institutions' services address the financing needs of individuals and firms, while also fostering systemic confidence and financial stability (Weber et al., 2015:2). Accordingly, the impact of the banking industry extends beyond the economic dimension to include social and environmental considerations (Friede et al., 2015; Işık, 2023). In today's financial landscape, banks are no longer seen solely as profit-maximizing entities, but rather as institutions with responsibilities to society, the environment and their stakeholders (Sullivan & Mackenzie, 2017).

Especially, the growing global concerns about environmental degradation, social inequality, and governance failures have increased the relevance of sustainability in banking (Fernando, 2021). The integration of sustainability principles into credit decisions, investment strategies, and corporate governance practices is essential not only to maintain institutional reputations, but also to mitigate long-term risks (Kotsantonis et al., 2016). In this regard, the evaluation of environmental, social, and governance (ESG) performance has become a necessity in the banking system. ESG indicators provide a framework for assessing the environmental sensitivity, social responsibility, and governance quality of banks (Kotsantonis et al., 2016; Işık & Adalar, 2025). These indicators go beyond traditional financial measurements and allow for a multidimensional assessment of corporate performance (Friede et al., 2015). Particularly in sectors such as banking, where societal impacts are substantial, monitoring and reporting ESG performance is critical for transparency, accountability, and institutional reputation (Sullivan & Mackenzie, 2017).

Systematically monitoring ESG factors contributes significantly to the development of sustainable lending policies and the effective management of social and environmental risks by banks (Weber et al., 2015). In addition, ESG ratings are becoming increasingly influential in the decision-making processes of investors, regulators and rating agencies. Banks that demonstrate strong ESG performance are often able to access capital at a lower cost and benefit from increased investor confidence (Goss & Roberts, 2011). Moreover, the tracking of ESG-related data allows for the evaluation of not only a bank's current performance, but also its long-term sustainability potential (Fernando, 2021).

Consequently, measuring ESG performance in the banking system is no longer just an environmental or ethical obligation, but has become a strategic management vehicle. In the building of sustainable financial systems, ESG performance serves as an important indicator for both mitigating institutional risks and enhancing stakeholder trust (Friede et al., 2015). From this perspective, sustainability-based performance assessment frameworks should be considered as an integral part of modern banking. Accordingly, this study intends to evaluate the sustainability performance of deposit banks listed on BIST by adopting a multidimensional assessment framework. To do this, a novel decision model is proposed that integrates MPSI and RAWEC algorithms. Within this model, MPSI is used to determine the weights of the chosen sustainability indicators objectively, while RAWEC is used to rank the banks based on their performance.

The remaining part of the paper is composed as follows: Section 2 provides a review of the previous literature. Section 3 outlines the methodological frameworks of the study, while Section 4 presents the data set and sample. Section 5 introduces the empirical results, and Section 6 contains the findings of the sensitivity analyses carried out to validate the robustness of the suggested model. Section 7 discusses the theoretical and managerial implications of the present work. Finally, section 8 discusses the conclusions and provides recommendations for future studies.

2. LITERATURE REVIEW

A large number of empirical studies conducted in both domestic and international contexts have investigated the performance of the banking sector using a range of MCDM approaches. Table 1 provides a synthesized overview of selected studies on this topic.

Table 1
Literature Review

Study	Period	Approach	Sample
Lemonakis and Strikos (2012)	2005-2009	PROMETHEE	Commercial banks operating in 15 member countries of the European Union
Chaudhuri and Ghosh (2014)	2007-2013	Equal Weight, TOPSIS and M-TOPSIS	A total of 29 Indian banks with public and private ownership structures
Banu and Santhiyavalli (2018)	1999-2015	TOPSIS	40 Indian banks with various ownership structures
Marjanović and Popović (2020)	2012-2017	CRITIC and TOPSIS	25 commercial banks operating in Serbia
Işık (2020)	2014-2018	SD, MABAC, and WASPAS	Evaluating the performance of state-owned development and investment banks
Guru and Mahalik (2021)	2014	AHP and TOPSIS	26 Indian public sector banks
Gazel et al., (2021)	2007-2017	F-Entropy, F-TOPSIS and Regression analysis	Deposit-taking banks registered within the Turkish banking sector
Jaradat (2022)	2016-2020	TOPSIS and EDAS	Participation banks operating under the Jordanian banking system
Bayram (2022)	2019-2021	SWARA and CODAS	A total of 10 banks from the Turkish banking sector, including 7 traditional and 3 participation banks
Avşarlıgil et al., (2023)	2019-2020	Entropy, MOOSRA ARAS, and MOORA	13 Turkish commercial banks examined through a multi-criteria performance evaluation framework
Akbulut and Aydın (2024)	2022	MSD, MPSI and RAWEC	6 commercial banks listed on the BIST
Antunes et al., (2024)	2010-2018	DEA and SRP	39 commercial banks operating in China
Akbulut (2024)	-	Grey LOPCOW and Grey PIV	6 deposit-taking banks operating in Turkey
Mastilo et al., (2024)	2022	MEREC and MARCOS	21 banks operating within the banking system of Bosnia and Herzegovina
Islatince (2024)	2012-2022	GIA	A total of 21 deposit-taking banks in Turkey with domestic private and foreign ownership structures
Işık et al. (2025a)	-	F-LBWA, F-LMAW, and MARCOS	15 listed commercial banks operating in Pakistan

As summarized in Table 1, a review of the existing literature reveals a significant number of empirical studies that focus on the performance of the banking sector or individual banks operating within it. However, many of these studies concentrate solely on financial indicators or incorporate only a few ESG criteria in the evaluation process. Furthermore, most of these studies employ traditional MCDM methodologies, providing limited insight into the applicability of more recent models. In recent years, there has been growing academic and institutional interest in assessing bank performance using both financial metrics and sustainability-oriented ESG indicators. This study aims to address these research gaps and make several original contributions to the literature.

First, the present case study employs a comprehensive assessment framework integrating financial and ESG performance indicators to assess banks' sustainability performance from a multidimensional perspective. The proposed model moves beyond conventional, profit-centered assessment paradigms by incorporating components such as social responsibility, environmental sensitivity and corporate governance directly into the decision-making structure.

Secondly, the study presents a hybrid MCDM model based on the integration of the MPSI and RAWEC procedures, two emerging decision-making techniques that have only been applied in a limited number of studies to date. The MPSI algorithm provides a statistically robust and objective approach to allocating weights to performance criteria, while the RAWEC method offers a consistent framework for ranking alternatives based on multiple criteria. Accordingly, the study contributes to the literature on decision sciences in terms of both methodological diversity and analytical depth.

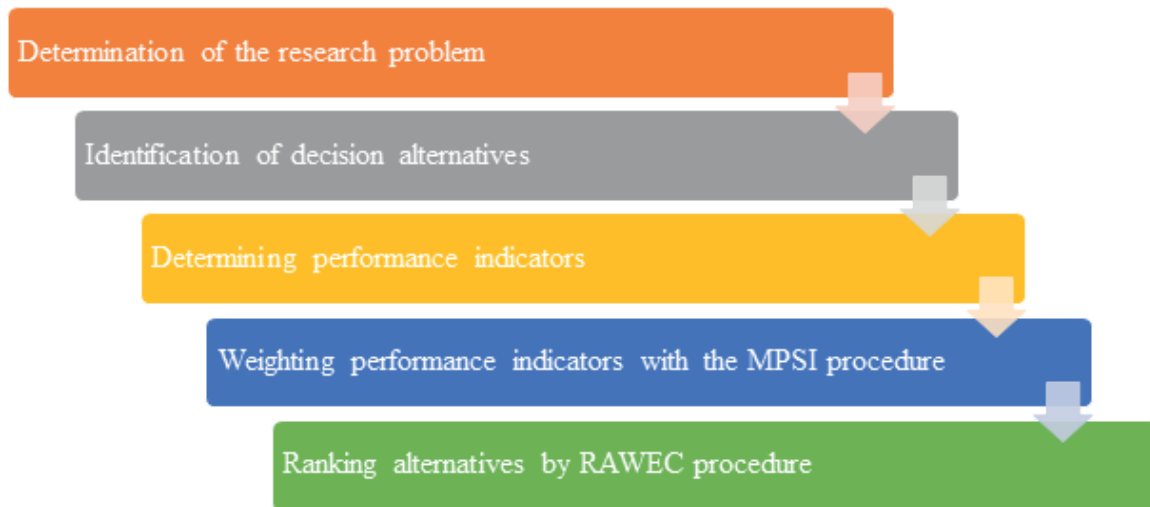
Thirdly, in addition to the proposed conceptual model, the empirical study validates its applicability through a real-world case involving six publicly traded deposit banks on Borsa Istanbul. This application demonstrates the model's capacity to support decision-making using actual financial and ESG data, and also evaluates its stability through sensitivity analyses.

Addressing a clear gap in the literature on sustainability-based performance assessment in banking, the study also advances the field of multi-criteria decision-making. With its integrative perspective and innovative methodological design, the proposed model provides a practical, informative and forward-looking framework for academic researchers and financial sector decision-makers alike.

3. METHODOLOGICAL BACKGROUND

In the existing work, the multi-criteria sustainability performance of commercial banks listed on Istanbul (BIST) is evaluated based on a novel integrated decision-making methodology. The assessment framework combines the Modified Preference Selection Index (MPSI) and Ranking of Alternatives with Weights of Criterion (RAWEC) procedures. In the initial phase, the relative importance of the selected sustainability criteria is determined through the objective weighting mechanism of the MPSI approach. Subsequently, the derived weights are employed within the RAWEC algorithm to perform a comparative analysis of bank performance. The overall structure of the proposed decision framework is depicted in Figure 1, followed by a comprehensive explanation of each procedural step in the methodology.

Figure 1
Proposed Hybrid Model



3.1. MPSI Procedure

The Modified Preference Selection Index (MPSI) procedure is an enhanced version of the original Preference Selection Index (PSI) method, initially developed by Maniya and Bhatt (2010) and later introduced into the broader decision-making literature by Gligorić et al. (2022). As an objective weighting technique, MPSI has gained growing recognition and adoption among researchers across a range of disciplines for determining the relative importance of decision criteria. For instance, Torres et al. (2023) applied the MPSI method in the selection of unmanned aerial vehicles, Akbulut and Aydın (2024) utilized it for evaluating the sustainability success of banks, and Macit (2024) employed it to measure the development levels of countries in Europe and Central Asia. The MPSI procedure follows a structured five-step process, as detailed by Gligorić et al. (2022), to ensure objective, consistent, and transparent weighting of criteria in multi-criteria decision-making applications.

Step 1. The initial decision matrix - consisting of alternatives and evaluation criteria - is constructed according to Equation (1).

$$[x_{ij}]_{m \times n} = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \quad (1)$$

Step 2. The decision matrix is normalized using Equations (2) and (3).

$$v_{ij} = \frac{x_{ij}}{\max(x_{ij})}, \text{ for beneficial criteria} \quad (2)$$

$$v_{ij} = \frac{x_{ij}}{\max(x_{ij})}, \text{ for non-beneficial criteria} \quad (3)$$

Step 3. The means of the assessment criteria are obtained using Equation (4).

$$g_j = \frac{1}{m} \sum_{i=1}^m v_{ij} \quad (4)$$

Step 4. The preference variation coefficients for each criterion are calculated by Equation (5).

$$s_j = \sum_{i=1}^m (v_{ij} - g_j)^2 \quad (5)$$

Step 5. At the last stage, the weights corresponding to each evaluation criterion are derived by employing Equation (6).

$$w_j = \frac{s_j}{\sum_{j=1}^n s_j} \quad (6)$$

3.2. Rawec Procedure

The RAWEC approach, recently developed in the decision-making literature by Puška et al., (2024), is used in this study to rank the decision alternatives. As a novel ranking method, RAWEC has been effectively applied in a number of empirical studies. For example, Sandra et al. (2025) used RAWEC to identify the optimal drilling technique in geothermal reservoir heat extraction, Durmuş (2025) applied it to analyze Turkey's renewable energy performance, and Karadağ (2025) utilized the methodology to assess the financial performance of Turkish football clubs. The RAWEC procedure follows a structured four-step implementation process as outlined by Puška et al., (2024) and Akbulut & Aydın (2024).

Step 1. The decision matrix is created according to Equation (1).

Step 2. A two-way normalization process is performed, taking into account the nature of each assessment criterion. In this context, Equation (7) is utilized for the beneficial criteria, while Equation (8) is employed for the non-beneficial criteria.

$$v_{ij} = \frac{x_{ij}}{\max \{x_{ij} | i = 1, 2, \dots, m\}} \text{ and } v'_{ij} = \frac{\min \{x_{ij} | i = 1, 2, \dots, m\}}{x_{ij}} \quad (7)$$

$$v_{ij} = \frac{\min \{x_{ij} | i = 1, 2, \dots, m\}}{x_{ij}} \text{ and } v'_{ij} = \frac{x_{ij}}{\max \{x_{ij} | i = 1, 2, \dots, m\}} \quad (8)$$

Step 3. The deviation scores derived from the final importance weights of the assessment criteria are obtained by means of Equation (9) for beneficial indicators and Equation (10) for non-beneficial indicators, depending on the nature of each criterion.

$$n_{ij} = \sum_{i=1}^m w_j \cdot (1 - v_{ij}) \quad (9)$$

$$n'_{ij} = \sum_{i=1}^m w_j \cdot (1 - v'_{ij}) \quad (10)$$

Step 4. In the last stage of the RAWEC procedure, the overall performance score for each alternative is obtained by Equation (11)

$$\Omega_i = \frac{n'_{ij} - n_{ij}}{n_{ij} + n'_{ij}} \quad (11)$$

Based on the resulting Ω_i scores, the alternative with the highest value is considered to be the best performing option for the given assessment period.

4. DATA SET AND SAMPLE

In this study, the sustainability performance of selected commercial banks listed on Borsa Istanbul (BIST) was assessed using a hybrid MCDM framework. As presented in Table 2, a total of six banks were considered as decision alternatives, each represented by a code (A1–A6) for simplicity in analysis. The evaluation of these banks was conducted based on a set of 14 performance indicators, categorized into financial and non-financial dimensions. These indicators are detailed in Table 3, along

with their corresponding codes and whether they follow a maximization or minimization direction.

The financial criteria (IN1–IN4) include:

- a) Share Closing Price (IN1) representing investor confidence and stock market performance
- b) Market Value / Book Value (IN2) indicating market perception of firm value
- c) Market Risk (Beta) (IN3) measuring volatility relative to the market
- d) Return on Equity (IN4) measuring profitability

The remaining indicators (IN5–IN14) represent various Environmental, Social, and Governance (ESG) dimensions, including:

- a) Environmental: Resource Use (IN5), Emissions (IN6), Innovation (IN7).
- b) Social: Workforce (IN8), Human Rights (IN9), Community (IN10), Product Responsibility (IN11).
- c) Governance: Management (IN12), Shareholders (IN13), Corporate Social Responsibility (IN14).

Table 2

Decision Alternatives

Rank	Banks	Code
1	Akbank	A1
2	Vakıflar Bankası	A2
3	Halk Bankası	A3
4	Türkiye İş Bankası	A4
5	Yapı ve Kredi Bankası	A5
6	Şekerbank	A6

Table 3

Assessment Criteria

Rank	Indicators	Code	Qualification
1	Share Closing Price	IN1	Max.
2	Market Value / Book Value	IN2	Max.
3	Market Risk (Beta)	IN3	Min.
4	Return on Equity	IN4	Max.
5	Resource Use	IN5	Max.
6	Emissions	IN6	Max.
7	Innovation	IN7	Max.
8	Workforce	IN8	Max.
9	Human Rights	IN9	Max.
10	Community	IN10	Max.
11	Product Responsibility	IN11	Max.
12	Management	IN12	Max.
13	Shareholders	IN13	Max.
14	Corporate Social Responsibility	IN14	Max.

5. FINDINGS OF THE RESEARCH

This section reports the empirical findings obtained from the integrated model proposed in the study. First, the importance weights of each performance indicator were calculated using the MPSI, one of the objective weighting techniques, and the results were comparatively evaluated. Subsequently, the ranking outcomes derived from the RAWEC procedure - used to determine the performance rankings of the banks for the year 2022 - are reported and discussed.

5.1. MPSI Procedure Results

The analysis process started with the determination of objective importance weights for the chosen performance indicators. In the first step of the MPSI procedure, the decision matrix was prepared based on Equation (1), as shown in Table 4.

Table 4
Decision Matrix

	IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8	IN9	IN10	IN11	IN12	IN13	IN14
A1	7.11	0.49	1.09	17.46	96.69	98.53	96.72	94.34	95.45	89.56	96.94	74.02	60.78	96.28
A2	3.86	0.28	1.2	10.84	94.16	94.58	55.33	95.18	95.45	99.39	98.96	28.92	77.94	90.43
A3	4.71	0.27	1.11	4.29	83.9	90.75	55.33	90.96	79.32	88.9	99.16	44.61	25.98	56.91
A4	3.11	0.36	1.10	17.54	99.79	99.3	96.72	99.39	95.45	99.11	99.75	43.63	60.78	81.38
A5	3.37	0.45	1.17	18.89	91.49	97.64	91.09	94.71	95.45	93.12	75.00	47.55	76.96	81.38
A6	1.15	0.65	1.29	13.82	67.72	70.85	55.33	74.58	95.45	26.26	61.19	32.84	53.43	81.38

The values associated with the performance assessment criteria were then normalized with the help of Equations (2) and (3), and the resulting normalized results are given in Table 5.

Table 5
Normalized Matrix

	IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8	IN9	IN10	IN11	IN12	IN13	IN14
A1	1.00	0.75	1.00	0.92	0.97	0.99	1.00	0.95	1.00	0.90	0.97	1.00	0.78	1.00
A2	0.54	0.43	0.91	0.57	0.94	0.95	0.57	0.96	1.00	1.00	0.99	0.39	1.00	0.94
A3	0.66	0.42	0.98	0.23	0.84	0.91	0.57	0.92	0.83	0.89	0.99	0.60	0.33	0.59
A4	0.44	0.55	0.99	0.93	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.59	0.78	0.85
A5	0.47	0.69	0.93	1.00	0.92	0.98	0.94	0.95	1.00	0.94	0.75	0.64	0.99	0.85
A6	0.16	1.00	0.84	0.73	0.68	0.71	0.57	0.75	1.00	0.26	0.61	0.44	0.69	0.85

At this step, the mean values of the performance indicators were first calculated based on Equation (4). Then, based on the calculated means, the coefficients of preference variation were determined for each indicator using Equation (5). The results of the preference variation coefficients are illustrated in Table 6.

Table 6
Preference Variation Matrix

	IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8	IN9	IN10	IN11	IN12	IN13	IN14
A1	0.21	0.01	0.00	0.04	0.01	0.00	0.05	0.00	0.00	0.00	0.01	0.15	0.00	0.02
A2	0.00	0.04	0.00	0.02	0.00	0.00	0.04	0.00	0.00	0.03	0.01	0.05	0.06	0.01
A3	0.01	0.05	0.00	0.25	0.00	0.00	0.04	0.00	0.02	0.00	0.01	0.00	0.18	0.06
A4	0.01	0.01	0.00	0.04	0.01	0.01	0.05	0.01	0.00	0.03	0.01	0.00	0.00	0.00
A5	0.01	0.00	0.00	0.07	0.00	0.00	0.03	0.00	0.00	0.01	0.02	0.00	0.05	0.00
A6	0.15	0.13	0.01	0.00	0.05	0.05	0.04	0.03	0.00	0.32	0.07	0.03	0.01	0.00

The objective weight values for each performance indicator were obtained by means of Equation (6). The MPSI weighting findings are display in Table 7.

Table 7
MPSI Results

	IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8	IN9	IN10	IN11	IN12	IN13	IN14
Σ	0.38	0.25	0.02	0.43	0.07	0.06	0.25	0.04	0.02	0.40	0.14	0.23	0.30	0.10
w_j	0.14	0.09	0.01	0.16	0.03	0.02	0.09	0.01	0.01	0.15	0.05	0.09	0.11	0.04
Sıra	3	6	14	1	10	11	5	12	13	2	8	7	4	9

The findings presented in Table 7 show that the most impactful indicators on the multidimensional sustainability performance of banks in 2022 were found to be IN4 (return on equity), IN10 (community), and IN1 (share closing price), respectively. Conversely, the three least impactful indicators were identified as IN3 (market risk - beta), IN9 (human rights), and IN8 (workforce).

5.2. RAWEC Procedure Results

Once the final importance weights had been determined, the RAWEC ranking algorithm was employed to comparatively assess the performance of the alternative banks based on these weights. In this context, the first step of the RAWEC procedure was to construct the initial matrix via Equation (1), as shown in Table 4. Then, the values in the decision matrix were normalized by applying Equation (7) for the beneficial criteria and Equation (8) for the non-beneficial criteria. The results of the normalization process are presented in Tables 8 and 9.

Table 8.

Benefit Normalization (v_{ij})

	IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8	IN9	IN10	IN11	IN12	IN13	IN14
A1	1.00	0.75	1.00	0.92	0.97	0.99	1.00	0.95	1.00	0.90	0.97	1.00	0.78	1.00
A2	0.54	0.43	0.91	0.57	0.94	0.95	0.57	0.96	1.00	1.00	0.99	0.39	1.00	0.94
A3	0.66	0.42	0.98	0.23	0.84	0.91	0.57	0.92	0.83	0.89	0.99	0.60	0.33	0.59
A4	0.44	0.55	0.99	0.93	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.59	0.78	0.85
A5	0.47	0.69	0.93	1.00	0.92	0.98	0.94	0.95	1.00	0.94	0.75	0.64	0.99	0.85
A6	0.16	1.00	0.84	0.73	0.68	0.71	0.57	0.75	1.00	0.26	0.61	0.44	0.69	0.85

Table 9

Cost Normalization (v'_{ij})

	IN1	IN2	IN3	IN4	IN5	IN6	IN7	IN8	IN9	IN10	IN11	IN12	IN13	IN14
A1	0.16	0.55	0.78	0.25	0.70	0.72	0.57	0.79	0.83	0.29	0.63	0.39	0.43	0.59
A2	0.30	0.96	0.70	0.40	0.72	0.75	1.00	0.78	0.83	0.26	0.62	1.00	0.33	0.63
A3	0.24	1.00	0.76	1.00	0.81	0.78	1.00	0.82	1.00	0.30	0.62	0.65	1.00	1.00
A4	0.37	0.75	0.77	0.24	0.68	0.71	0.57	0.75	0.83	0.26	0.61	0.66	0.43	0.70
A5	0.34	0.60	0.72	0.23	0.74	0.73	0.61	0.79	0.83	0.28	0.82	0.61	0.34	0.70
A6	1.00	0.42	0.66	0.31	1.00	1.00	1.00	1.00	0.83	1.00	1.00	0.88	0.49	0.70

In the final phase of the RAWEC methodology, the deviation scores derived from the importance weights of the evaluation criteria were computed using Equations (9) and (10). Subsequently, the overall performance values of each banking alternative were determined via Equation (11). A comparative summary of these results is presented in Table 10.

Table 10.

RAWEC Results

	n_{ij}	n'_{ij}	Ω_i	Rank
A1 (Akbank)	0,0771	0,5968	0,7712	1
A2 (Vakıfbank)	0,2851	0,4361	0,2095	4
A3 (Halkbank)	0,4140	0,2767	-0,1988	5
A4 (İşbank)	0,1991	0,5280	0,4524	3
A5 (Yapı ve Kredi)	0,1726	0,5452	0,5190	2
A6 (Şekerbank)	0,4399	0,2461	-0,2825	6

According to the multidimensional sustainability performance scores reported in Table 10, the best performing banks in 2022 were determined to be A1 (Akbank), A5 (Yapı ve Kredi), and A4 (İşbank), respectively. This result shows that these institutions had stronger and more balanced performance in environmental, social, and governance (ESG) dimensions compared to their competitors. On the other hand, the banks with the lowest performance scores were A6 (Şekerbank), A3 (Halkbank), and A2 (Vakıfbank), respectively. This result suggests that these banks had a relatively low performance in sustainability-oriented practices compared to other banks in the sample.

6. SENSITIVITY ANALYSES

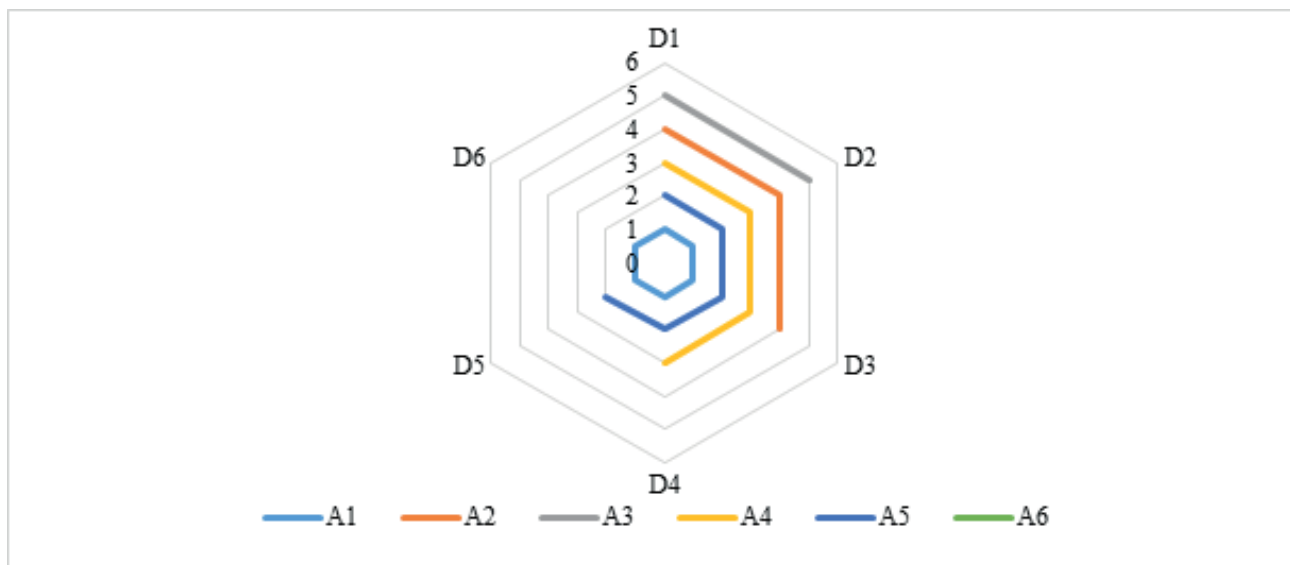
In order to assess the robustness and reliability of the proposed decision methodology for measuring the sustainability (ESG) performance of deposit banks, a number of sensitivity analyses are performed in this section. First, the phenomenon of rank reversal was investigated to identify the extent to which the ranking results are resilient to changes in the model parameters. In the second and final step of the sensitivity analysis, the effect of different weight scores of performance indicators on the ranking of alternatives was investigated.

6.1. Investigating the Impact of Rank Reversal on Ranking

As a first step in the sensitivity analysis, the effects of the rank reversal phenomenon, which is commonly discussed in the decision-making literature as a source of inconsistency, was assessed in relation to the model's ranking results (). To this end, the worst performing alternative was iteratively excluded from the model's analysis until only the best performing alternative remained, following the approach of Işık et al. (2025b). The results obtained under six different scenarios are shown in Figure 2. As Figure 2 shows, the phenomenon of rank reversal does not cause any change in the final rankings, demonstrating the internal consistency and stability of the proposed model.

Figure 2

Effect of Rank Reversal on Final Ranking



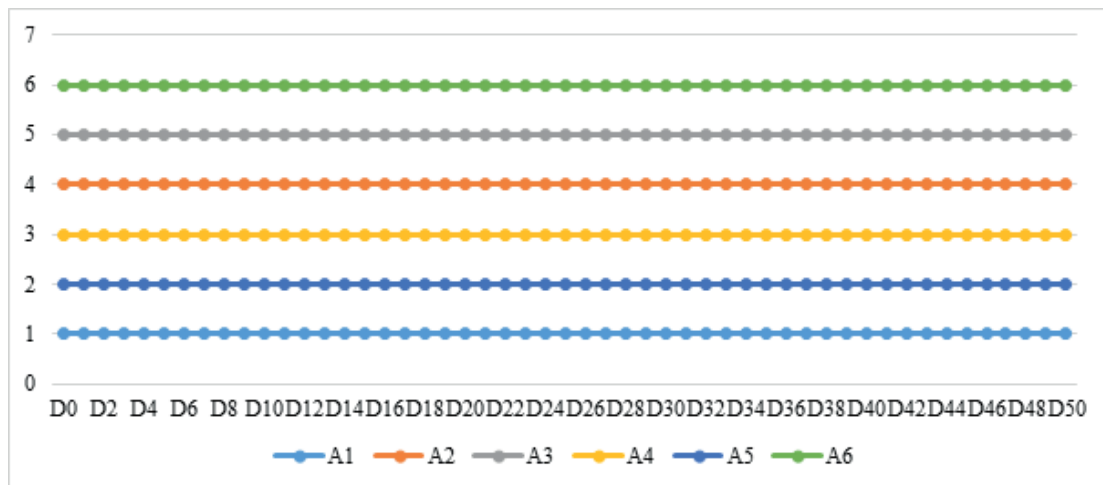
6.2. Assessment of the Impact of Weight Changes on the Ranking of Alternatives

Finally, to assess the sensitivity of the ranking results to marginal changes in the weights of the performance indicators, a scenario-based analysis consisting of 50 different scenarios was performed.

In each scenario, the most significant performance indicator (C4) was lowered by 5%. The 5% difference was then redistributed proportionally across the remaining indicators to generate a new set of weights. These revised weights were integrated into the RAWEC methodology to observe whether there were any changes in the rankings of the alternatives. The ranking results from this sensitivity assessment are shown in Figure 3. As can be seen from the figure, the variations in the weight coefficients did not result in any changes in the ranking of the alternatives, providing further confirmation of the robustness of the proposed model.

Figure 3

Impact of Weight Coefficient Variations on Final Ranking Results



7. THE THEORETICAL AND MANAGERIAL IMPLICATIONS BASED ON RAWEC AND MPSI RESULTS

7.1. Theoretical Implications

This study contributes to the theoretical advancement of sustainability performance evaluation by utilizing MCDM framework based on the MPSI and RAWEC methods to assess banks across both ESG and financial indicators. By identifying return on equity (IN4), community investment (IN10), and share price (IN1) as the most influential factors, the study challenges the conventional separation between financial and non-financial performance and promotes a more holistic, integrated understanding of sustainability in the banking sector. It presents a novel, data-driven perspective that frames sustainability not merely as an ethical or regulatory obligation but as a multidimensional construct that is inherently linked to profitability and market dynamics. Furthermore, the application of hybrid MCDM techniques enhances the methodological robustness and reproducibility of ESG performance assessments, offering valuable tools for future research in sustainable finance.

7.2. Managerial Implications

For bank managers and executives, the results have several actionable implications:

a) Top-performing banks (e.g., Akbank, Yapı ve Kredi) demonstrate that strong financial results combined with proactive social and governance practices lead to superior sustainability scores. Managers at these institutions should continue leveraging this balance as a competitive advantage in ESG-driven financial markets.

b) Lower-ranked banks (e.g., Şekerbank, Halkbank, and Vakıfbank) should interpret their rankings as a call to strengthen their ESG strategies, particularly in areas like workforce, human rights, and market risk management, which were among the least influential or poorly addressed.

c) The findings underscore the importance of embedding ESG principles into core strategic planning. Managers are encouraged to view ESG not as compliance or CSR activity, but as a source of long-term value creation.

d) Lastly, the objective weighting of indicators highlights which areas may yield the greatest returns on sustainability investments, helping managers allocate resources more efficiently.

8. CONCLUSION, DISCUSSION, AND RECOMMENDATIONS

The concept of sustainability goes beyond the traditional paradigm of profit maximization and emphasizes a long-term approach to value creation. In this context, striking a balance between the environmental impact, social and institutional responsibility and financial performance of the banking sector is critical to maintaining sector stability and fostering public trust. Evaluating multidimensional sustainability performance can help encourage banks to invest in environmentally friendly projects, support social development, and promote financial transparency and accountability. In addition, sustainable financial strategies - such as risk management, social impact monitoring and internal ethical practices - are essential components of ensuring long-term institutional success. These performance measures provide reliable insights to investors, regulators, and other stakeholders, and contribute to the achievement of sector-wide sustainability goals. Accordingly, this study introduces a novel integrated decision-making model to assess the multidimensional sustainability performance of the banking sector based on financial and non-financial ESG indicators. To test the applicability and effectiveness of the model, a real-time case analysis of six deposit-taking banks listed on BIST was conducted based on 2022 data. The proposed hybrid framework integrates the MPSI and RAWEC approaches. Within this framework, MPSI method used to calculate the weights of the chosen indicators, while RAWEC was applied to rank the banks based on their overall performance.

In the first stage of the evaluation, the results of the MPSI showed that return on equity, community, and closing stock price were the three most impactful indicators for bank performance in 2022. In contrast, market risk (beta), human rights, and workforce were identified as the lowest impacting indicators. These results, obtained from the MPSI algorithm, show that banks' institutional efficiency and their ability to optimize profitability structures have a crucial role in shaping multidimensional sustainability performance. Likewise, the high weight scores assigned to indicators such as community and stock closing price highlight the strategic importance of the relationship between social responsibility initiatives and market value. Meanwhile, the lowest weight scores were allocated to indicators such as market risk (beta) and workforce, indicating that these areas currently have a relatively limited impact on sustainability performance. This could mean that these dimensions are either not being managed effectively, or that their impact on performance is comparatively lower than that of other criteria. Therefore, greater strategic attention to these areas in the future may help banks achieve a more balanced and holistic sustainability framework.

In a second step, these weightings were integrated into the RAWEC methodology to determine the final performance scores of the banks. The results showed that Akbank emerged as the best performing bank in 2022, followed by Yapı ve Kredi, İşbank, Şekerbank, Halkbank and Vakıfbank, respectively. The ranking scores obtained through the RAWEC methodology provide important insights into the multidimensional sustainability performance of the banks assessed. The result that Akbank performed better than its competitors in 2022 indicates the bank's relative strength in reconciling financial profitability with ESG practices. The high rankings of Yapı ve Kredi and İşbank support the notion that a balanced and comprehensive sustainability strategy, encompassing both financial and nonfinancial dimensions, contributes significantly to institutional performance. In comparison, Şekerbank, Halkbank, and Vakıfbank ranked lowest, indicating potential gaps in the integration of

ESG principles into their strategic operations. These banks could take advantage of a more proactive and focused approach in areas such as environmental risk management, stakeholder engagement, and ESG disclosure practices. Lastly, the findings underscore the significance of institutional adaptability and long-term sustainability vision in maintaining competitive advantage in the evolving regulatory and market landscape of the banking industry.

In order to assess the robustness and consistency of the suggested model, a two-stage sensitivity analysis was implemented. This included an investigation of the rank reversal phenomenon, as well as an analysis of how marginal changes in the weights of the indicators affected the final rankings. The results of these investigations confirmed that the proposed decision framework is highly resilient to structural changes, reinforcing its potential as a reliable and stable tool for decision makers.

However, this research has some limitations. First, the analysis is limited to a small sample of banks listed on the BIST, which could limit the generalizability of the results to other financial institutions. Second, the performance assessment is limited to data from a single year-2022-which limits the ability to capture temporal dynamics or trends. Third, the methodological scope is limited to the integration of only two specific algorithms (MPSI and RAWEC). Future research could extend the current literature by considering different time periods, broader institutional or sectoral samples, alternative performance metrics, and diverse decision-making approaches to deepen the multidimensional understanding of sustainability performance in banking

REFERENCES

- Akbulut, O. Y. & Aydın, Y. (2024). A hybrid multidimensional performance measurement model using the MSD-MPSI-RAWEC model for Turkish Banks. *Journal of Mehmet Akif Ersoy University Economics and Administrative Sciences Faculty*, 11(3), 1157-1183.
- Akbulut, O. Y. (2024). Assessing the environmental sustainability performance of the banking sector: A novel integrated grey Multi-Criteria Decision-Making (MCDM) approach. *Int J. Knowl. Innov Stud*, 2(4), 239-258.
- Antunes, J., Hadi-Vencheh, A., Jamshidi, A., Tan, Y., & Wanke, P. (2024). Cost efficiency of Chinese banks: evidence from DEA and MLP-SSRP analysis. *Expert Systems with Applications*, 237, 121432.
- Avşarlıgil, N., Doğru, E., & Çiğner, A. (2023). The bank performance ranking in the emerging markets: A case of Turkey. *Sosyoekonomi*, 31(55), 69-84.
- Banu, A. R., & Santhiyavalli, G. A. (2019). TOPSIS approach to evaluate the financial performance of scheduled commercial banks in India. *International journal of economics and research*, 21(1), 24-33.
- Bayram, E. (2022). Türkiye'deki özel sermayeli bankaların finansal performans analizi: Swara ağırlıklı CODAS yöntemi. *Karamanoğlu Mehmetbey Üniversitesi Sosyal ve Ekonomik Araştırmalar Dergisi*, 24(43), 992-1004.
- Chaudhuri, T. D., & Ghosh, I. (2014). A multi-criteria decision making model-based approach for evaluation of the performance of commercial banks in India. *IUP Journal of Bank Management*, 13(3), 23.
- Durmuş, Z. (2025). Assessment of renewable energy performance in Turkey using a novel integrated MSD-CRITIC-RAWEC Model. *J. Oper. Strateg Anal.*, 3(1), 49-64.
- Fernando, G. D. (2021). Sustainability and financial institutions: Challenges and opportunities. *Journal of Sustainable Finance & Investment*, 11(2), 90-108.
- Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, 5(4), 210-233.
- Gazel, Y. H., Altınırmak, S., & Karamaşa, Ç. (2021). Türkiye'de faaliyet gösteren ticari bankaların çok kriterli karar verme yöntemlerine göre performanslarının sıralanması. *Sosyoekonomi*, 29(48), 161-180.
- Gligorić, M., Gligorić, Z., Lutovac, S., Negovanović, M., & Langović, Z. (2022). Novel hybrid MPSI-MARA decisionmaking model for support system selection in an underground mine. *Systems*, 10(6), 248.
- Goss, A., & Roberts, G. S. (2011). The impact of corporate social responsibility on the cost of bank loans. *Journal of Banking & Finance*, 35(7), 1794-1810.
- Guru, S., & Mahalik, D. K. (2021). Ranking the performance of Indian public sector bank using analytic hierarchy process and technique for order preference by similarity to an ideal solution. *International Journal*

of *Process Management and Benchmarking*, 11(1), 28-43.

Işık, Ö. (2020). SD tabanlı MABAC ve WASPAS Yöntemleriyle Kamu Sermayeli Kalkınma Ve Yatırım Bankalarının Performans Analizi. *Uluslararası İktisadi ve İdari İncelemeler Dergisi*, (29), 61-78.

Işık, Ö., Shabir, M., Demir, G., Puska, A., & Pamucar, D. (2025a). A hybrid framework for assessing Pakistani commercial bank performance using multi-criteria decision-making. *Financial Innovation*, 11(1), 38.

Işık, Ö., & Adalar, İ. (2025). A multi-criteria sustainability performance assessment based on the extended CRADIS method under intuitionistic fuzzy environment: a case study of Turkish non-life insurers. *Neural Computing and Applications*, 37(5), 3317-3342.

Işık, Ö., Çalık, A., & Shabir, M. (2025b). A consolidated MCDM framework for overall performance assessment of listed insurance companies based on ranking strategies. *Computational Economics*, 65(1), 271-312.

Işık, Ö. (2023). ESG activities and financial performance in banking industry. *International Journal of Insurance and Finance* 3(2), 53-64. <https://doi.org/10.52898/ijif.2023.10>.

İslatince, N. (2024). Financial performance comparison of private and foreign-capitalized deposit money banks in the Turkish banking sector for the period 2012-2022 with Gray Relation Analysis and Gray Relation Level and ranking. In *Obstetrics and Gynaecology Forum*, 34(2), 192-203

Jaradat, Q. M. (2022). Financial performance ranking of Islamic banks in Jordan employing Edas and Topsis methods. *Pearson Journal*, 7(19), 256-267.

Karadağ, M. M. (2025). An in-depth evaluation of the financial performance of Turkish Football Clubs using entropy-based RAWEC, FUCA, and SAW Methodologies. *Journal of Physical Education and Sport*, 25(3), 661-671.

Kotsantonis, S., Pinney, C., & Serafeim, G. (2016). ESG integration in investment management: Myths and realities. *Journal of Applied Corporate Finance*, 28(2), 10–16.

Lemonakis, C., & Strikos, I. (2012). Measurement of commercial banks performance in EU countries: a multi-criteria approach. *Financial services: efficiency and risk management*, 93-138.

Macit, N. Ş. (2024). Avrupa ve Orta Asya ülkelerinde BİT gelişmişlik düzeyinin entegre MPSI-RAPS yöntemi ile ölçülmesi. *Kafkas Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 15(29), 24-53.

Maniya, K., & Bhatt, M. G. (2010). A selection of material using A Novel Type Decision-Making Method: Preference Selection Index Method. *Materials & Design*, 31(4), 1785-1789.

Marjanović, I., & Popović, Ž. (2020). MCDM approach for assessment of financial performance of Serbian banks. In *Business Performance and Financial Institutions in Europe: Business Models and Value Creation Across European Industries*, 71-90.

Mastilo, Z., Štilić, A., Gligović, D., & Puška, A. (2024). Assessing the banking sector of Bosnia and Herzegovina: An analysis of financial indicators through the MEREC and MARCOS methods. *Journal of Central Banking Theory and Practice*, 13(1), 167-197.

Puşka, A., Štilić, A., Pamučar, D., Božanić, D., & Nedeljković, M. (2024). Introducing a Novel multi-criteria Ranking of Alternatives with Weights of Criterion (RAWEC) model. *MethodsX*, 102628.

Sandra, M., Narayanamoorthy, S., Suvitha, K., Pamucar, D., Simic, V., & Kang, D. (2025). An insightful multicriteria model for the selection of drilling technique for heat extraction from geothermal reservoirs using a fuzzy-rough approach. *Information Sciences*, 686, 121353.

Scholtens, B. (2006). Finance as a driver of corporate social responsibility. *Journal of Business Ethics*, 68(1), 19–33.

Sullivan, R. & Mackenzie, C. (2017). Responsible investment: Guide to ESG data providers and relevant trends. *Journal of Environmental Investing*, 8(1), 57–72.

Şişman, M. E., & Çankaya, S. (2021). Çevresel, sosyal ve kurumsal yönetim (ESG) verilerinin firmaların finansal performansına etkisi: Hava yolu sektörü üzerine bir çalışma. *Çukurova Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 25(1), 73-91.

Torres, P. S., Gomes, C. F. S., & Santos, M. D. (2024). Selection of unmanned aerial vehicle systems for border monitoring using the MPSI-SPOTIS method. *Journal of Defense Analytics and Logistics*, 8(1), 80-104.

Weber, O., Hoque, S. F., & Islam, M. A. (2015). Incorporating environmental criteria into credit risk management in Bangladeshi banks. *Journal of Sustainable Finance & Investment*, 5(1–2), 1–15.

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