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An Analysis on Turkey's Merger and Acquisition Activities: MAIRCA Method

Türkiye'nin Birleşme ve Satınalma Faaliyetleri Üzerine Bir Analiz: MAIRCA Yöntemi

Esra Aksoy[1]

Abstract

Economic developments in one country are linked to the economic situations in other countries. Merger and Acquisition (M&A) has become an integral part of firms around the world. In today's conditions, firms are ready to seize the opportunity for competitive advantage and an increase in profitability. Firms can go on the path of external growth through internal growth, merging with, or purchasing other firms. The most common justification in M&A is to create economic synergy. Firms with global economic developments in Turkey wants to reach more customers to enlarge its share of the market and to increase their profits. Under more competitive economic conditions, firms cross-border mergers. This paper aims to analyze the year based on performance criteria that determine the direction of Turkey's M&A data by using the MAIRCA method, one of the MCDM methods and testing the applicability of the MAIRCA method. The data of four criteria determined between 2015-2019 were used. These criteria are; the share of foreign investors in the total transaction volume (%), deal number, deal valume and the ratio of financial investor activities to the total transaction volume. Criteria weights with the entropy method and the performance evaluation of the years by using the MAIRCA MCDM method was performed. It has been determined which year M&A performed better. As a result; according to the criteria determined between 2015-2019 the best performing year is 2015 and M&A performance decreases over the years.

Keywords: *Multi Criteria Decision Making, Merger and Acquisition, Performance, MAIRCA, Entropy*

Öz

Bir ülkede yaşanan ekonomik gelişmeler, diğer ülkelerdeki ekonomik durumlarla bağlantı halindmedir. (M&A) Birleşme ve satın alma, dünya genelinde işletmelerin ayrılmaz bir parçası haline gelmiştir. Günümüz koşullarında şirketler, rekabet avantajı ve karlılıktaki artış için her an fırsatı yakalamaya hazır konumdadır. Bu yüzden şirketler içsel büyüme, başka bir işletme ile birleşme ya da onu satın alma ile dışsal olarak büyüme yoluna gidebilirler. M&A'da en yaygın gerekçe, ekonomik sinerji yaratılmasıdır. Küresel ekonomik gelişmelerle birlikte Türkiye'deki şirketler de karlarını arttırmak ve pazardaki payını büyütmek için daha fazla müşteriye ulaşmayı istemektedir. Gün geçtikçe daha rekabetçi olan ekonomik koşullar altında şirketler sınır ötesi birleşme faaliyetlerinde bulunmaktadır. Bu çalışmanın amacı ise Türkiye M&A verilerinin belirlenen kriterler doğrultusunda ÇKKV yöntemlerinden MAIRCA yöntemi kullanılarak yıl bazlı performans analizini yapmak ve MAIRCA yönteminin uygulanabilirliğini test etmektir. 2015-2019 yılları arasında belirlenen dört kriterin verileri kullanılmıştır. Bu kriterler; yabancı yatırımcıların toplam işlem hacmi içindeki payı (%), işlem sayısı, işlem hacmi, finansal yatırımcı faaliyetlerinin toplam işlem hacmine oranıdır. Entropy yöntemiyle kriter ağırlıkları, MAIRCA ÇKKV yöntemi kullanılarak da yılların performans değerlendirmesi yapılmıştır. Bu bağlamda Türkiyede M&A 'nın hangi yıl iyi performans gösterdiği belirlenmiştir. Sonuç olarak; 2015-2019 yılları arasında belirlenen kriterlere göre en iyi performans gösteren yıl 2015'dir ve M&A performansı yıllara göre düşüş göstermektedir.

Anahtar Kelimeler: *Çok Kriterli Karar Verme, Birleşme ve Satınalma, Performans, MAIRCA, Entropi*

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Introduction

In recent days, with the contribution of developing technology and globalization, companies have opened international marketing from national markets. The strengthening of competition in the market and the lifting of economic borders around the world offer different opportunities to companies. These opportunities are to gain an increase in sales revenues and increase customer demand by entering new markets.

Firms can enter new international markets and launch new products. It also takes a great opportunity for more customer potential. Also, to grow internally, firms can grow externally by merging with another firm or buying it. With a growth strategy in the form of Mergers and Acquisitions (M&A), firms can react to the phenomenon of globalization and they achieve synergistic gains that will result from growth at the same time (İlarslan and Aşıkoğulu, 2012: 60).

Firms, can find new markets, increase market share, and gain control power in the market as the advantage of merging. However, the disadvantage is that the cultural conflict in different markets does not provide the expected return. Companies need to consider the advantages and disadvantages when moving to M&A (Karcığolu et al., 2019: 989). The M&A strategy has emerged as a preferred method to strengthen the position of corporate companies in the market and to prevent any threats that may encounter in the market (Agrawal et al., 2015: 385). M&A can facilitate rapid growth for companies. However, M&A play an active role in the capital market discipline M&A is a mechanism that positively contributes to market efficiency and maximizes public welfare. (Piesse et al., 2005: 541). The most common justification for M&A is to create economic synergy. Especially in the 2000s, the increase in the number of M&As contributed to the development in the relevant literatüre (Selçuk et all, 2016: 49). M&A means a big change for a business. This is a period of difficulty and disorder for the business. It is essential that every company involved in this process can better understand how the M&A process works (Koi-Akrofi, 2016: 49).

Economic developments in a country are linked to the economic situation in other countries in today's business world. (Mavlutova and Olevsky, 2015: 73). M&A has become an integral part of businesses around the world. Firms are always ready to seize the opportunity for competitive advantage and an increase in profitability (Zahid and Shah, 2011: 44). Parallel to the developments in the world, companies wants to reach more customers to enlarge their market share and increase their profits in companies in Turkey. Companies are engaged in cross-border merger activities. As a result of this, increasing the number of foreign partner companies in Turkey (İştar, 2014: 113-114).

In Turkey, it is limited statistical data related to mergers. For this reason, it is often not possible to provide numerical information on M&A. The oldest known history of company mergers in our country was realized in 1874 (Eyceyurt and Seçmeli, 2013: 160). Mergers after the 1950s especially began to be seen in public and banking sectors in Turkey. During this period, mergers were mostly made in order to regain and rescue banks, which were in a difficult situation. Parallel to the economic crises experienced after 1980, banks in distress were merged. These mergers and transfers were generally realized between banks in distress or a bank in distress was transferred to another bank that was stronger. The synergy effect expected from the mergers did not occur (Eyceyurt and Seçmeli, 2013: 160).

Referring to current information, (Deloitte 2019 Report on Turkey); the overall appearance of the M&A in Turkey, the total transaction volume in 2019 has been seen the lowest level after the financial crisis. It was realized as approximately 5.3 billion dollars with 233 transactions. The number of transactions decreased by 9% compared to the previous year. In M&A, total transaction volume contracted by 56%. When the transaction volume was very limited during a year, numerous start-up investments made by venture capital funds and angel investors ensured that the total number of transactions remained at the average level of the last 10 years. Foreign investors continued to pursue medium-scale investment opportunities within the framework of their strategic goals in 2019. Foreign investors accounted for 64% of the total transaction volume. Limited activity during the year caused foreign investors' transaction volume to decline to one of its historically lowest levels. Financial investors signed a total of 87 transactions in 2019 (Deloitte, 2020: 2).

M&A activities every year take shape according to changes in market conditions in Turkey. If its performance is evaluated in general terms, it is uncertain in terms of the criteria determined which year performed better. Multi-criteria Decision Making Method for Analysis was used in this study to eliminate this uncertainty. The main reason for choosing this method is to choose the best option from a range of viable alternatives in the presence of various conflicting criteria.

Multi-criteria decision making (MCDM) methods are widely used by many researchers in various fields of study (Palczewski and Salabun, 2019: 2294). MCDM methods have been used and proposed by previous researchers to deal with these complex selection problems that arise in today's modern production environment. The methods applied are being expanded by researchers.

Each selection problem basically consists of four main components; alternatives, qualification/criteria, the relative importance of each feature (weight), and performance measures of alternatives according to different properties. Such selection problems with the desired structure are quite suitable to be solved by using MCDM techniques. Therefore, the

main purpose of any MCDM approach is to select the best option from a range of viable alternatives in the presence of various conflicting criteria (Chakraborty and Zavadskas, 2014: 2).

There are many MCDM methods in the literature. Some of those; TOPSIS, VIKOR, ELECTRE and PROMETHEE, SAW, MULTIMOORA, MOOSRA, ARAS, MAUT methods. The common feature of all methods is that they offer the possibility to list alternatives or options. The preferred method of application is MAIRCA. While evaluating decision alternatives according to the criteria, the MAIRCA method was preferred because it is a method that calculates by considering their proximity to ideal ratings. In addition, considering the studies in which the method was performed, it is expected that the present study will contribute to the literature, as it is a new method and the studies using the MAIRCA method in the national literature on MCDM are limited. Compared to some of the other multi-criteria decision making methods (e.g. ELECTRE method), MAIRCA has been preferred because it is a relatively simple and new method that requires less computation time. Entropy method, which is one of the objective decision methods used in calculation of criterion weights in MCDM problems, uses only the data in the decision matrix during calculations. Since there is no need for any other subjective evaluation in the entropy method, it is frequently used in studies in the literature. The method is very easy to apply because it does not require any other subjective evaluation and is therefore preferred.

In this paper, an effort is made to justify the feasibility and correctness of the solution by using one of the MCDM methods. The paper is to investigate in accordance with the criteria set out in the framework of Turkey in the last 5 years of M & A data. How has M&A performance been in the last 5 years? Which year M&A performance is better? And is the MAIRCA method, one of the MCDM methods, suitable for this analysis? To find answers to questions; four criteria are set as constraints. These; the share of foreign investors in the total transaction volume (%), deal number, deal volume, the ratio of financial investor activities to the total transaction volume. Criterion weight coefficients were calculated with the entropy method. The performance of the years was also evaluated using the MAIRCA MCDM method.

This structure of the paper is as follows: first, a literature review are discussed. Previous studies with selected MCDM methods are mentioned. Then, the theories about the methods are mentioned and analyze. In the last part, the analysis results are given.

1. Literature review

MCDM methods are used in many application areas. These methods are widely used and preferred in the literature for alternatives selection and weighting the criteria.

The literature reviews are examined, there is an article in that the MCDM method. It was used in the study utilized in the field of M&A. Lee (2013) used the VIKOR method to evaluate the performance of three banks in the study. The result was from the three banks evaluated; it demonstrated that Bank B was the best M&A investment option. As a result, it was emphasized that the study constitutes a comprehensive decision-making evaluation model in M&A.

Some of the studies in different fields using MAIRCA and Entropy, which are MCDM methods, are summarized in Table 1.

Table 1. Studies in Different Fields with the MAIRCA and ENTROPY Methods

Studies Using the MAIRCA Method	
Selection of Railway Level Crossing	(Pamucar et al., 2014)
Selection of Sites for Ammunition Depots	(Gigovic et al., 2016)
Novel Approach to Group Multi-Criteria Decision Making Based on Interval Rough Numbers	(Pamucar et al., 2017)
Evaluation of Workers' Ergonomic Risk Levels	(Ekinci and Can, 2018)
Location Selection	(Pamucar et al., 2018), (Delice et al., 2019)
Supplier Selection	(Badi and Ballem, 2018)
Evaluation of Suppliers' Performance	(Chattarjee et al., 2018)
Evaluation of the Performance of Deposit Banks	(Ayçin and Orçun, 2019)
Selection of Catering Firm	(Ulutaş, 2019)
Material Selection	(Saraloğlu Güler and Can, 2020)
Financial Performance Analysis of Businesses	(Ayçin and Güçlü, 2020)
Operational Performance Assessment in the Airline Industry	(Bakır et al., 2020)
Location Optimization of International Logistics Centers	(Muravev et al., 2020)
Studies Using the ENTROPY Method	
Supplier Selection	(Shemshadi et al. 2011)
Evaluation of Areas	(Chen et al. 2015)
Evaluation of the Tourism Sector	(Karaatlı, 2016)

Evaluating the Quality of Life of Countries	(Ömürbek et al.,2017)
Evaluation of Bank Performance	(Akçakanat et al., 2017), (Topak and Çanakçıoğlu, 2019),
Production System Selection	(Ulutaş, 2018)
Evaluation of OECD Countries Performance	(Koca et al., 2018)
Evaluation of Activities of Innovative Initiatives	(Çınaroğlu, 2020)
Identification of critical factors in the construction industry	(Dehdasht et al., 2020)
Financial Performance Analysis of Businesses	(Ayçin and Güçlü, 2020)
Material Selection for Automotive Piston	(Dev et al, 2020)

2.Entropi Method

Entropy was first defined by Rudolph Clausius (1865) and expressed as a measure of the disorder and uncertainty that exist in a system (Zhang et al., 2011: 444). The entropy method uses available data and measures the amount of useful information obtained from this data. (Wu, 2011: 5163). Criterion weights are calculated using the Entropy Method. The weight of all indicators determined according to the index distribution degree is calculated by information entropy (Akyene, 2012: 10).

***Step 1*:** Standardization of indexes;

If the decision matrix is X, m alternatives and n indicators; to eliminate the effect of index size on immeasurability, it is necessary to standardize the indexes using the relative optimum membership degree equations (Li et al., 2011: 2087);

To the benefit indexes, the attribute value of the jth index in the ith X matrix can be transformed by;

$$r_{ij} = x_{ij} / \max_{ij} \qquad (i = 1\ldots,m;\ j = 1,\ldots, n) \tag{1}$$

To the cost indexes, the attribute value of the jth index in the ith X matrix can be transformed by;

$$r_{ij} = \min_{ij} / x_{ij} \qquad (i = 1\ldots,m;\ J = 1,\ldots, n) \tag{2}$$

Step 2: If the decision matrix is X, m alternatives and n indicators; (Akyene, 2012: 10, Dashore et al, 2013: 2183).

In matrix X, feature weight p_{ij} is of the ith alternatives to the jth factor;

$$P_{ij} = \frac{a_{ij}}{\sum_{i=1}^{m} a_{ij}}; \forall_j \tag{3}$$

Step 3: The output entropy E_j of the jth factor becomes;

$$E_j = -k \sum_{j=1}^{m} \left[P_{ij} \ln P_{ij} \right]; \forall_j \qquad k : (\ln(n))^{-1} \tag{4}$$

k: coefficient of entropy

E_j: value of entropy

Step 4: The variation coefficient of the jth factor: *d*j can be determined by the following equation:

$$d_j = 1 - E_j; \forall_j \tag{5}$$

Step 5: Calculate the weight of entropy w_j;

$$w_j = \frac{d_j}{\sum_{j=1}^{m} d_j}; \forall_j \tag{6}$$

3. MAIRCA Method

MAIRCA (MultiAtributive Ideal-Real Comparative Analysis) method was proposed by Gigovic et al. as one of the MDCM methods. The MAIRCA method is based on identifying the gaps between ideal and empirical ratings. The sum of the gaps is calculated for each criterion. The calculated total value gives the total gap for each alternative observed. The ranking of the alternatives is done at the last stage. The best alternative in the ranking is the one with the lowest gap value. This alternative is the one with the closest values to the ideal rating by many criteria. (Pamucar et al., 2018: 1646; Gigovic et al., 2016:11).

The 6 steps of the MAIRCA method are shown.

Step 1: The Initial decision matrix is defined as X. The criteria values obtained for each alternative are as shown in equation (7).

$$X = \begin{array}{c} \\ A_1 \\ A_2 \\ \dots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccc} C_1 & C_2 & \dots & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \dots & \dots & \dots & \dots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix} \end{array} \quad x_{ij},\ i = 1, 2, \dots .n;\ j = 1, 2, \dots m \tag{7}$$

The criteria in the X matrix can be qualitative or quantitative. While the values taken from quantitative criteria for an alternative are directly addressed, the values of qualitative criteria are formed by the priorities of decision-makers.

Step 2: Determining preferences for the choice of alternatives $P_{ai.}$ Decision-makers being neutral in the selection of alternatives; shows that each of the proposed alternatives is of equal importance. It is an assumption of the method that the decision-maker has not assigned probability values for any alternative selection. m being the total number of alternatives; i. the priority of the alternative is calculated by using the expression (8).

$$P_{Ai} = \frac{1}{m}; \sum_{i=1}^{m} P_{Ai} = 1, i = 1,2,\dots,m \tag{8}$$

Each alternative is at an equal distance from the decision-maker. All priorities are equal to each other as shown in expression (9).

$$P_{A1} = P_{A2} = \dots = P_{Am} \tag{9}$$

Step 3: Creating the theoretical ranking matrix (T_p): n is the total number of criteria and m is the total number of alternatives. (T_p) is an mxn matrix, the elements of the matrix are calculated by multiplying the priorities of the alternatives P_{Ai} with the criterion weights $W_{ij.}$ The theoretical rating matrix is as shown in equation (10).

$$T_p = \begin{array}{c} \\ P_{A1} \\ P_{A2} \\ \dots \\ P_{Am} \end{array} \begin{array}{c} \begin{array}{cccc} W_1 & W_2 & \dots & W_n \end{array} \\ \begin{bmatrix} t_{p11} & t_{p12} & \dots & t_{p1n} \\ t_{p21} & t_{p22} & \dots & t_{p2n} \\ \dots & \dots & \dots & \dots \\ t_{pm1} & t_{pm2} & \dots & t_{pmn} \end{bmatrix} \end{array} = \begin{array}{c} \\ P_{A1} \\ P_{A2} \\ \dots \\ P_{Am} \end{array} \begin{array}{c} \begin{array}{cccc} W_1 & W_2 & \dots & W_n \end{array} \\ \begin{bmatrix} P_{A1}.w_1 & P_{A1}.w_2 & \dots & P_{A1}.w_n \\ P_{A2}.w_1 & P_{A2}.w_2 & \dots & P_{An}.w_n \\ \dots & \dots & \dots & \dots \\ P_{Am}.w_1 & P_{Am}.w_2 & \dots & P_{Am}.w_n \end{bmatrix} \end{array} \tag{10}$$

Since the priorities of all alternatives are equal, the (Tp) matrix is shown in equation (11) as the row vector.

$$T_p = P_{A1} \begin{bmatrix} W_1 & W_2 & \dots & W_n \\ t_{p11} & t_{p12} & \dots & t_{p1n} \end{bmatrix} = P_{A1} \begin{bmatrix} W_1 & W_2 & \dots & W_n \\ p_{A1}.w_1 & p_{A1}.w_2 & \dots & p_{A1}.w_n \end{bmatrix} \tag{11}$$

***Step 4*:** Defining the real rating matrix (T_r); the elements of the real rating matrix are shown in equation (12).

$$T_r = \begin{array}{c} \\ A_1 \\ A_2 \\ \dots \\ A_m \end{array} \begin{array}{c} \begin{array}{cccc} C_1 & C_2 & \dots & C_n \end{array} \\ \begin{bmatrix} t_{r11} & t_{r12} & \dots & t_{r1n} \\ t_{r21} & t_{r22} & \dots & t_{r2n} \\ \dots & \dots & \dots & \dots \\ t_{rm1} & t_{rm2} & \dots & t_{rmn} \end{bmatrix} \end{array} \tag{12}$$

To obtain the (Tr) matrix, the theoretical rating matrix (Tp) and the initial decision matrix X is used.

Matrix elements; use equation (13) for the benefit type criteria and equation (14) for the cost type criteria.

$$t_{rij} = t_{pij} \cdot \left(\frac{x_{ij} - x_j^{\min}}{x_j^{\max} - x_j^{\min}} \right) \tag{13}$$

$$t_{rij} = t_{pij} \cdot \left(\frac{x_{ij} - x_j^{\max}}{x_j^{\min} - x_j^{\max}} \right) \tag{14}$$

$x_j^{\max}$ is the higher value of the criterion from the alternative ($x_j^{\max} = \max(x_1, x_2, \dots x_m)$),

$x_j^{\min}$ is the lower value the criterion gets from the alternative. ($x_j^{\min} = \min(x_1, x_2, \dots x_m)$)

Step 5: Calculation of Total Gap Matrix: The Gap Matrix (G) is calculated by taking the difference between the theoretical rating matrix (T_p) and the real rating matrix (T_r). Equality (15) and equation (16) are used for calculation.

$$G = T_p - T_r = \begin{bmatrix} g_{11} & g_{12} & \dots & g_{1n} \\ g_{21} & g_{22} & \dots & g_{2n} \\ \dots & \dots & \dots & \dots \\ g_{m1} & g_{m2} & \dots & g_{mn} \end{bmatrix} = \begin{bmatrix} t_{p11} - t_{r11} & t_{p12} - t_{r12} & \dots & t_{p1n} - t_{r1n} \\ t_{p21} - t_{r21} & t_{p21} - t_{r21} & \dots & t_{p2n} - t_{r2n} \\ \dots & \dots & \dots & \dots \\ t_{pm1} - t_{rm1} & t_{pm2} - t_{rm2} & \dots & t_{pmn} - t_{rmn} \end{bmatrix} \tag{15}$$

$$g_{ij} = t_{pij} - t_{rij} \qquad g_{ij} \in [0, (t_{pij} - t_{rij}))$$

$$g_{ij} = \begin{cases} 0, & if t_{pij} = t_{rij} \\ t_{pij} - t_{rij}, & if t_{pij} \succ t_{rij} \end{cases} \tag{16}$$

Defining the total gap by alternatives, if for a criterion (C_j), the theoretical rating value (t_{pij}) of an alternative (A_i) and its real rating value (tr_{ij}) are equal and non-zero, the gap will be zero $g_{ij} = 0$. So for this criterion (C_j), this alternative (A_i) would be the ideal alternative (A^+_i).

Or if the theoretical rating value (tpij) and real rating value (trij) of an alternative (Ai) for a criterion (Cj) equals zero (tpij = trij = gij = 0). In this case, for this criterion (Cj), this alternative (Ai) will be expressed as the worst alternative (A-i).

Step 6: The calculation of the final values of criteria functions (Q_i) by alternatives: The value of the criterion functions is calculated by summing the rows of the gap matrix (G) for each alternative and equation (17) is used.

$$Q_i = \sum_{j=1}^{n} g_{ij} \quad i = 1,2,\dots,m \tag{17}$$

Finally, the alternatives are ranked according to the final criteria function values. The alternative with the smallest final criterion function value is determined as the best alternative.

4. Analysis Of M&A Data By Entropy-Based Mairca Method

This paper has focused on examining data for the last five years of M&A in Turkey. The aim of the study is to analyze the M&A data from 2015 to 2019 with the Mairca method to rank the year and determine which year is better. The data are derived from Deloitte's 2019 annual reports.

As Deloitte points to in its annual report, the data does not include capital market transactions, real estate sales, intra-group share transfers, IPOs and transactions of financial institutions within the framework of debt restructuring (Deloitte, Annual Report, 2019).

The weight coefficients have been determined by applying the entropy method. 4 criteria were considered to determine the performance of the years. The criteria used for the study were shown in Table 2.

Table.2. Criteria and Criterion Label

Criteria	Criterion Label
The Share of Foreign Investors in the Total Transaction Volume(%)	K1
Deal Number (Number)	K2
Deal Valume (Billion US$)	K3
The Ratio of Financial Investor Activities to the Total Transaction Volume (%)	K4

4.1.Calculation of Criteria Weights with the ENTROPY Method

The Entropy method was applied to evaluate the weight of each criterion. The evaluation process was shown in follows; In the first step, the analysis started with the creation of the decision matrix. The matrix was as shown in Table 3.

Table 3. Desicion Matrix

	K1	K2	K3	K4
2015	70	245	16.4	19
2016	52	246	7.3	22
2017	53	295	10.3	25
2018	63	256	12	8
2019	64	233	5.3	17

In the second step, all criteria used in the study were evaluated as benefit criteria. Expression (1) was used to calculate the normalized decision matrix. The normalized decision matrix was shown in Table 4.

Table 4. The Normalized Decision Matrix

	K1	K2	K3	K4
2015	0.231788079	0.192156863	0.319688109	0.208791209
2016	0.17218543	0.192941176	0.142300195	0.241758242
2017	0.175496689	0.231372549	0.200779727	0.274725275
2018	0.208609272	0.200784314	0.233918129	0.087912088
2019	0.21192053	0.182745098	0.10331384	0.186813187

In the third step, expression (4) was used to calculate the E_{ji} value. First, the value of K=1/ln.n was calculated.

K=1/*ln*5= 0, 621334. The $R_{ij}xln_{ij}$ values of the criteria was shown in Table 5. Then E_{ji} values were calculated. The E_{ij} values of criteria was shown in Table 6.

Table 5. $R_{ij}xln_{ij}$ Values of the Criteria

	K1	K2	K3	K4
2015	-0.338858359	-0.31695184	-0.36457533	-0.327054835
2016	-0.302905734	-0.317459608	-0.277459254	-0.343252474
2017	-0.305387949	-0.338666039	-0.32236126	-0.354940572
2018	-0.326951703	-0.322364037	-0.339832539	-0.21375103
2019	-0.328804013	-0.310605082	-0.234520757	-0.313406426
Sum	-1.602907756	-1.606046607	-1.53874914	-1.552405337

Table 6. E_{ji} Values of the Criteria

E_j	0.995942586	0.997892863	0.956078596	0.964563669

In the fourth step, expression (5) was used to calculate the D_{ji} value and D_{ji} values of criteria was shown in Table 7.

Table 7. D_{ij} Values of the Criteria

					Σ
D_j	0.004057414	0.002107137	0.043921404	0.035436331	0.085522

In the fifth step, the calculation of criterion weights was obtained by using the expression (6) and was as shown in Table 8.

Table 8. Weight of Criteria by Entropy Method

	K1	**K2**	**K3**	**K4**
W_i	0.04744	0.02464	0.51357	0.41435

According to the analysis result, the criterion with the highest entropy weight; (0.51357) with an index score "Deal Volume" criterion. This criterion can be expressed as the most important performance criterion for this application. Following, (0.41435) with an index score "The Ratio of Financial Investor Activities to the Total Transaction Volume" criterion was the second most important criterion.

4.2.Application with Entropy Based Mairca Method

In the first step, the decision matrix was formed. In the second step, expression (8) was used to determine the decision maker's preferences for alternatives, and priority values (PA_i) of the alternatives were determined. The following preferences were obtained;

$$PA_i = \frac{1}{5} = 0{,}20$$

In the third step, the theoretical ranking matrix (Tp) was created with expression (12) and was shown in Table 9.

Table 9. Theoretical Ranking Matrix

K1	**K2**	**K3**	**K4**
0.009488	0.004928	0.102714	0.08287

In the fourth step, since all of the criteria were wanted to get the highest value, they were evaluated as maximum criteria values. Thus, using expression (13), the normalization process was applied for the maximum criteria. After, the real ranking matrix (T_+) was created using expression (12) and was shown in Table 10.

Table 10. Real Ranking Matrix

	K1	**K2**	**K3**	**K4**
2015	0.009488	0.000954	0.102714	0.053622
2016	0	0.001033	0.018507	0.068246
2017	0.000527	0.004928	0.046268	0.08287
2018	0.005798	0.001828	0.061999	0
2019	0.006325	0	0	0.043872

In the fifth step, the calculation of the total gap matrix was carried out using the expression (15) and was showed in Table 11.

Table 11. Total Gap Matrix

	K1	K2	K3	K4
2015	0	0.003974	0	0.029248
2016	0.009488	0.003895	0.084207	0.014624
2017	0.008961	0	0.056446	0
2018	0.00369	0.0031	0.040715	0.08287
2019	0.003163	0.004928	0.102714	0.038998

In the next step, using the values in the total gap matrix and using the expression (17), the final criteria function values (Qi) were calculated for each year. The performance ranking of the years has been made and was shown in Table 12.

Table 12. The alternatives ranked by the MAIRCA method

Altenative	Q_i	Rank
2015	0.033222	1
2016	0.112214	3
2017	0.065407	2
2018	0.130375	4
2019	0.149802	5

By summarizing, considering the final ranking results, the year that operated best was 2015. Following, 2017, 2016, 2018, and finally 2019 were released.

Conclusion

In this paper, Turkey's M&A performance by the predetermined criteria are intended to be evaluated. For problems involving many alternatives and criteria, MCDM methods are a good choice. In this study, the choice of the MCDM method was deemed appropriate for data using. These methods, which are used in many areas, are highly preferred to evaluate performance as mentioned in the literature review. The Entropy method was used to determine the criterion weights and K3 and K4 criteria were found with the highest criterion coefficient. The high coefficients of these criteria affect the analysis result. Alternatives were sorted by using the criteria weights assigned from the entropy method in the MAIRCA method. 2015 was the best performance year in the last 5 years.

Considering the reasons for the best performance of 2015, the worries about economic growth in recent periods, the disputes with the world economy, the volatility in the exchange rate, the security problems in our country's close geography, especially in 2019, the M&A volume was $ 2.9 billion and the last fifteen It was observed to be at the lowest level of the year. In addition to the world agenda, it has been observed that domestic political and economic developments affect investors' appetite and transaction volume. As a result of this study, the observation of poor performance in the last five years supports the result of the study.

The use of the MAIRCA method was found to be appropriate in line with the criteria and alternatives determined in the study. In future studies, the results of the studies can be compared with different MCDM methods. The consistency and accuracy of the analyzes can be increased. It is also seen in this study that MCDM methods can be used in performance evaluation in different sectors and companies within the framework of different criteria and healthy results can be obtained. In the future, the performance of companies with similar financial characteristics can be evaluated using the MAIRCA method and it can contribute to having an idea in advance. At the same time, the preferred method in the study; is seen that it can be used in accordance with the criteria and alternatives determined in decision-making problems that may be experienced in the economy, finance, trade, business and similar fields.

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