Chapter 5

Do ESG Risk Ratings Affect Financial Performance? Evidence from Selected BIST Banking Sector Companies with LODECI and CRADIS Methods

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Abstract

The purpose of this study is to evaluate the impact of Environmental, Social and Governance (ESG) risk ratings on the financial performance of selected banks in the Borsa Istanbul (BIST) Banking Sector Index based on 2023 by using LODECI and CRADIS hybrid Multi-Criteria Decision Making (MCDM) model. The LODECI method, used for criterion weighting in the study, is a technique that objectively determines the importance levels of criteria while integrating the perspectives of two fundamental approaches; Entropy and MEREC methods. It also creates acceptable and robust weight vectors. The performance rankings of the companies are determined using the CRADIS method, which constructs utility functions based on ideal and anti-ideal values. In determining the financial performance rankings of the banks included in the analysis, a scoring is first conducted based on financial ratios and ESG risk ratings, and then the scores are recalculated excluding ESG risk ratings from the analysis. The scores calculated for both cases are compared, and it has been determined that including ESG risk ratings in the analysis causes differences in performance scores and rankings. In the performance ranking conducted with ESG risk ratings included, GARAN, AKBNK, and YKBNK are in the top three, while HALKB, VAKBN, and

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QNBFB are in the bottom three. In the performance ranking conducted with ESG risk ratings excluded, GARAN, SKBNK, and AKBNK are in the top three, while HALKB, VAKBN, and ISCTR are in the bottom three. Considering the scores and rankings of the CRADIS method, it has been observed that, in general, banks with lower ESG risk ratings have higher financial performance rankings, while those with higher ESG risk ratings have lower rankings. These results provide significant evidence regarding the impact of ESG risks on the Turkish banking system. The motivation behind this research stems from the very limited studies on the effect of ESG risk on the performance of banks listed on BIST, and it is believed that this research makes a valuable contribution to the literature in this field.

1. Introduction

As in most developing countries, the banking sector dominates the financial system in Türkiye (Özcan, 2021). In this context, the success or failure of the banking sector quickly reflects on the real sector, thus creating a significant impact on the country's economy (Kandemir & Demirel Arıcı, 2013). Measuring the performance of banks, which are key players in the financial system, and thus determining their position within the sector, is of strategic importance for both stakeholders in the sector and the country's economy in managing processes (Tezergil, 2016). A bank's stakeholders consist of its customers, managers, employees, partners, investors, competitors, and government institutions. Therefore, a wide audience is affected by the performance exhibited by banks (Onocak, 2024).

Robust and widely accepted financial indicators are needed to measure financial performance. For this purpose, financial ratios derived from financial statements are crucial resources. In financial analysis, comparing companies with one another reveals their level of competitiveness. Therefore, conducting the analysis on a sectoral basis is of great importance (Atukalp, 2019).

In recent years, financial crises and accounting scandals have caused stakeholders to question the quality of financial reporting, and the use of solely financial ratios for performance evaluation has begun to be seen as insufficient (Çalışkan & Eren, 2016; Şeker & Şengür, 2022). At this point, companies have started to provide environmental, social, and corporate governance disclosures to eliminate distrust (Şeker & Şengür, 2022). Banks, which play significant roles in the national economy, have not remained unaffected by these developments due to their responsibilities and influenced by past experiences, have increasingly focused on ESG activities (Onocak, 2024).

According to stakeholder theory, based on Freeman's (1984) work, ESG suggests that companies have an ethical responsibility to maximize the value of all their stakeholders (customers, debtors, employees, and regulatory authorities). The resource-based view also asserts that ESG activities can be seen as strategic investments, helping companies gain a competitive advantage by acquiring additional skills that are difficult to replicate. Thus, improvements in ESG within companies can lead to superior financial performance (Azmi et al., 2021). Furthermore, companies' social performance efforts contribute significantly to protecting stocks, providing a buffer against negative market reactions, and enhancing marketable brand image and reputation. On the other hand, companies with strong ESG performance tend to exhibit more stability in stock prices and achieve consistent profitability (Godfrey, 2005; Nagy et al., 2016). In recent years, due to increased demand from investors for sustainable products and regulatory pressures, banks have been required to consider ESG risks within their risk management frameworks (Nizamuddin et al., 2024). ESG risk encompasses potential threats arising from environmental, social and governance factors that can affect a company's sustainability and financial performance. As companies increasingly integrate ESG considerations into their decision-making processes, understanding these risks has become crucial for long-term sustainability (Gorzeń-Mitka, 2023). The impact of ESG risks on financial performance is increasingly recognised as companies face both challenges and opportunities. Effective management of these risks can lead to improved financial results and resilience. ESG factors can significantly impact companies' debt and liquidity risks by influencing the critical roles of corporate governance (Peliu, 2024). Particularly under stable economic conditions, improved ESG practices have been associated with higher stock valuations, emphasizing the importance of governance (Zhou, 2024). Additionally, companies that prioritize ESG factors tend to be more resilient to market fluctuations and exhibit more stable financial performance in the long term. In terms of ESG risk management strategies, integrating ESG criteria into decision-making processes can help reduce risks and uncover new opportunities (Pavani, 2024). Moreover, strong ESG performance, especially in privately-owned companies, has the potential to alleviate financing constraints by improving financial outcomes (Shang, 2024).

In this context, the main objective of this study is to examine the impact of ESG risk ratings on the financial performance of selected banks listed in the BIST Banking Sector Index using MCDM methods. Although many studies have explored the relationship between ESG investments and

financial outcomes in companies, there is a notable gap in the literature regarding the impact of ESG risk on the performance of banks listed on Borsa Istanbul.

In this regard, evaluating companies with similar objectives based on specific criteria is most effectively conducted using MCDM. The MCDM methodology is a widely used and continuously evolving framework in decision-making (Pala et al., 2024). In this study, two new and robust MCDM techniques have been employed. While financial ratios used as criteria were weighted using LODECI (Logarithmic Decomposition of Criteria Importance), the financial performances of the firms were ranked using CRADIS (Compromise Ranking of Alternatives from Distance to Ideal Solution). Within this framework, a CRADIS analysis was first conducted using financial ratios and ESG risk ratings, and then repeated with ESG risk ratings excluded, focusing solely on financial ratios. The performance rankings of the banks were determined for both scenarios and compared.

The second section of the study provides a review of the relevant literature, while the third section explains the methodology used in the study. In the fourth section, the empirical findings obtained from the study are presented. Following the fourth section, the results and policy recommendations are discussed.

2. Literature Review

In the national and international literature, a summary of the few studies focused on ESG scores and ESG risk ratings in the banking sector is provided.

In the study by Ahmed and Rahman (2014), a revised credit risk rating model was proposed for the banking lending process in Bangladesh by incorporating environmental, social, and governance (ESG) risk factors. It was found that banks are still in the developmental stage of integrating ESG factors into credit risk management, but regulatory bodies overseeing the banking sector exhibit a positive attitude toward such integration.

In Ng's (2016) study, the impact of countries' ESG performance and macroeconomic factors on banks' ESG scores was examined. The study assessed the relationship between the size, liquidity, founding year, market power of 251 banks from 45 different countries during the period 2005-2014 and their ESG performance using panel data analysis. The findings revealed that, at the macro level, countries' ESG scores were positively related to banks' environmental and social sustainability indicators, but not to any governance indicators. Furthermore, the study found that banks in countries

with higher economic freedom tended to focus more on ESG, while this tendency was weak among banks in developing countries, particularly during financial crises, which reduced banks' focus on ESG.

Ahmed et al. (2019) examined the contribution of the implementation of regulatory policy guidelines related to sustainability initiatives to financial performance. The study used data from 30 private commercial banks in Bangladesh, comparing the period between 2012 and 2018. By calculating ESG scores and correlating them with financial performance through regression analysis, the study found that the overall sustainability performance of banks increased by 33% from 2012 to 2018. Furthermore, it was determined that policy guideline initiatives had a positive impact on bank sustainability.

Di Tommaso and Thornton (2020) examined the impact of ESG scores on risk-taking behaviour and bank value in a sample of European banks. They found that high ESG scores are associated with a moderate reduction in risk-taking for both high- and low-risk banks, and that this effect depends on the characteristics of the board of directors. Despite the positive indirect link between ESG scores and bank value, the decrease in bank value increases the impact of ESG scores on risk-taking.

Citterio and King (2023) aimed to determine the relationship between the non-financial performance of banks and their risk levels using data from 362 commercial banks operating in the United States (US) and the European Union (EU) for the period 2012-2019. The research findings concluded that social sustainability, one of the components of ESG, has a risk-reducing effect on banks. Additionally, the study revealed that non-financial performance has predictive power over bank risk.

In the study by Ishizaka et al. (2021), which aimed to cluster the performance evaluation of U.S. banks based on a series of financial and non-financial (environmental, social, and governance) criteria, it was found that domestically owned banks generally ranked among the best-performing clusters.

In their study, Reig-Mullor and Brotons-Martinez (2021) used the CAMELS components as financial criteria and ESG indicators as non-financial criteria for six commercial banks operating in Spain during the 2015-2017 period. According to the Fuzzy AHP and TOPSIS methods, the performance ranking of the banks was determined, with Banco de Santander ranked first and Banco Sabadell ranked last.

Şimşek and Çankaya (2021) examined the relationship between the ESG scores and financial performance of all banks listed on stock exchanges in G8 countries. Return on assets (ROA) and return on equity (ROE) were used as measures of financial performance in the study. Additionally, the ESG scores of the banks were used separately as independent variables. In the study, which employed panel data analysis, it was found that both ROA and ROE had a negative and significant relationship with the environmental score, while the social score had a positive and significant relationship. However, the governance score was found to have no statistically significant relationship with either profitability ratio.

Çetenak et al. (2022) examined the impact of ESG scores on the financial performance of deposit banks operating in Türkiye. In the study, which applied panel data analysis for the period 2010-2020, it was found that the banks' total ESG score, as well as their social and governance scores, positively influenced accounting- and market-based performance indicators (ROA and Tobin's Q). However, the environmental score was found to have no statistically significant effect on either indicator.

In their study, Packin and Nippani (2022) explored the role of banks operating in the U.S. in advancing the government's fiscal policy and social agenda, focusing on ethics in banking and the recent rise of ESG objectives. The study suggests that the interests of banks aiming to maximize shareholder wealth alone may not be sufficient to align successfully with the government's social policy goals. Additionally, the study comments that even if banks choose to advance certain ESG-based goals, they are likely to do so while pursuing their own strategic objectives. Without clear standards and laws, efforts to accelerate ESG-based operations are likely to be non-transparent, ambiguous, and primarily public relations efforts that do not genuinely reflect their actual commercial interests and practices.

Bernardelli et al. (2022) examined the determinants of the ESG ratings of the world's largest 60 banks and how closely these ratings are related to their actual credit and investment risks. The results of the research, which used logistic regression methods, show that an increase in the Sustainable Development Index (SDI) corresponds to a lower probability of being assigned to the high-risk ESG group and a higher probability of being assigned to the low or medium-risk ESG group.

Yeh et al. (2022) measured the efficiency of Taiwanese banks through the perspective of banking integrity, environment, social, ESG, and Fintech using Network Data Envelopment Analysis (DEA). The results indicate that the main reason for differences in bank efficiency stems from the governance

and innovation stages. Banks affiliated with financial holding companies are more efficient at every stage compared to independent banks. The overall efficiency of public banks is lower than that of privately-owned banks, especially due to low efficiency scores in the innovation stage.

In their study, Niedziółka et al. (2023) examined the impact of cultural differences and credit ratings on the ESG scores of commercial banks using regression analysis. Based on data from 330 banks across 50 countries, the study found that the region with the highest ESG risk assigned to banks was the Arab countries, while the regions with the lowest ESG risk were Western Europe and Scandinavian countries. Furthermore, an increase in the average credit rating reduces the likelihood of a bank being classified as having high or medium ESG risk compared to low ESG risk.

Osuji (2023) examined the relationship between ESG strategies and corporate financial performance using data from 226 global banks in the context of firm size. The results of the moderated multiple regression analysis indicated that ESG risk scores and firm size were significant in explaining the variations in corporate financial performance.

Siklósi (2023) analyzed the ESG disclosures of international commercial banks in Hungary based on data from annual reports published between 2019 and 2022. The results indicate that the quality of ESG disclosures by international commercial banks in Hungary has, on average, improved from 2019 to 2022.

In his study, Bolibok (2024) aims to systematize and develop the theoretical foundations of the relationship between firm size and ESG risk in banks, highlighting its potential non-linear nature, and empirically investigate it within the international banking sector. This research uses both univariate and multivariate, linear and non-linear regression analyses applied to a sample of 668 banks with Morningstar Sustainalytics ESG Risk Ratings assigned for the year 2021. The results suggest that, although firm size appears to be negatively related to ESG risk on average, the relationship is non-linear and follows a U-shape.

Pyka and Nocoń (2024) examined the changes in ESG risk management in the Polish banking sector. The research findings confirm the adopted hypothesis, showing that the awareness and knowledge of ESG risk in commercial banks in Poland have increased, which is reflected in practical activities related to bank risk management systems. The study demonstrates that Polish banks are increasingly aware of ESG risk and the need to incorporate this risk into their risk management processes.

Onocak (2024) examined the impact of non-financial criteria, such as ESG, on the performance of six deposit banks operating in Türkiye using the CAMELS method. In the analysis, in addition to the CAMELS components as performance criteria, the banks' ESG score components were also used. The weights of the components used as performance criteria were determined according to the Entropy method. When determining the performance ranking of the banks included in the analysis, a scoring was first done based on the CAMELS component values, and then the ESG component values were included in the analysis, and the scores were recalculated. The scores calculated for both cases were compared, and it was found that including the ESG components in the analysis led to differences in the banks' performance scores and changed the performance rankings of Akbank and Garanti BBVA for the years 2019 and 2022.

Nizamuddin et al. (2024) examined how ESG risk scores affect the financial performance of banks in India. The study evaluates financial performance using metrics such as return on assets (ROA), return on capital employed (ROCE), and return on equity (ROE), while also considering factors like size (the logarithm of total assets) and leverage (Debt/Equity) as financial risk indicators. Data from 25 public and private banks for the years 2021-2022 were analysed cross-sectionally. To investigate how ESG risk affects the financial performance of Indian banks, Ordinary Least Squares (OLS) regression was used. The findings suggest that ESG risk scores have a negative impact on the overall financial performance of the banks.

When examining the literature using the LODECI method, it is observed that it has been used in a very limited scope. Pala (2024a) for assessing social progress in the European Union; Pala (2024b) for evaluating social discrimination in OECD countries; Yalçın et al. (2024) for commercial insurance selection; and Pala et al. (2024) for analysing the financial performance of the cement industry. As a result, since the LODECI method is newly introduced in the literature, only a few studies have utilized it. On the other hand, when looking at the literature related to CRADIS, many studies are evident. Puška et al. (2022b) used it for green supplier selection in agriculture under uncertain conditions; Starčević et al. (2022) for evaluating the impact of foreign direct investment on the sustainability of the economic system; Dordevic et al. (2022) for production optimization; Krishankumar and Ecer (2023) for selecting IoT service providers for sustainable transportation; Puška et al. (2023) for case study selection of electric vehicles; Ulutaş et al. (2023) for environmental impact and energy use in production; Keleş (2023) for evaluating livable power center cities in

G7 countries and Türkiye; Xu et al. (2023) for assessing sustainable mountain tourism; Wang et al. (2023) for risk assessment in the energy sector; Altıntaş (2023) for analyzing the welfare performance of G7 countries; Taşçı (2024) for performance evaluation of the Natural Disaster Insurance Institution in Türkiye; Kanmaz (2024) for electric vehicle selection; and Asker (2024) for evaluating the impact of the COVID-19 pandemic on the participation banking sector.

3. Method

This study, which aims to identify the impact of non-financial ESG risk ratings on the performance of banks, employs the CRADIS method for performance analysis. In the analysis, both financial ratios and the banks' ESG risk ratings are used as performance criteria. The weights of the criteria in the analysis of financial ratios and ESG risk ratings are determined using the LODECI method. The research question of this study is defined as: "Does the inclusion of ESG risk ratings in the performance analysis of banks affect the performance ranking?" In this context, first, the CRADIS analysis was conducted using only financial ratios, and then ESG risk ratings were also included in the analysis. The performance ranking of the banks was determined and compared for both cases. In this context, during the methodology phase, the LODECI and then the CRADIS methods are detailed.

3.1. LODECI Method

Pala (2024a) proposed the LODECI method as an approach that reconciles Hwang and Yoon's (1981) Entropy method with the MEREC (Method Based on the Removal Effects of Criteria) method introduced by Keshavarz-Ghorabaee et al. (2021). The method is based on the distances, or divergences, between the alternative scores for each criterion.

The maximum normalization approach proposed for the decision matrix $X=\|x_{ij}\|_{(nxm)}$ in MCDM problems can be applied for LODECI as shown in Equations 1 and 2.

$$a_{ij} = \frac{x_{ij}}{x_j^{max}} \quad \textit{for utility-orientated criteria} \tag{1}$$

$$a_{ij} = 1 - \frac{x_{ij}}{x_j^{max}} \text{ , for cost-orientated criteria} \quad (2)$$

The Divergence Value (DV) is calculated using a_{ij} as shown in Equation 3.

$$DV_{ij} = max \left\{ \left| a_{ij} - a_{rj} \right| \right\} r \neq i,\ r = 1,2,\ldots,n \quad (3)$$

The Logarithmic Divergence Value (LDV) for each criterion is calculated as shown in Equation 4.

$$LDV_j = ln\left(1 + \frac{\sum_{i=1}^{n} DV_{ij}}{n} \right) \quad (4)$$

The importance levels of the criteria, w_j, are obtained according to Equation 5.

$$w_j = \frac{LDV_j}{\sum_{j=1}^{m} LDV_j} . \quad (5)$$

3.2. CRADIS Method

The CRADIS (Compromise Ranking of Alternatives from Distance to Ideal Solution) approach proposed by Puška et al. (2022a) has emerged as a combination of commonly used methods in MCDM problems. The implementation stages of the CRADIS approach can be expressed as follows:

The normalization process for the decision matrix $C=\|c_{ij}\|_{(nxm)}$ is carried out using Equations 6 and 7.

$$x_{ij} = \frac{c_{ij}}{c_j^{max}} \text{ , for utility-orientated criteria} \quad (6)$$

$$x_{ij} = \frac{c_j^{min}}{c_{ij}} \text{ ,for cost-orientated criteria} \quad (7)$$

The weighted decision matrix is calculated using Equation 8.

$$v_{ij} = x_{ij} * w_j \quad (8)$$

The ideal and anti-ideal values for the entire decision matrix are found as shown in Equations 9 and 10.

$$t_i = max\left(v_{ij}\right) \tag{9}$$

$$t_{ai} = min\left(v_{ij}\right) \tag{10}$$

The distances from the ideal and anti-ideal solutions are calculated as shown in Equations 11 and 12.

$$d^+ = t_i - v_{ij} \tag{11}$$

$$d^- = v_{ij} - t_{ai} \tag{12}$$

The deviations of the alternatives from the ideal and anti-ideal solutions are calculated as shown in Equations 13 and 14.

$$s_i^+ = \sum_{j=1}^{m} d^+ \tag{13}$$

.

$$s_i^- = \sum_{j=1}^{m} d^- \tag{14}$$

n Equations 15-16, the notations s_0^+ and s_0^- are used to represent the sum of the minimum deviations from the ideal values for each criterion and the sum of the maximum deviations from the anti-ideal values for each criterion, respectively. These are used to calculate the utility values for the alternatives.

$$K_i^+ = \frac{s_0^+}{s_i^+} \tag{15}$$

$$K_i^- = \frac{s_i^-}{s_0^-} \tag{16}$$

.

The final ranking is calculated as shown in Equation 17, with the alternative having the highest Qi value being ranked first.

$$Q_i = \frac{K_i^+ + K_i^-}{2} \tag{17}$$

Findings

The study uses data from 8 deposit banks listed in the BIST Banking Index for the year 2023, for which financial ratios and ESG risk ratings were available during this period. The list of the banks included in the study is presented in Table 1.

Table 1. Selected Banks Included in the Study

Rank	Stock Code	Company Name
1	AKBNK	Akbank T. A. Ş.
2	QNBFB	QNB Finansbank A. Ş.
3	SKBNK	Şekerbank T. A. Ş.
4	GARAN	Türkiye Garanti Bankası A. Ş.
5	HALKB	Türkiye Halk Bankası A. Ş.
6	ISCTR	Türkiye İş Bankası A. Ş.
7	VAKBN	Türkiye Vakıflar Bankası T. A. O.
8	YKBNK	Yapı ve Kredi Bankası A.Ş.

In the study, 8 financial ratios reflecting capital structure, income-expense structure, liquidity, and profitability are used, based on the literature. A financial ratio is a comparison between elements of financial statements that reflects a financial health indicator at a specific point in time. Ratios are a mathematical relationship that explains one amount in terms of another or compares one amount to another. Many ratios can be used to assess the financial performance of banks (Ak et al., 2024). The ratios used in this study are among the significant ratios identified through the literature review (Aydogan & Geoffrey Booth, 1996; Akbulut & Albayrak, 2009; Ata, 2009; Demireli, 2010; Uçkun & Girginer, 2011; Bağcı & Rençber, 2014; Çalışkan & Eren, 2016; Kandemir & Karataş, 2016; Şişman & Doğan, 2016; Tezergil, 2016; Özkan, 2017; Yamaltdinova, 2017). In terms of research on the banking sector in the literature, the financial ratios used in this study, ESG risk ratings, and optimization aspects are presented in Table 2.

Table 2. Evaluation Criteria for Selected Banks

Ratio Type	**Ratio**	**Code**	**Optimization**
Capital Structure	Capital Adequacy Ratio	C1	+
	Equity/ Total Assets	C2	+
Income and Expenditure Structure	Total Revenues/Total Expenses	I1	+
	Interest Income/ Interest Expense	I2	+
Liquidity Ratios	Liquid Assets/ Short Term Liabilities	L1	+
	Liquid Assets / Total Assets	L2	+
Profitability Ratios	Net Profit/ Equity	P1	+
	Net Profit / Total Assets	P2	+
ESG Risk	-	E1	-

The Capital Adequacy Ratio (C1), which is based on balancing banks' equity with the risks they undertake and ensuring their continuity, is an important ratio for the safe sustainability of the banking sector (Hazar et al., 2017). The Equity/Total Assets ratio (C2) indicates how much of the assets are covered by equity, while also reflecting how unexpected losses will be covered, demonstrating capital adequacy that ensures the bank's general safety and soundness (Almazari, 2013; Sarıtaş et al., 2016). The difference between a bank's interest income and interest expenses is a crucial issue for analysis. The Interest Income/Interest Expenses ratio (I1) is preferred to be high for banks. The Income-Expense ratio, obtained by comparing total income to total expenses, is used for benchmarking while reviewing the bank's overall efficiency (Almazari, 2013; Dao & Nguyen, 2020). The Liquid Assets/Short-Term Liabilities ratio (L1) shows whether a bank's total liquid assets are sufficient to meet short-term debt obligations. The higher the Liquid Assets/Total Assets (L2) ratio, the better the bank's liquidity, as it means the bank has more liquid assets within its total assets (Tran et al., 2019). The Net Profit/Equity (P1) ratio shows the profit per unit of capital provided by the bank's owners and shareholders. A high value of this ratio indicates better performance for the bank (Sebayang, 2020). The Net Profit/Total Assets (P2) ratio is a profitability indicator that determines the effective use of a bank's assets. This ratio, which shows how much profit is made per unit of asset, allows the comparison of profitability among banks operating in the industry (Ekinci & Poyraz, 2019; Tezergil, 2016). Sustainalytics' ESG risk ratings assess how companies manage environmental, social, and governance risks, which directly affect their valuations and cash flows. These ratings help investors understand the impact of these factors on financial performance and long-term sustainability. Furthermore, they provide a key tool for decision-making in responsible investment, financial

product development, and sustainability-focused portfolio management by determining risk levels that vary from negligible to serious across various sectors globally (Puente De La Vega Caceres, 2024).

In the study, the financial ratios used were obtained from the Türkiye Bankalar Birliği (TBB) (TBB, 2024). Additionally, ESG risk ratings were sourced from Sustainalytics and integrated into the financial performance analysis (Sustainalytics, 2024). The financial data obtained from TBB and the ESG risk ratings from Sustainalytics correspond to the most up-to-date year, 2023, ensuring temporal alignment in the data used for the study.

Using Microsoft Excel, the LODECI and CRADIS analyses were initially conducted by including ESG risk ratings for the 8 financial ratios, and then again without including them. The results obtained were compared to determine whether the ESG risk ratings influence the financial performance of banks. Table 3 presents the decision matrix consisting of the banks' financial ratios and ESG risk ratings.

Table 3. Decision Matrix

Company	**C1**	**C2**	**I1**	**I2**	**L1**	**L2**	**P1**	**P2**	**E1**
AKBNK	21.922	11.804	158.287	140.465	36.578	19.132	36.447	4.642	14.800
QNBFB	16.656	8.263	159.498	139.617	35.142	18.741	52.703	4.174	28.000
SKBNK	27.221	9.345	175.659	194.021	43.649	23.612	39.771	3.382	27.100
GARAN	20.573	12.683	183.900	153.791	37.702	22.404	43.942	5.667	24.000
HALKB	14.260	5.849	109.769	115.699	19.548	13.190	9.266	0.564	22.500
ISCTR	21.595	10.914	143.722	143.158	36.346	23.097	31.476	3.742	18.100
VAKBN	15.091	6.130	131.796	119.909	30.549	18.530	17.992	1.119	18.600
YKBNK	20.284	10.287	165.397	149.892	30.253	16.730	44.580	4.778	14.800

The normalized decision matrix obtained for LODECI using Equations 1 and 2 is calculated as shown in Table 4.

Tablo 4. LODECI Normalized Decision Matrix

Company	**C1**	**C2**	**I1**	**I2**	**L1**	**L2**	**P1**	**P2**	**E1**
AKBNK	0.805	0.931	0.861	0.724	0.838	0.810	0.692	0.819	0.471
QNBFB	0.612	0.651	0.867	0.720	0.805	0.794	1.000	0.737	0.000
SKBNK	1.000	0.737	0.955	1.000	1.000	1.000	0.755	0.597	0.032
GARAN	0.756	1.000	1.000	0.793	0.864	0.949	0.834	1.000	0.143
HALKB	0.524	0.461	0.597	0.596	0.448	0.559	0.176	0.099	0.196
ISCTR	0.793	0.860	0.782	0.738	0.833	0.978	0.597	0.660	0.354
VAKBN	0.554	0.483	0.717	0.618	0.700	0.785	0.341	0.197	0.336
YKBNK	0.745	0.811	0.899	0.773	0.693	0.709	0.846	0.843	0.471

The DV matrix and LDV values calculated using Equations 3 and 4 are given in Table 5. According to this, the highest differentiation is achieved by P2 (Net Profit / Total Assets). The lowest level of differentiation is achieved by I2 (Interest Income / Interest Expense).

Table 5. LODECI, DV Matrix and LDV Values

Company	C1	C2	I1	I2	L1	L2	P1	P2	E1
AKBNK	0.281	0.470	0.264	0.276	0.390	0.252	0.516	0.720	0.471
QNBFB	0.388	0.349	0.270	0.280	0.357	0.235	0.824	0.637	0.471
SKBNK	0.476	0.276	0.358	0.404	0.552	0.441	0.579	0.497	0.439
GARAN	0.244	0.539	0.403	0.207	0.416	0.390	0.658	0.901	0.329
HALKB	0.476	0.539	0.403	0.404	0.552	0.441	0.824	0.901	0.275
ISCTR	0.269	0.399	0.218	0.262	0.385	0.420	0.421	0.561	0.354
VAKBN	0.446	0.517	0.283	0.382	0.300	0.226	0.659	0.803	0.336
YKBNK	0.255	0.350	0.302	0.227	0.307	0.291	0.670	0.744	0.471
LDV	0.303	0.357	0.272	0.266	0.342	0.291	0.497	0.542	0.332

Table 6 shows the calculated criterion importance levels using Equation 5. In both analyses, with and without the inclusion of ESG risk ratings, the most important criterion was P2 (Net Profit / Total Assets), while the criterion with the lowest importance weight was I2 (Interest Income / Interest Expense).

Table 6. LODECI Criteria Importance Levels

w_j Value	C1	C2	I1	I2	L1	L2	P1	P2	E1
Including ESG Risk	0.095	0.112	0.085	0.083	0.107	0.091	0.155	0.169	0.104
Excluding ESG Risk	0.106	0.124	0.095	0.093	0.119	0.101	0.173	0.189	-

In the study, the performance ranking of companies was carried out based on the CRADIS method. Using the data from Table 3, the CRADIS normalized decision matrix was calculated according to Equations 6 and 7, and it was obtained as shown in Table 7.

Table 7. CRADIS Normalised Decision Matrix

Company	C1	C2	I1	I2	L1	L2	P1	P2	E1
AKBNK	0.805	0.931	0.861	0.724	0.838	0.810	0.692	0.819	1.000
QNBFB	0.612	0.651	0.867	0.720	0.805	0.794	1.000	0.737	0.529
SKBNK	1.000	0.737	0.955	1.000	1.000	1.000	0.755	0.597	0.546
GARAN	0.756	1.000	1.000	0.793	0.864	0.949	0.834	1.000	0.617
HALKB	0.524	0.461	0.597	0.596	0.448	0.559	0.176	0.099	0.658
ISCTR	0.793	0.860	0.782	0.738	0.833	0.978	0.597	0.660	0.818
VAKBN	0.554	0.483	0.717	0.618	0.700	0.785	0.341	0.197	0.796
YKBNK	0.745	0.811	0.899	0.773	0.693	0.709	0.846	0.843	1.000

The normalized decision vector has been weighted according to Equation 8 and is presented in Table 8.

Table 8. CRADIS Weighted Decision Matrix

Company	C1	C2	I1	I2	L1	L2	P1	P2	E1
AKBNK	0.076	0.104	0.073	0.060	0.089	0.073	0.107	0.139	0.104
QNBFB	0.058	0.073	0.074	0.060	0.086	0.072	0.155	0.125	0.055
SKBNK	0.095	0.082	0.081	0.083	0.107	0.091	0.117	0.101	0.057
GARAN	0.072	0.112	0.085	0.066	0.092	0.086	0.129	0.169	0.064
HALKB	0.050	0.051	0.051	0.050	0.048	0.051	0.027	0.017	0.068
ISCTR	0.075	0.096	0.066	0.061	0.089	0.089	0.093	0.112	0.085
VAKBN	0.053	0.054	0.061	0.051	0.075	0.071	0.053	0.033	0.082
YKBNK	0.071	0.091	0.076	0.064	0.074	0.064	0.131	0.143	0.104

The deviations from the ideal and anti-ideal solutions, as well as the utility values obtained using CRADIS, are calculated as shown in Table 9. GARAN, which performs relatively well in both deviations from the anti-ideal and the ideal, has demonstrated better performance than other companies in both K_i^+ and K_i^- values. On the other hand, HALKB has the worst performance in both parameters, lagging.

Table 9. CRADIS Deviations from Ideal and Anti-Ideal Solutions and Utility Values

Company	s_i^+	s_i^-	K_i^+	K_i^-
AKBNK	0.698	0.674	0.751	0.795
QNBFB	0.768	0.605	0.683	0.713
SKBNK	0.711	0.662	0.738	0.780
GARAN	0.649	0.723	0.807	0.853
HALKB	1.112	0.260	0.471	0.307
ISCTR	0.759	0.614	0.691	0.724
VAKBN	0.991	0.382	0.529	0.450
YKBNK	0.707	0.666	0.742	0.785

The final CRADIS rankings and scores for the selected deposit banks in the BIST banking sector, both including and excluding ESG risk ratings, are shown in Table 10.

Tablo 10. CRADIS Performance Scores and Rankings with and without ESG Risk Ratings

	Including ESG Risk		**Except ESG Risk**	
Company	**Score**	**Rank**	**Score**	**Rank**
AKBNK	0.773	2	0.748	3
QNBFB	0.698	6	0.724	5
SKBNK	0.759	4	0.792	2
GARAN	0.830	1	0.865	1
HALKB	0.389	8	0.364	8
ISCTR	0.708	5	0.699	6
VAKBN	0.490	7	0.461	7
YKBNK	0.763	3	0.738	4

In the performance ranking with ESG risk ratings included, the top three positions are occupied by GARAN, AKBNK, and YKBNK, while the bottom three positions are held by HALKB, VAKBN, and QNBFB. In the performance ranking excluding ESG risk ratings, the top three positions are occupied by GARAN, SKBNK, and AKBNK, while the bottom three positions are held by HALKB, VAKBN, and ISCTR.

In the analysis including ESG risk ratings, GARAN, which ranked first in both analyses, had a CRADIS score of 0.865 in the analysis excluding ESG risk ratings, which decreased to 0.830 in the analysis including ESG risk ratings. Despite GARAN's rank remaining unchanged in both analyses, the decline in the CRADIS score could be attributed to the fact that, while all its financial ratios are high compared to the sector, its ESG risk rating (24.00) is relatively high.

SKBNK, which ranked second in the analysis excluding ESG risk ratings, had a CRADIS score of 0.792, but in the analysis including ESG risk ratings, its rank dropped to fourth, and its CRADIS score fell to 0.759. This decrease in SKBNK's rank and CRADIS score in the analysis including ESG risk ratings could be due to its relatively high ESG risk rating (27.10).

AKBNK, which ranked third in the analysis excluding ESG risk ratings, had a CRADIS score of 0.748, but in the analysis including ESG risk ratings, its rank rose to second, and its CRADIS score increased to 0.773. The rise in AKBNK's rank and CRADIS score in the analysis including ESG risk ratings could be attributed to its relatively low ESG risk rating (14.80).

YKBNK, which ranked fourth in the analysis excluding ESG risk ratings, had a CRADIS score of 0.738, but in the analysis including ESG risk ratings,

its rank rose to third, and its CRADIS score increased to 0.763. The rise in YKBNK's rank and CRADIS score in the analysis including ESG risk ratings could be attributed to its relatively low ESG risk rating (14.80).

QNBFB, which ranked fifth in the analysis excluding ESG risk ratings, had a CRADIS score of 0.724, but in the analysis including ESG risk ratings, its rank dropped to sixth, and its CRADIS score decreased to 0.698. This drop in QNBFB's rank and CRADIS score in the analysis including ESG risk ratings could be due to its relatively high ESG risk rating (28.00).

ISCTR, which ranked sixth in the analysis excluding ESG risk ratings, had a CRADIS score of 0.699, but in the analysis including ESG risk ratings, its rank rose to fifth, and its CRADIS score increased to 0.708. The rise in ISCTR's rank and CRADIS score in the analysis including ESG risk ratings could be attributed to its relatively low ESG risk rating (18.10).

VAKBN, which ranked seventh in both analyses, had a CRADIS score of 0.461 in the analysis excluding ESG risk ratings, which increased to 0.490 in the analysis including ESG risk ratings. Despite VAKBN's rank remaining unchanged in both analyses, the increase in its CRADIS score could be due to its relatively low ESG risk rating (16.60).

HALKB, which ranked last in both analyses, had a CRADIS score of 0.364 in the analysis excluding ESG risk ratings, which increased to 0.389 in the analysis including ESG risk ratings. Despite HALKB's rank remaining unchanged in both analyses, the increase in its CRADIS score could be due to its relatively low ESG risk rating (22.50).

In the analysis including ESG risk ratings, while GARAN's rank remained unchanged, its CRADIS score decreased. This could be attributed to GARAN's relatively high ESG risk rating (24.00). On the other hand, VAKBN and HALKB's CRADIS scores increased, despite their ranks remaining unchanged, possibly due to their relatively low ESG risk ratings (18.60 and 22.50, respectively). Furthermore, AKBNK, YKBNK, and ISCTR showed an improvement in both their performance ranks and CRADIS scores, likely due to AKBNK and YKBNK's lowest ESG risk ratings (14.8) and ISCTR's relatively low ESG risk rating (18.10). Conversely, SKBNK and QNBFB saw declines in both their performance ranks and CRADIS scores, which could be attributed to their highest ESG risk ratings (28.00 and 27.10, respectively). In this context, it is observed that banks with lower ESG risks had higher CRADIS scores, while those with higher ESG risks experienced a decline in their CRADIS scores.

5. Conclusions and Discussion

Within the scope of the purpose of the study, the research question was determined as "Does the inclusion of ESG risk ratings in the performance analysis of banks affect the performance ranking?". In the study, MCDM techniques were used to analyse the effect of ESG risk ratings of companies in the BIST Banking sector on financial performance. LODECI technique, which objectively determines the importance levels of the criteria and integrates the perspectives of two basic approaches, Entropy and MEREC methods, and at the same time creates acceptable and robust weight vectors, was used. The performance ranking of the companies was carried out with CRADIS, which has utility functions created according to ideal and anti-ideal values.

In the analysis conducted, in addition to financial ratios, the banks' ESG risk ratings were also used as performance criteria. When determining the financial performance ranking of the included banks, first, a scoring was done based on financial ratios and ESG risk ratings. Then, the ESG risk ratings were excluded from the analysis, and the scores were recalculated. The scores calculated for both scenarios were compared, and it was determined that including ESG risk ratings in the analysis led to differences in the performance scores and rankings.

In the performance ranking conducted with the inclusion of ESG risk ratings, the top three positions were held by GARAN, AKBNK, and YKBNK, while the bottom three positions were held by HALKB, VAKBN, and QNBFB. In the performance ranking conducted without including ESG risk ratings, the top three positions were held by GARAN, SKBNK, and AKBNK, while the bottom three positions were held by HALKB, VAKBN, and ISCTR. In the analysis with the inclusion of ESG risk ratings, it was observed that QNBFB's rank dropped from five to six, and SKBNK's rank dropped from two to four. It was found that companies with low ESG risk ratings improved their financial performance rankings, while those with high ESG risk ratings experienced a decline in their rankings. This finding shows that lower ESG risk ratings are effective in improving financial performance and is supported by the studies of Di Tommaso and Thornton (2020), Çetenak et al. (2022), and Onocak (2024).

This study, with a specific focus on Türkiye, makes a significant contribution to the existing literature by investigating the impact of ESG risks on the banking sector in emerging economies. The insights gained from this research could provide a valuable foundation for researchers to explore similar aspects of ESG risks in other developing countries that are

showing significant progress. Through empirical analysis, the study enhances the understanding of whether ESG factors contribute to improved financial performance, particularly in banking sectors of emerging economies like Türkiye. Furthermore, the study identifies the primary ESG risks that significantly influence the financial success of banks in Türkiye. The results unmistakably show that ESG risks have a distinctly negative impact on the financial performance of the banking sector in Türkiye.

To support these findings, future research is encouraged to conduct more comprehensive analyses. This could involve expanding the sample size, exploring alternative measures of profitability and performance, and employing advanced research methodologies. Such studies would contribute to the literature on ESG risk and bank performance, particularly in the context of Türkiye. The results of this study have policy implications not only for managers in the corporate sector but also for government officials, emphasizing the importance of cautious investment practices and decision-making in ESG projects. By integrating ESG factors into corporate operations, organizations can position themselves for enhanced long-term financial performance.

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