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The Bank Performance Ranking in the Emerging Markets: A Case of Turkey[1]

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Gelişmekte Olan Piyasalarda Banka Performans Sıralaması: Türkiye Örneği[3]

Abstract

In this study, the pre-pandemic (2019) and pandemic period (2020) financial performances of 13 commercial banks with the highest transaction volume in Turkey were compared using multi-criteria decision (Entropy, ARAS, MOORA, and MOOSRA) techniques. The financial performance ranking results obtained by the ARAS method are similar to the BrandFinance brand valuation ranking. In addition, before the pandemic Ziraat Bank, which was a public bank; during the pandemic period, along with Ziraat Bank, Halkbank, which is the other public bank, were found to be among the top 5 banks showing high performance.

Keywords : Firm Performance, Financial Analysis, Commercial Banks, Quantitative Methods, Brand Value.

JEL Classification Codes : L25, M40, G21, B2, M37.

Öz

Bu çalışmada, Türkiye'de işlem hacmi en yüksek 13 ticari bankanın pandemi öncesi (2019) ve dönemi (2020) finansal performansları çok kriterli karar (Entropi, ARAS, MOORA ve MOOSRA) teknikleriyle belirlenerek BrandFinance marka değerlemesi sıralaması ile karşılaştırılmıştır. ARAS yöntemi ile ulaşılan finansal performans sıralama sonuçları BrandFinance marka değerleme sıralaması ile benzeri çıkmıştır. Ayrıca kamu bankası olan Ziraat Bankası'nın pandemi öncesi; pandemi döneminde de Ziraat Bankası ile diğer kamu bankası olan Halkbank'ın da yüksek performans göstererek ilk 5 banka içinde yer aldığı tespit edilmiştir. Çalışmanın orijinalliği, finansal performans sıralaması sonuçları ile BrandFinace marka değerleme sıralama sonuçlarının karşılaştırıldığı ilk çalışmadır.

Anahtar Sözcükler : Firma Performansı, Finansal Analiz, Ticari Bankalar, Sayısal Yöntemler, Marka Değeri.

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1. Introduction

Commercial banks stand out as the financial institutions serving the highest number of participants in the financial system. There are academic studies on the measurement and ranking of the performances of commercial banks. Multi-criteria decision-making techniques are generally used in financial performance reviews. There are very few previous studies on the commercial banking ranking of Turkey, which has significant potential and population among emerging markets. Thus, it is essential to examine Turkish commercial banks in this respect. In addition, a study in which multi-criteria decision-making techniques ARAS, MOORA, and MOOSRA methods are examined together will contribute to the literature. For an original review, performance rankings of thirteen commercial banks serving in Turkey will be made using ARAS, MOORA, and MOOSRA methods. The entropy method will be used to determine the criterion weights as well. Comparing these results with the BrandFinance brand value ranking will reveal whether there is a consistency between financial performance and brand value. While ranking, ten financial items and derived rates used in measuring financial performance are determined. The weights of the financial items used in the calculations are determined using the entropy method.

2. Literature Review

Many studies have used ARAS, MOORA, and MOOSRA and entropy methods. For example, Zavadskas and Turksis (2010) and Zavadskas et al. (2010) studied selecting the place of establishment using the ARAS method. On the other hand, Bakshi and Sarkar (2011) made a project selection using the ARAS method. While Stanujkic and Jovanovic (2012) conducted a study on the measurement of website quality, Reza and Majid (2013) used the ARAS method to select the best bank. Sliogeriene et al. (2013) used the ARAS method in their studies on analysing and selecting energy generation technologies. Jagadish and Ray (2014) used the MOOSRA method to choose the fluid used in cutting processes. In the same year, Kutut et al. (2014) used the ARAS method to choose alternatives that can be used to protect historic buildings. Brauers and Zavadskas (2006) introduced the MOORA method, a new method, to the literature by explaining it with an example of privatisation in transition economies. Brauers et al. (2008) used the MOORA method to optimise alternatives for road design and determine the most suitable option in their study. Brauers and Ginevicius (2009) propose a new model for regional development in their work. While it is stated in the study that the regional income calculation is sufficient to measure the welfare of the population of the region, it is emphasised that it does not represent the welfare economy in general. Brauers et al. (2010) propose a model to reduce pollution related to promoting local employment in the tourism sector and solve problems associated with the development of renewable energy and tourism MOORA method. Chakraborty (2011) used the MOORA method in his study, stating that managers in the production environment should make critical decisions by evaluating many criteria. Brauers and Ginevicius (2013) suggest that investors consider many risks and benefits when investing in businesses. In such cases, the MOORA method was used based on the Bel20 list in Belgium to determine how the investors would follow. Sarkar et al. (2015) used the MOOSRA method for machine selection, while Yildirim (2015)

used the ARAS method for housing selection in his study. In 2016, Ecer used the ARAS method to choose and select ERP software in their research, while Adali and Isik (2016) used the ARAS method for their studies' best air conditioner selection. Omurbek et al. (2017) examined the sustainability performance of large-scale banks according to their asset sizes in the context of financial, operational, and environmental sustainability. In addition to the studies in which the ARAS and MOOSRA methods were used, studies using the entropy method are included in the literature. Firstly, Bilien and Tassinopoulos (2001) used the entropy method in their research while estimating employment. Chen et al. (2015) used the entropy method to analyse the effects of fighting poverty. In 2011, Shemshadi et al. (2011) used the entropy method in their studies where they selected suppliers. Chen et al. (2015) used the entropy method to analyse groundwater sustainability in their studies. Yavuz (2016) used the entropy method in the case of geographic market selection in his research. All in all, it has been determined that the entropy method was used in some studies on performance evaluation. In their research in 2016, Karaatli et al. (2016), performance evaluation in the defence industry, Karaatli (2016) in the evaluation of tourism performance in Turkey, Omurbek and Aksoy (2016), oil company performance measurement and Omurbek et al. (2016b), on the other hand, used the entropy method for the performance evaluation of automotive companies. Finally, Tunca et al. (2016) used the entropy method in the performance ranking of OPEC countries. In addition to all these studies, studies have also been conducted to reveal the effects of the COVID-19 pandemic that emerged worldwide in 2020 on the financial system. Examples of these are the following studies. Guo et al. (2021) found that when COVID-19 spreads worldwide, the markets' links seem closer than other risks. Shapoval et al. (2021) stated that the effects of the pandemic on travel negatively affect the tourism and hotel industry. Gunay, in the study (2021), shows that the volatility in the first months of COVID-19 is not as severe as in the global financial crisis in 2008 due to the independent risk analysis. He also states that the Brazilian real and the Turkish lira are the currencies that experienced the highest volatility during the COVID-19 outbreak. In the study conducted by Zaremba et al. (2021), it was determined that workplace and school closures impair liquidity in emerging markets. According to Danisman et al. (2021), countries with higher (Loan/Deposit) ratios and unrequited loans for the banking sector are more vulnerable.

3. Methodology

Entropy, ARAS, MOORA and MOOSRA methods, which are multi-criteria decision-making methods, were used to determine the performance ranking of banks. While the entropy method was used to determine the criterion weights, ARAS, MOORA and MOOSRA methods were used for performance rankings.

3.1. Entropy Method

The concept of entropy was defined for the first time in the literature by Rudolph Clausius (1865) as a measure of the disorder and uncertainty in a system (Zhang, 2011: 444). The entropy method measures the amount of helpful information provided by existing data

(Wu, 2011: 5163). The entropy method consists of four steps (Karami & Johansson, 2014: 523-524; Wang & Lee, 2009: 8982):

Firstly, various methods can standardise indices to eliminate the effects of different index sizes on incommensurability in the decision matrix. Criteria are normalised according to benefit and cost indexes with the help of the equations below.

$$r_{ij} = X_{ij}/Max_{ij} \quad (1)$$

$$r_{ij} = Min_{ij}/X_{ij} \quad (2)$$

It is, secondly, calculated by normalisation to eliminate discrepancies in different units of measure.

$$P_{ij} = (a_{ij}/\sum_{i=1}^{m} a_{ij}) \quad (3)$$

P_{ij} = Normalized values

a_{ij} = Benefit values

Third, the entropy of Ej is calculated from the below equation.

$$E_j = -k \sum_{i=1}^{m} [P_{ij}.lnP_{ij}]; \forall_j \quad (4)$$

$k = [\ln(n)]^{-1}$(Entropy coefficient)

In step 4, d_j uncertainty is calculated from the equation.

$$d_j = 1 - E_j; \ \forall j \quad (5)$$

Finally, with the help of the below equation, the weights of the wj criterion are calculated as the importance level.

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

3.2. ARAS Method

ARAS (Additive Ratio Assessment) method was developed by Zavadskas and Turksis (Zavadskas & Turksis, 2010: 159-172). Unlike other MCDM methods, the utility function values of the alternatives are compared with the utility function value of the optimal choice added to the decision problem by the researcher (Sliogeriene et al., 2013: 13). The ARAS method reveals the proportional similarity of each alternative to the ideal choice (Dadelo et al., 2012: 68).

The ARAS method consists of 4 steps (Zavadskas & Turskis, 2010: 163-165).

Firstly, there is a row of optimal values for each criterion in the initial decision matrix in the ARAS method.

$$X = \begin{bmatrix} X_{01} & X_{0j} & X_{0n} \\ X_{i1} & X_{ij} & X_{in} \\ X_{m1} & X_{mj} & X_{mn} \end{bmatrix}; \text{ i = 0,1,…,m j = 0,1,…,n} \quad (7)$$

X_{ij} = value representing the performance value of the *i.* alternative in terms of the *j.* criterion

X_{0j} = optimal value of *j*. criterion

If the optimal value of the criterion is not known in the decision problem, the optimal value is calculated from the below equations, depending on whether the criterion shows the maximum or minimum property.

$$X_{0j} = Max_i / X_{ij} \quad (8)$$

$$X_{0j} = Min_i / X_{ij} \quad (9)$$

The second step consists of normalized decision matrix values. Values are calculated in two ways, depending on whether the criterion has the benefit or cost feature. If the criterion performance values are considered better to be maximum, normalized values are calculated from the below equation.

$$\bar{X}_{ij} = (X_{ij} / \sum_{i=0}^{m} X_{ij}) \quad (10)$$

If the benchmark performance values are considered better to be minimum, the normalization process is carried out in two steps. First, it is transformed into a utility state by using performance values, then its normalized values are calculated from the below equations.

$$X_{ij}^{*} = 1 / X_{ij} \quad (11)$$

$$X_{ij} = (X_{ij}^{*} / \sum_{i=0}^{m} X_{ij}^{*}) \quad (12)$$

In the third step, after obtaining the normalized decision matrix, a weighted normalized decision matrix was created using the wj determined weights. The weight values of the criteria satisfy the condition 0 < wj <1, and the sum of the weights must be equal to 1, as shown below equation.

$$\sum_{j=1}^{n} w_j = 1 \quad (13)$$

Normalized values using the below equation, weighted normalized values of $\bar{x}$ij are obtained.

$$\hat{x}_{ij} = \bar{x}_{ij} . w_{ij} \quad (14)$$

$\hat{x}_{ij}$ weighted normalized decision matrix is obtained by constructing the calculated $\hat{X}$ weighted normalized values in the form of the matrix shown in the below equation.

$$\hat{X} = \begin{bmatrix} \hat{x}_{01} & \hat{x}_{0j} & \hat{x}_{0n} \\ \hat{x}_{i1} & \hat{x}_{ij} & \hat{x}_{in} \\ \hat{x}_{m1} & \hat{x}_{mj} & \hat{x}_{mn} \end{bmatrix}; \text{ i = 0,1,…,m j = 0,1,…,n} \quad (15)$$

Lastly, optimal values for each alternative are calculated, and values belonging to the other options are obtained from the below equation. Si., including the optimal function value of the option;

$$S_i = \sum_{j=1}^{n} \hat{x}_{ij} \quad ; \quad \text{i = 0,1,…,m} \quad (16)$$

The S_i values of the other options are proportioned to the S_0 optimal value, and the utility degrees are calculated from the equation.

$$K_i = S_i/S_0 \quad ; \quad \text{i = 0,1,…,m} \quad (17)$$

The utility function values of the alternatives can be calculated using the value area ratios in the range of [0,1]. Then, these values obtained are ranked in descending order, and the alternatives are evaluated.

3.3. MOORA Method

The MOORA method (MOORA-The Multi-Objective Optimization by Ratio Analysis Method), a Multi-Purpose Optimization Method Based on Ratio Analysis, was introduced by Brauers and Zavadskas (2006) and brought to the literature. MOORA method is basically a method based on different grouping predictions (Brauers & Zavadskas, 2006: 445-469).

The application of the MOORA method starts with a decision matrix that includes all alternatives and criteria. The matrix is shown as "xij" (Brauners & Ginevicius, 2009: 123).

MOORA, a multi-purpose optimisation method, is a new method in the literature. Still, it has different versions, such as MOORA-Ratio Method, MOORA-Reference Point Approach, MOORA-Significance Coefficient, MOORA-Full Product Form and MULTI-MOORA methods (Ersoz & Atav, 2011: 79). Since this study will be examined using the MOORA-Ratio method, only that will be introduced.

The three steps of the MOORA method are given below (Brauers & Zavadskas, 2006: 445-469);

Step 1: Determining the Objectives and Performance Values of Alternatives

It starts with bringing together the goals, alternatives, and performance values according to the goals into a matrix. It is expressed by a matrix formed in the following figure. In the matrix, m indicates the number of alternatives, and n indicates the number of criteria.

$$X_{ij} = \begin{bmatrix} X_{11} & X_{12} & X_{13} \\ X_{21} & X_{22} & X_{23} \\ X_{m1} & X_{m2} & X_{mn} \end{bmatrix}; \quad (18)$$

Step 2: Normalizing the Matrix

The matrix is normalized by dividing the sum of the performance values squared by the square root of the performance value of each alternative according to each criterion using the following equation.

$$X_{ij}^{*} = (x_{ij} / \sqrt{\sum_{i=1}^{n} x_{ij}^{2}}) \quad (19)$$

X_{ij}^{*} is i alternatives j performance value normalized by criterion shows. This value may be in the range of 0.1 or some cases, in the range of -1.1.

Step 3: Sorting Step

This step subtracted the Sum of Minimization Performance Values from the Total of Normalized Maximization Performance Values. This process is handled with the help of the following equation.

$$Y_i = \left(\sum_{j=1}^{g} x_{ij}^{*}\right) - \left(\sum_{j=g+1}^{n} x_{ij}^{*}\right) \quad (20)$$

g is the number of goals to be maximised, (n-g) the number of goals to be minimised, and yi is i. shows the normalised value of the alternative for all purposes. The values are ordered in descending order. The choice in the first rank, according to the order of yi is considered the most suitable option.

3.4. MOOSRA Method

Das, Sarkar and Ray first developed the MOOSRA method (Multi-Objective Optimization on Simple Ratio Analysis) (Das et al., 2012: 142-162). MOOSRA methodology, in general, begins by placing four significant parameters in the decision matrix: alternatives, criteria or attributes, individual weight or importance coefficients of each criterion, and the performance measure of options according to the criteria. MOOSRA is a multi-purpose and optimisation method (Jagadish & Ray; 2014: 560).

The application steps of the MOOSRA method are first started by creating the decision matrix of the problem, and the second step is the normalisation of the decision matrix. While calculating all performance values of each alternative in the MOOSRA method, the sum of the practical and non-useful values normalised performance values are obtained by the simple ratio method (Balezentiene et al., 2013: 85).

The four steps of the MOOSRA method are given below (Jagadish & Ray, 2014: 560-561):

Firstly, this methodology starts with defining the decision matrix in which criteria and alternatives are listed. The performance of each option is established in the following equation.

$$X_{ij} = \begin{bmatrix} X_{11} & X_{12} & X_{13} \\ X_{21} & X_{22} & X_{23} \\ X_{m1} & X_{m2} & X_{mn} \end{bmatrix}; \quad (21)$$

The process of converting the attribute value to 0-1 interval is called normalisation. In multi-criteria decision-making, the values in the decision matrix must be converted from different units to a single unit. The equation below is used for the normalisation process.

$$X_{ij}^{*} = (x_{ij} / \sqrt{\sum_{i=1}^{n} x_{ij}^{2}}) \quad (22)$$

Thirdly, all alternatives' performance values (Yi) are calculated using the simple ratio of the weighted sum of valuable and non-useful criteria. In this calculation, the following equation has been used.

$$Y_i = (\sum_{j=1}^{g} w_j \,.\, x_{ij}^{*}) / (\sum_{j=g+1}^{n} w_j \,.\, x_{ij}^{*}) \quad (23)$$

(g) is the maximised value, and (n-g) is the minimised value.

In the last step, the process of sorting the alternatives is carried out. When the alternatives are ordered in descending order, the best choice is the option with the highest value and is calculated by the below equation.

$$Y_i = (\sum_{j=1}^{g} . x_{ij}^{*}) / (\sum_{j=g+1}^{n} . x_{ij}^{*}) \quad (24)$$

3.5. Data

In this study, the financial performances of thirteen commercial banks operating in Turkey were examined. Banks were selected according to their total asset size. The data set used in the analysis consisted of variables obtained or derived from banks' financial statements in 2019 and 2020. Banks used in the study were numbered B1-B13 in Table 1.

Table: 1
Bank Names and Codes

Bank Name	Capital Structure	Bank Code
Akbank	Private	B1
Denizbank	Private	B2
HSBC Bank	Private	B3
ING Bank	Private	B4
QNB Finansbank	Private	B5
Şekerbank	Private	B6
Türk Ekonomi Bankası	Private	B7
Türkiye Cumhuriyeti Ziraat Bankası	Public	B8
Türkiye Garanti Bankası	Private	B9
Türkiye Halk Bankası	Public	B10
Türkiye İş Bankası	Private	B11
Türkiye Vakıflar Bankası	Public	B12
Yapı ve Kredi Bankası	Private	B13

The variables and derived rates used in the analysis are as follows; (Capital Adequacy Ratio, Return on Equity, Total Assets, Deposits, Operating Profit, Net Profit, Interest Income Expenses Per Employee, Non-Performing Loans and Interest Expenses). All data used in this study were obtained from the data in Turkey Banks Union's official website (TBB İstatistiki Raporlar, n.d.).

4. Results

As a result of the analysis using the entropy method, weights in Table 1 were obtained.

Table: 2
Weights

Criteria	Weights (2019)	Weights (2020)
CAR	0,0048	0,0029
ROE	0,0153	0,1069
TOA	0,134	0,1168
DEP	0,1361	0,1161
OPP	0,2149	0,1807
NEP	0,1961	0,1701
INI	0,1152	0,1049
EPE	0,0121	0,0065
NPL	0,0868	0,082
INE	0,1153	0,1131

When we look at the calculated weights of 10 criteria used in the study in 2019, it is seen that the criterion with the highest weight is approximately 21.5% operating profit. When we look at the calculated weights of 10 criteria used in the study in 2019, it is seen that the criterion with the highest weight is approximately 21.5% operating profit. While the second criterion with the highest weighting was Net profit, the criterion with the lowest weighting was the capital adequacy ratio of 0.48%.

When we look at the calculated weights of the criteria in 2020, which is the year of the pandemic, it is seen that the criterion with the highest weight is approximately 19% operating profit. The second criterion with the highest weight is Net profit, with 17%, while the criterion with the lowest weight is the capital adequacy ratio, with 0.29%.

The first five bank rankings calculated using the ARAS method are in Table 2.

Table: 3
Sorting by ARAS

Sorting 2019	Bank Code	K_i Value	Sorting 2020	Bank Code	K_i Value
1	B8	0,7885	1	B8	0,7760
2	B11	0,5987	2	B9	0,5983
3	B9	0,5925	3	B1	0,5782
4	B1	0,5590	4	B11	0,5640
5	B13	0,4225	5	B10	0,4693

In the performance ranking according to the ARAS method in 2019, the bank ranked first in B8. The second bank is B11, followed by B9. B13 ranks 5th in the ranking in 2019. In the performance ranking made according to the ARAS method in 2020, which is the year of the pandemic, B8 is again in first place. In 2020, the second bank was B9, followed by B1. B10, on the other hand, ranks 5th in the 2020 ranking. B13 needed help finding a place in the top five in 2020.

The first five bank rankings calculated using the MOORA method are in Table 3.

Table: 4
Sorting by MOORA

Sorting 2019	Bank Code	Y_i^* Value	Sorting 2020	Bank Code	Y_i^* Value
1	B8	0,3408	1	B8	0,3213
2	B9-B11	0,2399	2	B9	0,2409
3	B9-B11	0,2399	3	B1	0,2318
4	B1	0,2230	4	B11	0,2174
5	B10	0,1407	5	B10	0,1638

In the performance ranking according to the MOORA method in 2019, the bank ranked first in B8. B9 and B11 share the rankings of the second and third banks. The values of Yi* were equal in 2019. B1 ranks 4th and B10 5th in the ranking in 2019. In the performance ranking made according to the MOORA method in 2020, which is the year of the pandemic, B8 is again in first place. In 2020, the second bank was B9, followed by B1. B11 is the fourth bank, while B10 was the fifth in 2020.

The first five bank rankings calculated using the MOOSRA method are in Table 4.

Table: 5
Sorting by MOOSRA

Sorting 2019	Bank Code	Y_i Value	Sorting 2020	Bank Code	Y_i Value
1	B8	5,3944	1	B8	5,1305
2	B9	4,4099	2	B1	4,8973
3	B1	4,3866	3	B9	4,8571
4	B11	4,1980	4	B3	4,5874
5	B10	3,0163	5	B4	4,5061

The performance ranking was according to the MOOSRA method in 2019; the bank ranked first in B8. The second bank is B9, followed by B1. B10 ranks 5th in the ranking in 2019. The performance ranking was made according to the MOOSRA method in 2020, the

year of the pandemic, and B8 is again in the first place. In 2020, the second bank was B1, followed by B9. B4, on the other hand, ranks 5th in the 2020 ranking. B10 could not find a place in the top five in 2020.

The Brand value rank for 2019 and 2020 announced by BrandFinance is shown in Table 5.

Table: 6
Sorting by BrandFinance

Sorting 2019	Bank Code	Brand Value (Million USD)	Sorting 2020	Bank Code	Brand Value (Million USD)
1	B8	1,637	1	B8	1.616
2	B9	1,344	2	B9	1.538
3	B11	1,135	3	B1	998
4	B1	934	4	B11	951
5	B13	647	5	B10	408

Banks were classified among themselves in the list of the most valuable brands in Turkey, announced by BrandFinance in 2019. Accordingly, the banks with the highest brand value are B8, B9, B11, B1, and B13.

In 2020, the year of the pandemic, B8 and B9 were again in the first two places in the BrandFinance ranking. While B1 was the third bank in 2020, B10 ranked fifth. B13 could not find a place in the top five in 2020 again.

5. Discussion

The study's primary purpose is to conduct a comparative analysis of how commercial banks operating in Turkey have changed financially with the pandemic process. Comparisons were made in the context of this purpose, including method comparison and between periods. Rankings were made using different financial performance ranking methods. ARAS method, MOORA method and MOOSRA method gave different results. It is thought that using three different sorting methods in the same review contributes to this study's originality. To our knowledge, no study compares the results of these three other methods in the literature. The only study on the ranking of commercial banks operating in Turkey is Omurbek et al.'s (2017) study, which examines the sustainability performance of large-scale commercial banks concerning financial, operational, and environmental sustainability according to their asset sizes. This study primarily lists the one-year performances of banks realised under the concept of sustainability. When the results are examined, it is seen that there is a very high consistency between the outputs of the ARAS, MOORA and MOOSRA methods. In the study in which the first seven commercial banks were listed, only the fifth and seventh firms were evaluated in different ARAS methods. Apart from that, the rankings in all three methods were the same. If expressed using the codes in the study, B2 was identified as the first bank in the ranking.

In this study, besides the performance ranking in 2019 and 2020, the changes that have emerged in the ranking have also been emphasised. A comparison is made between the

results of multi-criteria decision-making methods, and determinations are made about the performance changes of banks. In addition, we tried to establish a link between financial performance ranking and brand value in the study. The banks, among the 100 most valuable companies in Turkey, announced in 2019 and 2020 by BrandFinance, a reputable brand valuation firm serving internationally, are listed among themselves. The brand value rankings obtained were compared with the outputs of the ARAS, MOORA and MOOSRA methods used in the study. Unexpectedly, with the brand value ranking announced by BrandFinance for the pandemic period 2020, it was seen that the rankings of both the ARAS method and the MOORA method in 2020 were the same at the level of the top five banks. In the MOOSRA method, the ranking is different from the BrandFinance ranking. However, it is seen that B8 is the first bank in all methods and BrandFinance rankings for both years. This result is consistent with Omurbek's (2017) study. Omurbek et al. (2017) coded the bank as B2, and B8 in the study refers to the same bank. However, in our research, it can be said that the rankings of other banks changed with the pandemic process. In the study, in which it was determined that the COVID-19 pandemic affected the dynamics of the Turkish banking sector, it can be concluded that ARAS, MOORA and MOOSRA methods yield different results in performance measurement. At the same time, as a result of the investigations conducted during the pandemic, it can be said that the BrandFinance brand value ranking method is compatible with the ARAS and MOORA methods. It can be noted that the implicit relationship, which is thought to be between financial performance and brand value, is proved by this study.

In future studies, the fuzzy logic approach can be included in the analysis instead of making precise judgments and sequences. Researchers are recommended to perform new investigations using fuzzy ARAS, MOORA and MOOSRA methods. In addition, it is thought that the interest rate volatility that emerged with the pandemic process will directly affect the financial performance of banks. Thus, with a duration analysis to be conducted on the said banks, their sensitivity towards changes in interest rates should be measured.

6. Conclusion

B8 stands out as the bank with the best performance and highest brand value in pre-pandemic 2019 and 2020, the pandemic year. B11, which came second in the ARAS method in 2019, fell to fourth place in 2020. The B9, which ranked 3rd in 2019, rose to the 2nd in 2020. B1, which ranked 4th in 2019 in the ARAS method, climbed one step in 2020 and ranked third. Finally, the B13, which ranked 5th in 2019, could not find a place in the top five in the pandemic year.

The B 8, which ranked first in the performance ranking according to the MOORA method in 2019, was also first place in 2020. In 2020, B9 maintained second place, while B11 dropped to fourth. B1, on the other hand, climbed up one step and ranked third. B10, on the other hand, ranked 5th in 2020, as in 2019.

The B8, which ranked in the first performance ranking according to the MOOSRA method in 2019, was also first in 2020. The B9, which came in second in 2019, dropped one place in 2020 and ranked third. B1, 3rd in 2019, rose to second place in 2020. In the MOOSRA method, B11 and B10, ranked 4th 2019 and 5th in 2019, could not find a place in the top five banks in 2020. B3, whose performances increased in 2020, rose to fourth place, while B4 took fifth place.

Looking at what changed from 2019 to 2020 according to both ARAS, MOORA and MOOSRA methods, it was seen in both years that B8 ranked first concerning performance. It can be concluded that the financial performance rankings of commercial banks changed significantly during the COVID-19 outbreak. Although the Ki value of B8 was calculated according to the ARAS method, the Yi value calculated according to the MOORA method and the Yi value calculated according to the MOOSRA method decreased in 2020. It was observed that it did not lose its first place.

Looking at the BrandFinance 2019 brand value ranking, it is seen that the B8 is the most valuable brand, followed by the B9. B1 has been declared the third most valuable bank. B1, the 4th most valuable bank, and B13, the 5th most valuable bank, lost their places in the top five in the pandemic year in the pre-pandemic period. In other words, B1 and B13 stand out as the banks most affected concerning brand value. Looking at the top three banks in BrandFinance's brand value ranking in 2020, it is seen that it is in line with 2019. While B8 is again the most valuable bank, B9 is the second and B1 is the third.

Looking at the top three banks in BrandFinance's brand value ranking in 2020, it is seen that it is in line with 2019. While B8 is again the most valuable bank, B9 is the second and B1 is the third. On the other hand, B11 and B10 increased their brand values in 2020, the year of the pandemic, and ranked fourth and fifth.

As a result, the COVID-19 outbreak has affected the performances of Turkish commercial banks and their brand values in Turkey. It can be said that the most adversely affected banks are B11 and B13. In addition, it is exciting that the public bank B8 ranks first in the financial performance ranking according to all methods. Otherwise, B10, another public bank, was not among the top 5 banks in the pre-pandemic period but increased its performance by rising to 5th in both ARAS and BrandFinance rankings. This may mean that public banks are not adversely affected by the pandemic process.

In brief, the financial performance ranking results obtained by the ARAS method from the ARAS, MOORA and MOOSRA methods used in the study were similar to the BrandFinance brand valuation ranking. This shows that the ARAS method provides more reliable results than other methods. On the other hand, when the bank performances are evaluated according to the pandemic period, it has been revealed that Ziraat Bank (B8) is the bank with the first financial performance according to all methods. The striking point of the result is that Ziraat Bank is the only public bank in the financial performance ranking made for the pre-pandemic period. In addition, it has been determined that Halkbank (B10),

another public bank during the pandemic period, increased its financial performance and became one of the top 5 banks in the BrandFinance ranking. It is in line with the ranking and BrandFinance ranking obtained due to the ARAS method during the pandemic period when Ziraat Bank ranked first, and Halkbank ranked fifth.

Banks positively affected by the pandemic process can be listed as B1, B3 and B4. A significant result that can come out of the study is that the ARAS method used in the financial performance ranking gives very consistent results with the BrandFinance technique, which is the brand value calculation technique. In summary, it can be said that the pandemic process has affected the financial performance of banks in Turkey and reduced their brand values, except for B9 and B1.

The originality of the study; no study has been found to measure the financial performance of commercial banks in Turkey using ARAS, MOORA and MOOSRA multi-criteria decision-making techniques. In addition, it is the first study to compare financial performance ranking results with BrandFinace brand valuation ranking results.

This study contributes to the fact that the ARAS method gives accurate results in the measurement of financial performance. On the other hand, while the results benefit the banking sector, they also provide ideas for new academic studies.

It is recommended to review these situations in further studies. Even comparisons using fuzzy ARAS, fuzzy MOORA and fuzzy MOOSRA methods are recommended. In addition, it is thought that the change in the financial performance of banks depends on their sensitivity to interest rates. To determine this situation, duration analysis is recommended to researchers.

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