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Analysis of financial performance of deposit banks in Turkey using multi-criteria decision-making methods

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Abstract. Financial performance analysis in the banking sector aims to determine the capacity for data-driven decision making. This study evaluates the financial performance of public and private deposit banks in Türkiye. In the study, we used the entropy method to determine performance weights. Then, we used the VIKOR technique, which integrates the entropy method with multi-criteria decision making. This integrated approach evaluates banks according to key dimensions such as profitability, liquidity, asset quality, and capital adequacy. We conducted the study on a sample of three public and eight private deposit banks

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operating in Türkiye. The data covers financial ratios starting from 2022. The findings show that two public banks have high financial performance, while publicly owned deposit banks have stronger financial performance than their privately owned counterparts. The findings provide valuable insights into the Turkish banking sector's financial stability and competitive positioning. The results of the study can guide bank managers and regulatory authorities.

Keywords: financial performance, MCDM, Deposit Bank, entropy, VIKOR method

JEL Classification: C13, G17, G21

1. INTRODUCTION

Financial performance is a key indicator for assessing the effectiveness and sustainability of an organization within the dynamics of a competitive market. Performance evaluation measures the extent to which strategic objectives are achieved and provides critical perspectives on a firm's position in its industry. A comprehensive financial performance analysis requires an integrated understanding of accounting principles, industry-specific conditions, and broader macroeconomic influences. Such analyses systematically examine financial statements and key ratios to assess a firm's profitability, liquidity, solvency, and operational efficiency. Monitoring these indicators over multiple periods facilitates the identification of structural trends and potential weaknesses. To ensure sound financial planning, obtaining accurate, timely, and complete information about a firm's current economic situation is imperative.

Multi-criteria decision-making (MCDM) methods are widely used in the banking sector because they combine various financial indicators and produce comparative performance assessments. As financial markets become increasingly interconnected and complex due to globalization and the proliferation of investment instruments, the challenge of making informed investment decisions and accurately assessing risk is intensifying. Especially in times of uncertainty, rational decision-making tools such as MCDM are critical for investors and analysts. The recent increase in competition due to globalization is crucial for effective cost control and profit maximization. In this process, banks play an important role in facilitating these goals by providing loans under favorable conditions, enabling firms to access investment capital and increase their market competitiveness. At the same time, banks increasingly integrate environmental and social governance criteria into their credit assessment processes, thus aligning their operations with sustainable finance principles (Streimikiene et al., 2024).

Given the dynamic nature of financial environments, performance evaluations also serve as a basis for shaping future policy decisions. Macroeconomic developments, especially monetary policy decisions, have profoundly affected bank profitability and stability. In 2022, the Central Bank of the Republic of Turkey adopted an expansionary monetary policy stance by keeping interest rates constant at 14% in the year's first half despite high inflation rates and then reducing them to 9% in the second half. This has resulted in a highly negative real interest rate that may have significantly affected bank operations and risk profiles. These conditions provide a unique opportunity to examine how monetary policy shapes the financial performance of both public and private banks.

This study limits the focus of the study to 2022, as comprehensive data for 2023 was not available at the time of the study. The assessment is based on a comparative analysis of public and private deposit banks to understand how domestic financial dynamics and macroeconomic indicators affect performance in that year. The Entropy method was used to assign objective weights to financial ratios, while the VIKOR method was applied to rank banks according to their overall performance. This study provides valuable insights for regulatory authorities, sector stakeholders, and financial analysts by identifying which institutions perform

better under certain economic conditions. In addition, the findings can guide underperforming banks by indicating key performance indicators associated with more successful institutions. As a result, the study contributes to understanding the development trajectory of the Turkish banking sector and its broader implications for national economic stability. The study's central hypothesis suggests that public deposit banks exhibit stronger financial performance than their private counterparts. The main question of the research is: What is the economic performance of public and private deposit banks operating in Türkiye?

2. CONCEPTUAL FRAMEWORK AND RELATED LITERATURE

Commercial or deposit banks play a pivotal role in modern economies by mobilizing financial resources and allocating capital efficiently across sectors. These institutions operate by accepting deposits from the public and extending credit to individuals and businesses on their behalf. Through this intermediation process, they channel savings into investments, stimulating economic growth, supporting entrepreneurial activity, and enhancing financial stability (Ojaghlou & Tercan, 2024). The clientele of these banks is diverse, encompassing individual consumers as well as micro, small, medium-sized, and large-scale enterprises. In catering to these segments, banks offer a suite of financial products, including checking and savings accounts, certificates of deposit, personal and corporate loans, and investment services. The economic performance of deposit banks is a critical metric that reflects their overall health and operational soundness. It encompasses the institution's ability to generate sustainable profits, manage risk, maintain liquidity, and deliver value to a range of stakeholders, including shareholders, creditors, investors, and regulators (Ergün & Köse, 2015; Demir, 2022; Larsson et al., 2021; Rahi et al., 2021). In this context, performance evaluation is not solely about profitability but includes broader considerations such as solvency, efficiency, resilience, and risk-adjusted returns.

Banks function not only as financial intermediaries but also as institutional pillars supporting macroeconomic stability. They facilitate the circulation of capital, influence monetary policy transmission, and contribute to employment generation. Their operational continuity is thus vital during periods of economic volatility. In developing economies, deposit banks provide critical credit facilities that ensure agricultural, commercial, and industrial resilience during financial turbulence (Akber & Dey, 2020; Sözcü et al., 2009; Singh & Milan, 2023). Therefore, ensuring banks maintain strong capital bases and robust risk management systems is essential for systemic stability. Given the central role of banks in economic ecosystems, it becomes imperative to assess their financial condition through well-established evaluation frameworks. Following the 2001 financial crisis in Turkey, sweeping reforms were introduced, with regulatory frameworks aligned to the Basel I principles. These frameworks aimed to bolster banks' capital adequacy and address deficiencies in supervision and governance. Subsequent refinements under Basel II (2008–2013) expanded the scope of regulatory oversight by classifying banking risks into three categories: credit risk, market risk, and operational risk. With the advent of Basel III, the regulatory focus further evolved to strengthen liquidity coverage, improve capital quality, and enhance stress-testing mechanisms (Erdoğan, 2014; Gržeta et al., 2023; Güngör & Engin, 2023).

These frameworks fortify the banking system's resilience against global and regional shocks. However, evaluating whether these regulatory upgrades have translated into tangible improvements in bank performance necessitates rigorous empirical analysis. Financial performance evaluation helps identify vulnerabilities, track operational progress, and benchmark institutional competitiveness. A sound evaluation system is also crucial for preempting crises and shaping proactive regulatory interventions. Traditionally, financial performance has been assessed using ratio analysis, which examines relationships among key financial metrics. Ratios such as gross profit margin, operating margin, net profit margin, current ratio, quick ratio, and debt-equity ratio are used to understand liquidity, profitability, leverage, and operational efficiency

(Iç et al., 2022; Sözcü et al., 2009; Dash, 2017; Guru & Mahalik, 2019; Ic et al., 2021; Roman & Şargu, 2013; Rozzani & Rahman, 2013). In addition, cash flow management, equity positioning, and turnover indicators such as inventory and receivables turnover provide deeper insights into a bank's capacity to meet its obligations and generate value over time.

While such ratios are instrumental in gauging financial stability, relying solely on them may not offer a comprehensive view of bank performance. This is especially true in complex and dynamic financial environments, where multiple factors interact simultaneously. In this context, Multi-Criteria Decision-Making (MCDM) methods have gained popularity as they allow for the simultaneous evaluation of multiple performance dimensions (Remeikienė et al., 2022; Brodny & Tutak, 2023). These approaches provide an integrated assessment by incorporating various financial and non-financial indicators into a structured decision framework. Indicators such as Return on Assets (ROA), Return on Equity (ROE), gross profit margin, and debt ratios serve as key inputs in MCDM-based evaluations (Abdel-Basset et al., 2020; Akber & Dey, 2020). These metrics reflect the ability of banks to create shareholder value, fulfill debt obligations, and maintain operational efficiency. Moreover, by bridging the supply and demand sides of financial markets, well-performing banks play a crucial role in aligning capital with productive investments. This alignment, in turn, catalyzes economic activity, supports employment, and reduces market inefficiencies (Abdelmoneim & Yasser, 2023; Abduh & Azmi Omar, 2012; Abdelmoneim & Mekidiche, 2020).

Among the structured models widely adopted for performance measurement are the CAMELS framework—Capital adequacy, Asset quality, Management efficiency, Earnings performance, Liquidity, and Sensitivity to market risk. First introduced in the U.S. in the 1980s and applied extensively since the 1990s, the CAMELS system provides a robust, standardized tool to assess financial institutions' health (Jaouad & Lahsen, 2018; Abdelmoneim & Yasser, 2023; Gavurova et al., 2017; Roman & Lahsen, 2018; Shargu, 2013; Rozzani & Rahman, 2013; Singh & Milan, 2023). It evaluates not only quantitative performance outcomes but also qualitative managerial aspects. Given its comprehensive nature, central banks, supervisory agencies, and credit rating institutions have preferred the CAMELS method for institutional rating and oversight. Many empirical studies have adopted the CAMELS framework to evaluate banks across geographies and timeframes. Scholars have used this method to assess profitability trends, asset risk, managerial quality, and sensitivity to macroeconomic variables (Gilbert et al., 2000; Roman & Şargu, 2013; Sah & Pokharel, 2023; Akhtar et al., 2023; Ayadurai & Eskandari, 2018; Baral, 2005; Bastian et al., 2016; Keffala, 2021). CAMELS provides absolute and relative performance assessments, making it suitable for cross-institutional comparisons and time-series evaluations.

As of December 2023, 34 deposit banks were operating in Turkey (BRSA, 2023). The period following 2020 has been incredibly challenging for Turkish banks due to macroeconomic uncertainties, currency volatility, and unconventional monetary policies. These developments have also spilled over into other sectors, amplifying the importance of a resilient and transparent banking system (Akkoc & Vatansever, 2013; Gavurova et al., 2017). The phrase "what cannot be measured, cannot be managed" gains renewed relevance within this context. Given the intangible nature of banking products - unlike the tangible output of industrial firms - quantifying efficiency and performance in banking requires advanced tools and methodologies (Akkoc & Vatansever, 2013; Kosmidou & Zopounidis, 2008). MCDM methods offer a solution to this challenge. These techniques evaluate multiple performance criteria simultaneously, assign appropriate weights to each, and generate composite scores that can be used for ranking and classification. Unlike traditional ratio analysis, which focuses on isolated indicators, MCDM techniques allow for holistic performance profiling (Gavurova et al., 2017). Entropy-based and distance-based methods such as TOPSIS, AHP, EDAS, PIV, and VIKOR have recently expanded in the banking sector to provide nuanced performance insights.

Numerous studies have applied MCDM frameworks to analyze the Turkish banking sector (Aydın, 2020a, 2020b; B. Erdoğan, 2022a, 2022b; Bayyurt, 2013; Ezin & Samırkaş, 2022; Korkmaz & Wolff, 2022; Seyfi-Shishavan et al., 2021; Sözcü et al., 2009; Ulas & Keskin, 2015). For instance, Seçme et al. (2009) examined Turkey's five largest commercial banks using financial and non-financial performance indicators, identifying Ziraat Bank as the top performer. Ulas and Keskin (2015) found that state-owned banks exhibited more substantial efficiency during 2005–2013, particularly after the 2008 global financial crisis. They suggested that public banks were better shielded from shocks due to their solid financial structures. The COVID-19 pandemic introduced new dynamics into the financial ecosystem, altering consumer behavior and increasing demand for secure investments such as gold. These shifts influenced bank performance, particularly for institutions relying on traditional retail banking services (Seyfi-Shishavan et al., 2021). Moreover, the performance outcomes of banks with foreign ownership structures have also been analyzed, with evidence suggesting that such institutions often outperform domestic private banks in profitability and operational resilience (Bayyurt, 2013).

Studies exploring bank behavior during crises emphasize the role of capital in ensuring institutional continuity and competitive positioning (Berger & Bouwman, 2013). Bhimjee et al. (2016) highlighted the contagion effects following the global financial crisis, while Kao and Lui (2004) demonstrated the predictive power of Data Envelopment Analysis (DEA) in anticipating the performance of troubled banks in Taiwan. Comparative analyses of state-owned and private banks yield mixed findings, often contingent on the methodologies and periods under review. For example, Ezin & Samırkaş (2022) applied the TOPSIS method to assess bank performance between 2015 and 2020, finding that public banks underperformed relative to private ones post-2018. Similarly, Erdoğan (2022a, 2022b) employed AHP, SD, PIV, and EDAS methods to analyze performance during the COVID-19 period and observed instability in public bank performance. Korkmaz and Wolff (2022) conducted a decade-long analysis using TOPSIS, identifying strong performance in public banks from 2011 to 2016, with foreign-owned banks dominating thereafter. Aydın (2020a) found that Garanti Bank consistently ranked among the top performers among foreign banks between 2016 and 2019. Despite these extensive studies, a gap remains in the literature concerning using the VIKOR method to assess the impact of monetary policy - particularly interest rate decisions - on bank performance. The present research aims to fill this gap by applying the Entropy-VIKOR model to evaluate and compare public and private banks in Turkey under the Central Bank's low-interest-rate policy in 2022.

3. MATERIAL AND METHODOLOGY

Although different methods measure financial performance, they are commonly used in the literature as a multicriteria decision-making (MCMD) method. Methods such as AHP, ANP, DEMATEL, TOPSIS, VIKOR, PROMETHEE, ELECTRE, COPRAS, GİA, MOORA, WASPAS are used (Saldanlı & Sırma, 2014). The rationale for using multi-criteria decision-making methods is the performance ranking of banks, using selected ratios and determined weights. This study used 10 financial ratios from 11 banks as samples for the analysis. The sample is considered sufficient considering the 72% asset size of the 11 banks in the Turkish banking system. When banking studies are examined, the validity of the analysis increases based on the selection of financial ratios used in the literature. The rationale for year selection in this study is to measure the performance of banks in the relevant period by considering the fragile period.

This study used the Entropy method to determine the criterion weights. Entropy is a method in which criteria weights are objectively determined. Regarding MCMD, Entropy's essential operation and purpose is to apply critical weighting to alternatives. This method, which allows objective weighting between criteria, is frequently preferred in the literature because it has a sensitive measurement (Ayçin & Orçun, 2017; Ayçin

& Orçun, 2019). The Entropy method has five stages (Karami & Johansson, 2014; Wang & Lee, 2009; Zhang et al., 2011), as shown in the following equations:

Stage 1: The values to be assigned the criterion weight in the study are expressed with the decision matrix, and the decision matrix is denoted as:

$$D.M. = \begin{bmatrix} X_{11} & \cdots & X_{1n} \\ \vdots & \ddots & \vdots \\ X_{m1} & \cdots & X_{mn} \end{bmatrix} \quad (1)$$

Stage 2*: The values in the decision matrix are normalized as in equation 2, and the normalization process is carried out to standardize the unit of measurement.*

$$P_{ij} = {X_{ij}}\Big/{\sum_{i=1}^{m} X_{ij}} \quad (2)$$

Stage 3: In the next stage, the formula used to obtain Entropy values for the criteria and the formula developed to obtain the Entropy coefficient (k) are shown in equations 3 and 4.

$$k = 1/\ln(m) \quad (3)$$

$$e_j = -k.\sum_{j=1}^{m} p_{ij}.\ln(p_{ij}) \quad (4)$$

Stage 4: The d_j values used to calculate the criteria weights are obtained with Equation 5.

$$d_j = 1 - e_j \quad (5)$$

Stage 5: In the last stage of the Entropy method, criterion weights are calculated. Criterion weights are expressed as w_j, and their sum equals 1.

$$w_j = {d_j}\Big/{\sum_{j=1}^{n} d_j} \quad (6)$$

After determining the After-criterion weights using the Entropy method, VIKOR, an MCMD method, was applied. VIKOR is a multi-criteria decision-making (MCDM) technique that ranks and selects alternatives based on multiple criteria. The VIKOR method (VIseKriterijumsa Optimizacija I Kompromisno Resenje) is used. It is possible to determine the method applied by Opricovic and Tzeng by determining cost and benefit criteria (Oprivic & Tzeng, 2004, 2007). This method is preferred because of its understandable systematics, being based on group benefits, and allowing compromise between alternatives (Aktepe & Ersöz, 2014). VIKOR is especially useful when decision-makers seek a compromise solution that balances conflicting criteria. VIKOR technique consists of determining the evaluation criteria, normalizing the criteria, assigning weights, creating a decision matrix, and calculating the S-closeness coefficient, ranking, and selection, as shown below (Safari et al., 2016; Gul, 2018).

Stage 1: The first stage of the VIKOR method is the creation of the decision matrix. The decision matrix creation step is shown in Equation 1.

Stage 2: The best and worst values for the criteria are selected. This choice is made separately according to the type of benefit and cost.

⇒ For benefit criteria:

$$f_i^* = \max_j (X_{ij}) \quad (7)$$

$$f_i^- = \min_j (X_{ij}) \quad (8)$$

⇒ For cost criteria:

$$f_i^* = \min_j (X_{ij}) \quad (9)$$

$$f_i^- = \max_j (X_{ij}) \quad (10)$$

Stage 3: The decision matrix is normalized, and a standard structure is created. The normalization process is calculated with the help of Equation 11.

$$r_{ij} = (f_j^* - X_{ij}) / (f_j^* - f_j^-) \quad (11)$$

Stage 4: After the normalization process is completed, the values in the normalized decision matrix are multiplied by the criterion weights. Criterion weights are values determined by the Entropy method.

$$v_{ij} = r_{ij} \times w_j \quad (12)$$

Stage 5: In the fifth stage of the method, S_i and R_i values are calculated. S_i values are calculated with the help of Equation 13 and R_i values are calculated with the help of Equation 14.

$$S_i = \sum_{j=1}^{n} w_j \times (f_j^* - X_{ij}) / (f_j^* - f_j^-) \quad (13)$$

$$R_i = \max_j (w_j \times (f_j^* - X_{ij}) / (f_j^* - f_j^-)) \quad (14)$$

Stage 6: The Q_i value is calculated for each alternative. Calculations of Q_i and S^*, S^-, $R^*$and R^- values are shown with equations.

$$S^* = \min (S_i) \quad (15)$$

$$S^- = \max (S_i) \quad (16)$$

$$R^* = \min (R_i) \quad (17)$$

$$R^- = \max (R_i) \quad (18)$$

$$Q_i = q \times (S_i - S^*)/(S^- - S^*) + (1 - q) \times (R_i - R^*)/(R^- - R^*) \quad (19)$$

The q parameter in Equation 19 expresses the group benefit. This parameter is between 0 and 1. It takes the value 0, 0.25, 0.50, 0.75 and "1".

Stage 7: In the last stage of the method, sorting is performed according to Qi values. First, the conditions were checked by calculating the Qi values, and the ranking was performed according to the criteria that met the conditions. In the VIKOR method, the minimum criterion is considered the best choice and the following conditions must be met:

Condition 1: The 1st and second criteria are determined by listing the Q1 values from smallest to largest. The smallest value is denoted as A1, and the second smallest value is denoted as A2. The criteria that must satisfy the first condition must satisfy the equality in Equation 20.

$$Q(A^2) - Q(A^1) \geq DQ \quad (20)$$

$$DQ = 1 / (m-1) \quad (21)$$

Condition 2: The criterion with the best Q value must be the best alternative in at least one of the S and R alternatives. If the conditions are met, the criterion with the smallest Q_1 value is considered the best alternative.

4. ANALYSIS AND FINDINGS

The research used data from 11 banks in 2022 and analyzed them using Entropy and VIKOR methods. The 11 banks used in the sample are included in the public capital deposit bank and private capital deposit bank groups. The sample was formed by considering the grouping of the Turkish Banks Association. These banks have significant weight in terms of assets and deposit size. Regarding asset size, 11 banks had 71.9% weight in the sector. The total deposit weight was 77.5%. Since the relevant ratios and types of banks are the same, 11 banks were included in the sample. In addition, the relevant banks realized the distinction between public and private capital. From the analysis using the financial ratios in Table 2, we determined that the performance of public capital deposit banks was better. When financial performance was evaluated, three state-owned banks ranked first, second, and fifth among 11. In this case, the research question was answered by determining whether public capital deposit banks' financial performance is better than private capital deposit banks. The samples and codes used in this study are presented in Table 1.

Table 1

Banks in the Sample

Bank Name	**Code**
Türkiye Cumhuriyeti Ziraat Bankası A.Ş.	B1
Türkiye Halk Bankası A.Ş.	B2
Türkiye Vakıflar Bankası T.A.O.	B3
Akbank T.A.Ş.	B4
Anadolubank A.Ş.	B5
Fibabanka A.Ş.	B6
Şekerbank T.A.Ş.	B7
Turkish Bank A.Ş.	B8
Türk Ekonomi Bankası A.Ş.	B9
Türkiye İş Bankası A.Ş.	B10
Yapı ve Kredi Bankası A.Ş.	B11

Source: (The Banks Association of Turkey, 2023)

In selecting financial ratios, a financial ratio was taken from each of the ten main groups in the Banks Association of Turkey, and a comprehensive analysis was carried out. The benefit-cost criteria that are characteristic of the VIKOR method are listed in Table 2.

Table 2

Financial Ratios Used in the Study

No	Groups	Financial Ratio	Type	Kod
1	Capital Adequacy	Capital Adequacy Ratio	Benefit	F1
2	Balance Sheet Structure	Total Deposits / Total Assets	Benefit	F2
3	Asset Quality	Non-Performing Receivables / Total Loans	Cost	F3
4	Liquidity	Liquid Assets / Total Assets	Benefit	F4
5	Profitability	Average Return on Equity	Benefit	F5
6	Income-Expense Structure	Interest Income / Interest Expenses	Benefit	F6
7	Sector Shares	Total Assets	Benefit	F7
8	Group Shares	Total Deposits	Benefit	F8
9	Branch Ratios	Net Profit per Branch	Benefit	F9
10	Activity Ratios	Net Operating Profit (Loss) / Total Assets	Benefit	F10

Source: The Banks Association of Turkey, 2023

Table 2 uses ten financial ratios for financial performance measurement. In the first analysis stage, the Entropy method determined the criteria weights. The decision matrix that represents the first stage of the Entropy method is presented in Table 3.

Table 3

Decision Matrix

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
B1	16,5	75,2	1,1	16,9	27,4	222,5	17,6	20,6	23	2,6
B2	14,7	76,2	2,2	11,9	22,1	179,6	10,6	12,6	14	1,4
B3	15,2	67,1	2,1	18,4	30,2	186,9	12,8	13,4	25	2,2
B4	24,6	63,2	3,0	14,9	52,3	250,9	8,2	8,1	84	7,1
B5	22,4	77,3	3,6	24,8	33,9	154,3	0,3	0,4	17	5,6
B6	19,4	63,2	1,7	25,8	60,3	151,9	0,6	0,6	61	4,6
B7	20,7	74,0	3,9	18,4	39,1	216,4	0,5	0,6	6	2,9
B8	19,2	73,6	4,7	47,8	10,3	169,5	0,0	0,0	4	1,1
B9	18,6	72,8	1,8	22,0	57,4	232,4	2,1	2,4	25	5,4
B10	24,4	66,1	3,0	15,8	44,2	255,9	10,7	11,0	54	3,7
B11	21,3	60,7	3,4	15,6	55,6	250,3	8,4	8,0	66	5,9

Source: own calculation

Table 3 includes the financial ratios of the 11 banks. After the decision matrix was created, the data were normalized. The normalized decision matrix is listed in Table 4.

Table 4

Normalized Decision Matrix

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
B1	0,07617	0,09777	0,03544	0,07286	0,06335	0,09800	0,24511	0,26604	0,06150	0,06227
B2	0,06772	0,09903	0,07228	0,05138	0,05110	0,07910	0,14761	0,16228	0,03740	0,03401
B3	0,06997	0,08717	0,06963	0,07927	0,06979	0,08230	0,17825	0,17249	0,06659	0,05207
B4	0,11335	0,08210	0,09883	0,06430	0,12077	0,11050	0,11400	0,10391	0,22212	0,16653
B5	0,10314	0,10050	0,11764	0,10660	0,07838	0,06794	0,00417	0,00465	0,04354	0,13157
B6	0,08944	0,08217	0,05514	0,11115	0,13922	0,06691	0,00786	0,00717	0,15974	0,10787
B7	0,09546	0,09611	0,12873	0,07916	0,09032	0,09531	0,00671	0,00715	0,01661	0,06849
B8	0,08845	0,09570	0,15548	0,20582	0,02385	0,07466	0,00031	0,00033	0,01037	0,02475
B9	0,08571	0,09464	0,05760	0,09451	0,13267	0,10237	0,02917	0,03065	0,06572	0,12710
B10	0,11227	0,08591	0,09685	0,06784	0,10216	0,11268	0,14933	0,14242	0,14316	0,08704
B11	0,09832	0,07890	0,11236	0,06711	0,12839	0,11022	0,11749	0,10291	0,17325	0,13830

Source: own calculation

Following the normalization of the decision matrix, Entropy values for the criteria were created and are listed in Table 5.

Table 5

Entropy Values for Criteria

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
B1	-0,19612	-0,22733	-0,11837	-0,19083	-0,17479	-0,22764	-0,34464	-0,35227	-0,17151	-0,17288
B2	-0,18232	-0,22899	-0,18990	-0,15252	-0,15198	-0,20068	-0,28241	-0,29510	-0,12289	-0,11498
B3	-0,18611	-0,21269	-0,18554	-0,20094	-0,18580	-0,20553	-0,30740	-0,30314	-0,18040	-0,15387
B4	-0,24680	-0,20524	-0,22873	-0,17645	-0,25529	-0,24340	-0,24756	-0,23528	-0,33419	-0,29852
B5	-0,23430	-0,23090	-0,25176	-0,23865	-0,19958	-0,18271	-0,02284	-0,02497	-0,13645	-0,26686
B6	-0,21592	-0,20533	-0,15978	-0,24418	-0,27450	-0,18096	-0,03808	-0,03539	-0,29300	-0,24021
B7	-0,22424	-0,22511	-0,26391	-0,20077	-0,21716	-0,22404	-0,03356	-0,03534	-0,06805	-0,18362
B8	-0,21453	-0,22457	-0,28939	-0,32535	-0,08909	-0,19372	-0,00248	-0,00262	-0,04738	-0,09154
B9	-0,21057	-0,22313	-0,16440	-0,22295	-0,26798	-0,23332	-0,10312	-0,10682	-0,17892	-0,26218
B10	-0,24552	-0,21087	-0,22611	-0,18254	-0,23305	-0,24601	-0,28396	-0,27757	-0,27827	-0,21250
B11	-0,22805	-0,20037	-0,24562	-0,18130	-0,26354	-0,24307	-0,25160	-0,23400	-0,30371	-0,27361

Source: own calculation

After the Entropy values were obtained, e_j, d_j, and w_j were calculated. The k value used to obtain the e_j value was calculated as 0.4170 (1/ln (11)). The values of e_j, d_j, and w_j are listed in Table 6.

Table 6

Entropy Values for Criteria

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
e_j	0,9944	0,9985	0,9689	0,9660	0,9644	0,9929	0,7997	0,7934	0,8819	0,9469
d_j	0,0055	0,0014	0,0310	0,0339	0,0355	0,0070	0,2002	0,2065	0,1180	0,0530
w_j	***0,0081***	***0,0020***	***0,0448***	***0,0490***	***0,0513***	***0,0101***	***0,2892***	***0,2984***	***0,1705***	***0,0766***

Source: own calculation

After applying the Entropy method, the criteria weights were obtained, and the criterion weights were denoted by w_j. Table 6 shows that the financial ratios with the highest weights are Total Deposits and Total Assets, with 0.2984 and 0.2892, respectively. It has been determined that the financial ratio with the least weight is Total Deposits/Total Assets. The Entropy method provides objective and critical weights. The VIKOR method was applied using Entropy. The decision matrix that represents the first stage of the VIKOR method is presented in Table 7.

Table 7

Decision Matrix

Criteria Type	Benefit (Max)	Benefit (Max)	Cost (Min)	Benefit (Max)	Benefit (Max)	Benefit (Max)	Benefit (Max)	Benefit (Max)	Benefit (Max)	Benefit (Max)
Criteria Weight	0,0081	0,0020	0,0448	0,0490	0,0513	0,0101	0,2892	0,2984	0,1705	0,0766
BANKS	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**
B1	16,53	75,24	1,08	16,93	27,43	222,53	17,63	20,61	23,37	2,65
B2	14,70	76,21	2,21	11,94	22,13	179,61	10,61	12,57	14,21	1,45
B3	15,19	67,08	2,13	18,42	30,22	186,87	12,82	13,36	25,31	2,22
B4	24,60	63,18	3,02	14,94	52,30	250,90	8,20	8,05	84,42	7,09
B5	22,38	77,34	3,59	24,77	33,94	154,28	0,30	0,36	16,55	5,60
B6	19,41	63,23	1,68	25,82	60,29	151,94	0,57	0,56	60,71	4,59
B7	20,72	73,96	3,93	18,39	39,11	216,42	0,48	0,55	6,31	2,91
B8	19,20	73,65	4,75	47,81	10,33	169,51	0,02	0,03	3,94	1,05
B9	18,60	72,83	1,76	21,95	57,45	232,44	2,10	2,37	24,98	5,41
B10	24,36	66,11	2,96	15,76	44,24	255,86	10,74	11,03	54,41	3,70
B11	21,34	60,71	3,43	15,59	55,60	250,28	8,45	7,97	65,85	5,88
Best Value	24,60	77,34	1,08	47,81	60,29	255,86	17,63	20,61	84,42	7,09
Lowest Value	14,70	60,71	4,75	11,94	10,33	151,94	0,02	0,03	3,94	1,05

Source: own calculation

In Table 7, the weights obtained from the Entropy method with ten financial ratios of 11 banks continue to be applied with the normalization process, showing the highest and lowest values.

Table 8

Normalized Decision Matrix

	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
B1	0,815	0,126	0,000	0,861	0,658	0,321	0,000	0,000	0,759	0,735
B2	1,000	0,068	0,307	1,000	0,764	0,734	0,398	0,390	0,872	0,935
B3	0,951	0,617	0,285	0,819	0,602	0,664	0,273	0,352	0,735	0,807
B4	0,000	0,852	0,528	0,916	0,160	0,048	0,536	0,610	0,000	0,000
B5	0,224	0,000	0,685	0,642	0,527	0,977	0,984	0,984	0,843	0,247
B6	0,524	0,849	0,164	0,613	0,000	1,000	0,969	0,974	0,295	0,414
B7	0,392	0,203	0,777	0,820	0,424	0,379	0,974	0,974	0,971	0,692
B8	0,546	0,222	1,000	0,000	1,000	0,831	1,000	1,000	1,000	1,000
B9	0,606	0,271	0,185	0,721	0,057	0,225	0,882	0,886	0,739	0,278
B10	0,024	0,675	0,512	0,893	0,321	0,000	0,391	0,465	0,373	0,561
B11	0,329	1,000	0,641	0,898	0,094	0,054	0,521	0,614	0,231	0,199

Source: own calculation

In the second stage of the VIKOR method, data were normalized. The purpose of normalizing the data was to obtain a standard structure. The normalization process was performed using the best and lowest values using the equations in the method. The next step, data weighting, is presented in Table 9.

Table 9

Weighting of Data

Criteria weight	0,0081	0,0020	0,0448	0,0490	0,0513	0,0101	0,2892	0,2984	0,1705	0,0766
	F1	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**
B1	0,007	0,000	0,000	0,042	0,034	0,003	0,000	0,000	0,129	0,056
B2	0,008	0,000	0,014	0,049	0,039	0,007	0,115	0,117	0,149	0,072
B3	0,008	0,001	0,013	0,040	0,031	0,007	0,079	0,105	0,125	0,062
B4	0,000	0,002	0,024	0,045	0,008	0,000	0,155	0,182	0,000	0,000
B5	0,002	0,000	0,031	0,031	0,027	0,010	0,285	0,294	0,144	0,019
B6	0,004	0,002	0,007	0,030	0,000	0,010	0,280	0,291	0,050	0,032
B7	0,003	0,000	0,035	0,040	0,022	0,004	0,282	0,291	0,165	0,053
B8	0,004	0,000	0,045	0,000	0,051	0,008	0,289	0,298	0,171	0,077
B9	0,005	0,001	0,008	0,035	0,003	0,002	0,255	0,264	0,126	0,021
B10	0,000	0,001	0,023	0,044	0,016	0,000	0,113	0,139	0,064	0,043
B11	0,003	0,002	0,029	0,044	0,005	0,001	0,151	0,183	0,039	0,015

Source: own calculation

The weighting process was performed by multiplying the weights determined by the Entropy method with the normalized values, and the results are presented in Table 9. In the next step of the VIKOR method, Si and Ri values are calculated.

Table 10

Calculation of S_i and R_i Values

	S_i	R_i	
	0,272	0,129	
	0,570	0,149	
	0,471	0,125	
	0,416	0,182	
	0,842	0,294	
	0,706	0,291	
	0,895	0,291	
	0,944	0,298	
	0,721	0,264	
	0,443	0,139	
	0,471	0,183	
S^*	0,272	0,125	R^*
S^-	0,944	0,298	R^-

Source: own calculation

Si and Ri values, whose formulas are given in Table 10, and the maximum and minimum values of these values, and in the last stage of the method, Qi values were calculated Qi value is calculated with 0, 0.25, 0.50, 0.75, 0.50, 0.75 and 1 weightings. The computed values must meet the two conditions mentioned in the methodology section. Although it is possible to choose values that meet the two conditions, it is observed in the literature that the Qi value with a value of 0.50 is generally chosen (Çakır & Perçin, 2013). The stage of checking the conditions with Qi values is shown in Table 11.

Table 11

Qi Values and Conditions

	Q_i (0)	Q_i (0,25)	Q_i (0,50)	Q_i (0,75)	Q_i (1)
B1	0,024	0,018	0,012	0,006	0,000
B2	0,136	0,213	0,289	0,366	0,443
B3	0,000	0,074	0,148	0,222	0,296
B4	0,328	0,300	0,271	0,243	0,215
B5	0,972	0,941	0,910	0,879	0,848
B6	0,956	0,878	0,801	0,724	0,646
B7	0,956	0,949	0,941	0,934	0,927
B8	1,000	1,000	1,000	1,000	1,000
B9	0,803	0,770	0,736	0,702	0,668
B10	0,079	0,123	0,167	0,211	0,255
B11	0,335	0,325	0,316	0,306	0,297
Q(A2)	0,024	0,074	0,148	0,211	0,215
Q(A1)	0,000	0,018	0,012	0,006	0,000
Q(A2)-Q(A1)	0,024	0,056	0,136	0,205	0,215
DQ=1/(11-1)	0,10	0,10	0,10	0,10	0,10
Condition 1	-	-	+	+	+
Condition 2	+	+	+	+	+

Source: own calculation

When Table 11 is examined, it can be seen that the Q_i values of 0.50, 0.75, and 1 weigh both conditions. When the table is examined in detail, it is observed that the best alternative is B1 for all three Q_i values that meet the conditions. The financial performance ranking of banks according to Q_i value, with a generally accepted weighting of 0.50 and ting of 0.50, is shown in Table 12.

Table 12

Financial Performance Ranking

ORDER	BANK NAME	CODE	Q_i (0,50)
1	Türkiye Cumhuriyeti Ziraat Bankası A.Ş.	B1	0,012
2	Türkiye Vakıflar Bankası T.A.O.	B3	0,148
3	Türkiye İş Bankası A.Ş.	B10	0,167
4	Akbank T.A.Ş.	B4	0,271
5	Türkiye Halk Bankası A.Ş.	B2	0,289
6	Yapı ve Kredi Bankası A.Ş.	B11	0,316
7	Türk Ekonomi Bankası A.Ş.	B9	0,736
8	Fibabanka A.Ş.	B6	0,801
9	Anadolubank A.Ş.	B5	0,910
10	Şekerbank T.A.Ş.	B7	0,941
11	Turkish Bank A.Ş.	B8	1,000

Source: own calculation

The financial performance results show that the Ziraat Bank of the Republic of Turkey is the best-performing bank, according to the financial ratios in 2022. The second bank with the best performance is Türkiye Vakıflar Bank. It was determined that the other public capital bank, Türkiye Halk Bank, was the fifth best-performing bank among the 11 banks. The financial performance rankings of all banks are listed in Table 12.

5. DISCUSSION AND CONCLUSION

This study sought to evaluate and rank the financial performance of public and private deposit banks in Turkey, focusing specifically on the impact of monetary policy—notably the Central Bank of the Republic of Turkey's (CBRT) interest rate strategies—on banking sector outcomes. The evaluation, grounded in the principles of financial ratio analysis and multi-criteria decision-making (MCDM) methodologies, offers a comprehensive assessment of the financial soundness of selected banks and provides valuable insights into the interaction between macroeconomic policies and institutional performance in a fragile economic environment. Financial performance analysis is a critical component of strategic financial management. It is a decision-support mechanism for many stakeholders, including investors, policymakers, regulators, and bank managers. At its core, it represents the effective deployment of financial resources and reflects institutions' operational efficiency, profitability, risk resilience, and long-term sustainability. Maintaining a robust financial structure becomes indispensable in banking, where depositors' trust, borrowers' solvency, and the broader economic environment converge. It ensures uninterrupted service delivery, promotes market confidence, and supports national economic stability.

The present study employs MCDM tools, precisely the VIKOR method, to construct a performance ranking of deposit banks based on their financial ratios for 2022. The ratios selected for this analysis represent standard indicators widely accepted in academic literature and industry practice. They capture various dimensions of bank performance, including profitability, liquidity, asset quality, and capital adequacy. Such multi-dimensional criteria allow for a holistic comparison across banks of different ownership types. The results show that two state-owned banks occupy the top ranks in terms of financial performance, while the third ranks among the top five, outperforming most privately owned institutions. These findings suggest that, under the economic conditions prevailing in 2022, public banks demonstrated superior operational and financial resilience. This may be attributed to policy-related advantages, risk mitigation strategies, and access to stable deposit bases, supported partly by their structural integration into public sector financial flows.

Regarding monetary policy, CBRT maintained a consistent interest rate of 14% from January to July 2022, then reduced the rate by 500 basis points to 9% between August and December. This move was part of a broader initiative to stimulate industrial production and offset the recessionary pressures of a global inflationary environment. Simultaneously, the annual inflation rate reached 64.27% by December 2022, leading to a significantly hostile real interest rate environment (The Central Bank of the Republic of Turkey, 2023; TUIK, 2023). In such a context, the competitive dynamics among banks shifted substantially. Public banks—such as Ziraat Bank, Halkbank, and Vakıfbank—were able to attract substantial deposit inflows, likely due to their role as intermediaries for government transfers, salary distributions, and subsidies. In contrast, privately owned banks struggled to compete for deposits, facing higher fund acquisition costs and greater exposure to market volatility. Deposit growth figures reflect this disparity: while public banks collected between 435 and 790 billion TL in new deposits, the top private banks lagged considerably despite being large institutions (TBB, 2023).

This disparity in deposit growth has implications for both liquidity and profitability. Banks that can secure a more extensive, more stable deposit base typically benefit from reduced funding costs, which enhances their cost-to-income ratios and overall performance (Kosmidou, 2008). Moreover, aligning public banks with government fiscal operations grants them a comparative advantage in times of uncertainty, allowing for greater operational predictability and cost efficiency. These findings confirm the hypothesis that public capital banks exhibit stronger financial performance than their privately held counterparts, especially during negative, accurate interest rates. Another insight from the study concerns asset quality and risk management. Public banks demonstrated a lower ratio of non-performing loans to total loans, indicating

better credit performance and portfolio quality. By contrast, private banks exhibited higher default ratios, which may reflect differences in customer base selection, underwriting standards, or exposure to higher-risk market segments. Private banks may need to enhance their credit risk assessment practices and reconfigure lending strategies to align with market realities and borrower profiles.

The study also contributes to a broader understanding of institutional structures and monetary policy intersect. In Turkish, where public banks often serve quasi-fiscal roles and are directly influenced by state policy, monetary easing tends to benefit these institutions disproportionately. For investors, recognizing such patterns can be critical to portfolio management. Aligning investment strategies with interest rate policy cycles may reduce exposure to volatility and increase return predictability. Comparative literature across countries supports the generalizability of these findings. Various studies employing MCDM methods, including AHP, TOPSIS, and PROMETHEE, have consistently identified variations in performance based on ownership structure and external conditions. For example, in Greece, commercial banks outperformed cooperative banks during the early 2000s due to more substantial capital bases and broader market access (Kosmidou & Zopounidis, 2008). Similarly, in Iran, private banks were evaluated using a fuzzy AHP-TOPSIS framework, emphasizing profitability and equity as core criteria (Rezaei & Ketabi, 2016). In Serbia, research between 2005 and 2010 prioritized pre-tax profit and capital strength in the performance evaluation (Mandic et al., 2014).

The present study also confirms the suitability of the VIKOR method in capturing nuanced differences among banks, especially under volatile economic conditions. Unlike traditional techniques such as SAW or even TOPSIS, VIKOR incorporates a compromise ranking logic that enables the assessment of trade-offs among conflicting performance indicators (Chu et al., 2007; Opricovic & Tzeng, 2002). Its comparative advantage lies in its ability to balance extremes, offering a more refined picture of institutional performance. This is corroborated by studies in Egypt, where VIKOR, TOPSIS, and COPRAS were applied to evaluate the financial performance of commercial banks, yielding consistent top and bottom rankings across all methods (Abdel-Basset et al., 2021). When compared with previous domestic studies, this study aligns with the results of Seyfi-Shishavan et al. (2021), Yetiz & Kılıç (2021), and Gülsün & Erdoğmuş (2021), all of which highlight the superior performance of state-owned banks during crisis periods. However, it also diverges from findings by Akgül (2021), who reported that certain private banks outperformed their public counterparts. Such divergence underscores the importance of considering variations in sampling, time frame, and variable selection. Furthermore, studies by Ekinci & Poyraz (2019), Katırcıoğlu et al. (2020), and Gülcemal (2022) suggest that bank size, capital structure, commodity prices, and inflation play critical roles in determining financial outcomes. These studies indirectly support the current research's hypothesis, indicating that institutional responsiveness to macroeconomic conditions is a key determinant of performance.

Although the findings of this study are robust, several limitations must be acknowledged. First, the study focuses exclusively on 2022, a year marked by exceptional monetary and inflationary conditions. This restricts longitudinal inferences and makes isolating structural trends from policy-induced anomalies complex. Second, the study excludes foreign banks, which may exhibit different performance dynamics due to international capital flows and diversified operational bases. Future research should, therefore, extend the temporal scope and include foreign institutions to enhance the generalizability of findings. Despite these limitations, this research significantly contributes to the literature by offering an up-to-date, methodologically rigorous, and policy-relevant financial performance analysis within a key emerging market. By classifying banks according to ownership and analyzing their responses to monetary policy, the study provides a framework for understanding institutional behavior under stress. In doing so, it equips policymakers with evidence-based insights and gives practitioners a benchmark for comparative evaluation.

Additionally, this study provides actionable implications for bank management. Institutions with relatively low performance can identify specific financial ratios that require improvement, such as ROA, liquidity coverage, or loan quality. Benchmarking against top-performing peers offers a roadmap for internal strategic transformation. For policymakers, understanding the asymmetric impacts of interest rate changes on different bank categories is vital in designing interventions that do not inadvertently disadvantage one sector segment. The data set employed in the analysis covers 11 banks, which, in the aggregate, represent more than 70% of the sector in terms of both assets and deposits. This makes the findings sectorally representative and analytically robust. The exclusion of smaller or foreign banks was a deliberate methodological choice to ensure a precise comparative analysis between public and private Turkish banks. The fact that this sample includes institutions with significant market share and institutional history enhances the study's validity.

In addition, the study period includes policy shifts and exogenous shocks such as the pandemic and geopolitical tensions. Evaluating bank performance during such a fragile period offers unique insights into institutional resilience and adaptability. Particularly noteworthy is that state-owned banks maintained superior performance levels despite performing additional public duties such as subsidy distribution. These findings challenge conventional assumptions about the inefficiencies of public banking and open up a new avenue for performance-based public sector evaluation. Looking ahead, future research should expand both the temporal and methodological scope. Incorporating data from multiple years will facilitate time-series analysis while employing different MCDM tools, allowing for robustness testing and sensitivity analysis. Furthermore, integrating macroeconomic variables such as GDP growth, interest rate spreads, and external debt levels could enrich the explanatory power of the models used. In conclusion, this study validates the hypothesis that public deposit banks in Turkey outperform private ones under specific monetary conditions and offers a replicable model for performance evaluation in emerging markets. It demonstrates the importance of ownership structure, monetary policy, and macroeconomic context in shaping financial performance. Most importantly, it underscores the need for continuous monitoring, strategic adaptability, and evidence-based policymaking to ensure a resilient, efficient, and inclusive bankings.

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