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The Race of Financial Performance: Evidence from XKURY in Türkiye

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ABSTRACT

This research aims to rank the 32 companies in the BIST Corporate Governance Index according to their financial performance. MARCOS and ARAS, which are among MCDM techniques, are used as methods for ranking the companies in the study. The dataset is prepared by averaging the year–end balance sheets for the years 2020, 2021 and 2022. The data used for the analysis are current ratio, cash ratio, return on assets ratio, return on equity ratio, leverage ratio and asset turnover ratio. In the research, the importance weight of the criteria was calculated by CRITIC method. According to the CRITIC method, the criterion with the highest importance weight was the asset turnover rate. The companies were also ranked with the MARCOS and ARAS methods. Some differences were detected in the ranking. Spearman's ranking correlation coefficient revealed a strong positive linear relationship between the rankings from the MARCOS and ARAS methods. The results of the two methods were validated by Spearman's correlation analysis.

Keywords: *Corporate Governance, MCDM, MARCOS, ARAS, CRITIC, Financial Performance*

Finansal Performans Yarışı: Türkiye XKURY Örneği

ÖZET

Bu çalışmada BIST Kurumsal Yönetim Endeksi'nde yer alan 32 şirketin finansal performanslarına göre sıralanması amaçlanmaktadır. Çalışmada şirketlerin sıralaması ÇKKV tekniklerinden MARCOS ve ARAS kullanılarak yapılmıştır. Veri seti 2020-2021-2022'e ait yılsonu bilançolarının ortalaması alınarak hazırlanmıştır. Analiz için kullanılan veriler cari oran, nakit oran, aktif karlılık oranı, özsermaye karlılık oranı, borç/kaynak oranı ve aktif devir hızıdır. Çalışmada kriterlerin önem ağırlığı CRITIC yöntemi ile hesaplanmıştır. CRITIC yöntemine göre en yüksek önem ağırlığına sahip kriter, aktif devir hızı çıkmıştır. MARCOS ve ARAS yöntemi ile şirketlerin sıralaması yapılmıştır. Sıralamada bazı farklılıklar tespit edilmiştir. Spearman'ın sıralama korelasyon katsayısı, MARCOS ve ARAS yöntemlerinden gelen sıralamalar arasında güçlü bir pozitif doğrusal ilişki olduğunu ortaya koymuştur. Böylelikle iki yöntemin sonuçlarının güvenirliği Spearman'ın sıralama korelasyon analizi ile desteklenmiştir.

Anahtar Kelimeler: *Kurumsal Yönetim, ÇKKV, MARCOS, ARAS, CRITIC, Finansal Performans*.

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1. INTRODUCTION

It is extremely important for companies operating in the increasingly competitive environment of the global world to be able to maintain their continuity in both domestic and international markets, and to adapt to market conditions. The development of technology has eliminated traditional shopping opportunities, forcing companies to constantly innovate in all aspects of their activities (Güney, 2018).

In this context, corporate governance emerged as a concept in the 1990s under the leadership of the United Nations and the World Bank. It refers to good state management (Aktan, 2013) and quickly became a management philosophy that was approved and accepted in the business world, international organizations, the academic community, and governments.

Effective management of corporate governance practices can enhance transparency and increase investor trust. Additionally, such practices can reduce risks for companies, making them more competitive both domestically as well as internationally. This, in turn, can make them more attractive to investors (Turnacıgil, 2018). Furthermore, a company with effective corporate governance can enhance its liquidity and financing opportunities, leading to a reduced cost of capital (Öztürk & Demirgüneş, 2008).

This study aims to evaluate the companies' financial performances indexed in BIST Corporate Governance Index based on data from 2020 to 2022 by ranking them with MCDM methods. Financial performance indicators such as cash, current, leverage, return on assets, asset turnover and return on equity ratios are used. In the study, the concept of corporate governance and its theoretical background, literature review, and analysis are given respectively. The study concludes with a discussion of the findings and a general evaluation of the subject.

1.1. Corporate Finance

There are numerous definitions of corporate governance in the literature by various researchers and institutions. One of the first definitions of corporate governance was made by Millstein, who defined it as 'the order of relations between top managers, shareholders, and the board of directors'. Millstein also defined the concept of corporate governance broadly as 'all of the rules of stock exchange listing, laws, regulations, and voluntary rules determined by the private sector' (Millstein, 1998). According to Shleifer and Vishny (1997), the definition of corporate governance is a mechanism that ensures trust between investors and companies and that both parties receive a return on their investment. Corporate governance, as defined by the Organisation for Economic Co-operation and Development (OECD), is a set of rules and practices that govern the relationship between a company's shareholders and managers, and its stakeholders, such as employees and creditors. It contributes to financial growth and stability by promoting financial market integrity, market safety and economic efficiency (OECD, 2005). Furthermore, while the World Bank (1995) defines corporate governance as a system by which organizations can

be controlled and directed (Zuva and Zuva, 2018). Barras defines it as a system of procedures which is controlled by individual companies. (Barras, 2007, as cited in Dağlı et al., 2010).

Looking at the studies conducted around the world on how corporate governance emerged and developed, the first corporate governance traces appear in corporate bankruptcies and scandals. Apart from these, many other factors have an impact on corporate governance. Some of these factors can be listed as the increase in international economic investments, globalization, international capital movements and the weight of private capital, mergers and acquisitions, financial crises, widespread share ownership and investment demands. In Türkiye, corporate governance studies emerged with the impact of inappropriate credit transactions in banks and the 2001 economic crisis. Although corporate governance practices started late in Türkiye, this gap has been gradually closed with the regulations of regulatory bodies that benefit from best practice examples (Karakılıç, 2018; Doğan, 2007).

Although corporate governance practices vary from country to country, there are four basic principles that are generally accepted in international approaches to corporate governance. These four principles are transparency, responsibility, fairness, and accountability. Corporate governance is the way in which companies are managed in accordance with these four principles. The principles of corporate governance include treating all stakeholders equally, sharing all information with stakeholders and shareholders, respecting the rules that reflect the values of society and being accountable for the activities undertaken. The corporate governance approach enhances company liquidity, reduces the cost of capital, and provides financing opportunities. It also plays a crucial role in supervising, developing, and structuring financial markets and companies (Öztürk & Demirgüneş, 2008).

The principle of transparency in corporate governance requires companies to provide open, comparable, and accurate information to the public during the assessment process. This enables investors to allocate their resources effectively and to obtain information of a satisfactory quality. Investors examine not only the financial reports of the companies to which they will allocate their savings, but also whether these companies are well managed. In order for investors to have the opportunity to choose among institutions or organizations with corporate governance practices, the practice of corporate governance index should be developed (Keküllüoğlu, 2008).

According to the responsibility principle of corporate governance, the board of directors should demonstrate to the shareholders that they are accountable and at the same time the board of the board should play an effective role in the company (Şehirli, 1999). An important role in the choices and decisions of the company should be played by the board, which should be primarily responsible. Therefore, a company should properly define the responsibilities of the board of directors in order to be better managed (TÜSİAD, 2002).

Corporate governance is defined by the principle of fairness as the need for companies to strike a balance, and this balance can only be achieved by taking into account the interests of stakeholders. Therefore, when making a decision, management should determine its

strategy by considering all stakeholders, not just shareholders. This is because the sustainability and long-term profitability of a company is only possible if it acts with all its stakeholders in mind (Tuzcu, 2004).

Corporate governance creates an opportunity for the creation of systems where management performance is monitored impartially in line with the principle of accountability, and for the performance of these companies to improve. These companies that implement corporate governance principles will be a source of reference for other companies (Özger, 2009).

In Türkiye, corporate governance principles were first approved and announced to the public by the Capital Markets Board of Türkiye (CMB) on 4 July 2003. During this period, when the corporate governance principles were introduced into the capital markets legislation and into Türkiye, the companies whose shares are traded on the Borsa Istanbul (BIST) were not required to implement these principles. However, in order to increase the implementation of these principles and to raise public awareness on this issue, comprehensive studies have been carried out by the board. Some of these studies are determining the drafts of compliance reports on corporate governance principles and making the preparation of these reports mandatory, establishing a separate index based on the level of compliance with corporate governance principles in BIST, and evaluating shareholders' compliance with corporate governance principles (SPL, 2016).

Corporate governance conformity rating is a qualitative rating activity that questions the corporate governance practices of companies within the framework of the established corporate governance principles (Güçlü, 2010). The CMB has established rules and principles for the corporate governance rating process. The corporate governance rating approach reflects an opinion on the value given by companies to shareholders' rights, their relations with stakeholders, public disclosure activities and the overall credibility of the company's board of directors (Karakılıç, 2018). Accordingly, rating agencies assign corporate governance ratings to companies in light of the principles established by the CMB. The corporate governance rating determined by the CMB is calculated and assigned by rating agencies as a result of an assessment of companies that act in accordance with corporate governance principles. The corporate governance rating published by the CMB based on the corporate governance principles is classified into four categories (Karğın et al., 2015). These are:

a. “The board of directors (35%)”
b. “Shareholders (25%)”
c. “Public disclosure and transparency (25%)”
d. “Stakeholders (15%)”

Based on CMB's Corporate Governance Principles, CMB–authorized rating agencies determine the degree of compliance with these principles by companies applying for ratings after a detailed 3–4 week review. At the end of this period, the rating expert assigns a score between 1 and 10. This is then announced to the public. The process continues after the

rating is announced. For 12 months, these companies are closely monitored by the rating agencies in terms of corporate governance. If there is a significant development in this process, this is also reflected in the rating score. The rating is calculated as the company score, which is composed of the individual items shown above with percentages and the sum of these items (Dağlı et al., 2010).

The Corporate Governance Index (XKURY) has been calculated at Borsa Istanbul since 2007 in order to promote the concept of corporate governance. It is an index that includes Corporate Governance Index companies whose shares are traded on Borsa Istanbul markets (excluding C–list and Detention Market). It is composed of the shares of companies traded in the Main Market, Sub Market and Star Market whose compliance with corporate governance principles is at least 8 out of 10 and at least 7 out of 10 for each main item (BIST, n.d.). Companies that implement corporate governance principles are included in this index (Kargın et al., 2015).

In Türkiye, the initial value of the Corporate Governance Index was 48,082.17 and it started to be calculated on 31.05.2007. In 2007, there were 5 companies in this index (SAHA, n.d.) and as of 2023, this number increased to 51 (KAP, n.d.).

1.2. Literature Review

Numerous studies have been conducted to investigate the potential relationship between a company's financial performance and corporate governance, and if so, at what level and what effect it has (Klein et al., 2005; Horváth and Spirollari, 2012; Sarkar et al., 2012; Arora et al., 2018). Horváth and Spirollari (2012) investigated the effect of corporate governance on firm performance from the perspective of board characteristics. They found that insider ownership has a positive effect on performance, while the presence of independent directors has a negative effect on performance. In a study by Çarıkçı et al. (2009), the authors examined the stock market index return and the volatility of returns using ARCH and GARCH models with the XKURY index. The study found no significant relationship between the two variables. Furthermore, panel data analysis was used to investigate whether the inclusion of companies in the corporate governance index affects their financial performance. The results showed that there was no significant relationship between corporate governance and profitability (Erdoğan and Demir, 2015). However, a significant relationship was found between corporate governance and market capitalization (Vuran and Kömeçoğlu, 2018). Contrary to previous studies, while Gergin and Kıymetli Şen (2019) examined the impact of including banks traded on Borsa Istanbul on the corporate governance index on firm performance but found no significant association using panel data analysis of data from 2012 to 2017, Bhagat and Bolton (2008) found a positive relationship between current and future financial performance of a firm and corporate governance indexes. On the other hand, Sakarya (2011), with his case study, utilizing the 2009 data of the companies included in the XKURY index for the first time, suggested that above–normal returns can be obtained from stocks with the announcement of corporate ratings of companies. Furthermore, a case study was conducted to investigate whether there

is a relationship between the stock returns of companies included in the XKURY index and the announcement of corporate governance ratings, and it was found that there is no positive relationship between them (Sakarya et al., 2017). Kevser and Doğan (2021) found a significant and strong effect of rating announcements on stock returns using the Paired t-test and Pearson correlation test with data from 2007–2019. The study conducted simple and multiple linear regression methods to test the relationship between corporate governance practices and the financial performance of companies in Croatia's CROBEX index. The results revealed that corporate governance practices are a significant factor in explaining the performance of the companies in the index (Korent et al., 2014). Similarly, Amba (2014) found that corporate governance variables had a significant impact on the performance of companies listed on the Bahrain stock exchange, using the multiple regression method. While Zelenyuk and Zheka (2006) tested the hypothesis that the relationship between corporate governance and firm performance is positive for Ukraine, Kraft et al. (2013) investigated the relationship between corporate governance, value and firm performance in the USA. In both studies, the results demonstrated a positive relationship between firms that adopt corporate governance practices and the performance of these firms. Also, Ertuğrul and Hedge (2009) gave further evidence supporting the relationship between two terms. The study by Karamustafa et al. (2009) analyses the relationship between corporate governance and firm performance. The findings indicate significant differences in some financial indicators for periods prior to and subsequent to the incorporation of corporate governance into the index.

The relationship between corporate governance and financial performance has also been examined in the literature using multi–criteria decision making methods (MCDM). Ege et al. (2013) measured the financial performance of companies in the XKURY index with the TOPSIS method using data from 2009–2011. The study revealed no positive relationship between TOPSIS ranking and the ranking created by corporate governance ratings. Ünlü et al. (2017) discovered, similar to Ege et al. (2013), that there is no significant difference in performance between companies included and excluded in the XKURY index, using 2014 data of BIST–30 companies. Esendemirli and Erdener Acar (2016) measured the financial performance of the companies included in the index by using TOPSIS method and similarly revealed that performance and corporate governance ratings are not directly proportional when data from 2013 and 2014 are used. Temizel et al. (2016), on the other hand, ranked the financial performance of the companies in the index by taking the averages of the 5–year data between 2011 and 2015 and revealed that the companies with LOGO, TRCAS, MGROS, TTRAK and PRKME codes ranked high. Kundakçı and Arman (2023) utilized the Improved IDOCRIW and MABAC methods to measure the financial performance of real estate investment trusts included in the index from 2020 to 2022. Their findings revealed that companies with AKMGY and HLGYO codes demonstrated more stable and higher performance compared to other real estate investment trusts. Yavuz and Sönmez (2023) also evaluated the performance of companies in the index from 2019 to 2021 using CRITIC–MABAC and ENTROPI–MABAC methods.

The scope of the study is BIST Corporate Governance Index (XKURY). As a method, MCDM techniques were utilized. A review of the literature reveals that the majority of studies examining the XKURY index employ a range of MCDM techniques, including TOPSIS. This study employs a distinctive methodology, utilizing MARCOS and ARAS This study ranked companies included in the corporate governance index using CRITIC based MARCOS and ARAS.

2. METHOD

2.1. Data and Methodology

This study aims to evaluate the financial performance of companies in the BIST XKURY index using the MCDM methods MARCOS and ARAS. The criteria weights were calculated using the CRITIC method and included in the analysis. The steps of CRITIC, MARCOS and ARAS methods are as follows.

2.2. CRITIC

CRITIC, which stands for Criteria Importance Through Intercriteria Correlation, is an objective weighting method proposed by Diakoulaki et al. in 1995 that uses the standard deviation of the criteria and the correlation between them. The CRITIC method is carried out in four stages: (Diakoulaki et al., 1995; Jahan et al., 2012).

First Step: To create and normalize decision matrix

x_j^{max} = "Maximum value of the criterion j among alternatives"

x_j^{min} = "j. Minimum value of the criterion j among alternatives"

"i =1,2,3.., m" refers alternatives

"j =1,2,3.., n" refers criteria.

$$r_{ij} = \frac{x_{ij} - x_j^{min}}{x_j^{max} - x_j^{min}} \quad (1)$$

$$r_{ij} = \frac{x_j^{max} - x_{ij}}{x_j^{max} - x_j^{min}} \quad (2)$$

Equation (1) is used to normalize the decision matrix for beneficial criteria, and Equation (2) is used for cost criteria.

Second Step: Determining the degree of relationship between criteria

The correlation values Pjk between criterion j and criterion k are calculated using the rij (normalization) values obtained after the normalization process and Equation (3).

$$P_{jk} = \frac{\sum_{i=1}^{m}\left(r_{ij} - \overline{r_j}\right)\left(r_{ik} - \overline{r_k}\right)}{\sqrt{\sum_{i=1}^{m}\left(r_{ij} - r_j\right)^2 \sum_{i=1}^{m}\left(r_{ik} - r_k\right)^2}} \qquad (j,k= 1,2,3\ldots n) \qquad (3)$$

Third Step: Calculating C_j

σJ: Represents the standard deviation value of the Criterion j and it is calculated using Equation (4). After calculating the standard deviation Cj is calculated usin Equation (5).

$$\sigma_j = \sqrt{\frac{\sum_{i=1}^{m}\left(r_{ij} - \overline{r_j}\right)^2}{m}} \qquad (4)$$

$$C_j = \sigma_j \sum_{k=1}^{n}(1 - P_{jk}) \qquad (j=1,2,3\ldots..n) \qquad (5)$$

Fourth Step: Obtaining the criteria weights.

At this step, the Cj value of each criterion j is divided by the sum of the criterion values and the weight values are obtained using Equation 5.

$$W_j = \frac{C_j}{\sum_{k=1}^{n}(C_k)} \qquad (j,k=1,2,\ldots..n) \qquad (6)$$

2.3. MARCOS

MARCOS, which stands for 'Measurement Alternatives and Ranking according to Compromise Solution', is a method of MCDM introduced to the literature in 2019 by Stevic, Pamucar, Puska, and Chatterjee. The method involves measuring alternatives and ranking them according to a compromise solution process (Stevic et al., 2019). It is based on defining the relationship between alternatives and reference values. Based on this relationship, the alternatives' utility functions are determined. Using the determined utility function, a compromise ranking is created according to ideal and anti-ideal solutions (Stevic and Brkovic, 2020). The MARCOS method consists of seven steps (Stevic et al., 2019).

First Step: Constructing the decision matrix.

Second Step: Constructing extended initial decision matrix

Ideal (AI) and anti-ideal (AAI) solutions are added to the initial matrix to form an expanded initial matrix as shown in Equation (7).

$$X^G = \begin{array}{c} \\ A_1 \\ A_2 \\ \vdots \\ A_m \\ AI \\ AAI \end{array} \begin{array}{c} \begin{array}{cccc} C_1 & C_2 & \dots & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ x_{m1} & x_{m1} & \cdots & x_{mn} \\ x_{ai1} & x_{ai2} & \cdots & x_{ain} \\ x_{aa1} & x_{aa2} & \cdots & x_{aan} \end{bmatrix} \end{array} \tag{7}$$

Equation (8) is used to calculate the beneficial criteria and Equation (9) is used to calculate the cost criteria when determining (AI) and (AAI) values.

$$AAI = \min_i x_{ij}, \quad \text{if it is a beneficial criteria} \quad (j \in B)$$

$$AI = \max_i x_{ij}, \quad \text{if it is a beneficial criteria} \quad (j \in B) \tag{8}$$

$$AAI = \max_i x_{ij}, \quad \text{if it is a cost criteria} \quad (j \in C)$$

$$AI = \min_i x_{ij}, \quad \text{if it is a cost criteria} \quad (j \in C) \tag{9}$$

Third Step **:** Normalizing the extended initial decision matrix.

Equation (10) is used to obtain the normalized initial matrix (N) for the beneficial criterion, and Equation (11) is used for the cost criterion.

$$n_{ij} = \frac{x_{ij}}{x_{ai}} \qquad j \in B \tag{10}$$

$$n_{ij} = \frac{x_{ai}}{x_{ij}} \qquad j \in C \qquad (11)$$

Fourth Step **:** Constructing weighted matrix.

The weighted matrix (V) is obtained using Equation (12).

$$v_{ij} = n_{ij} w_j \qquad (12)$$

Fifth Step **:** Calculating the utility degree of the alternatives.

Equations (13) and (14) are utilized to determine the degrees of utility in relation to ideal and anti–ideal solutions. The Si value is the sum of the weighted matrix elements, which is calculated using Equation (15).

$$K_i^+ = \frac{S_i}{S_{ai}} \qquad (13)$$

$$K_i^- = \frac{S_i}{S_{aai}} \qquad (14)$$

$$S_i = \sum_{i=1}^{n} v_{ij} \qquad \text{……...(15)}$$

Sixth Step **:** Calculating the utility function of the alternatives.

The utility function shows the solution of the observed alternative with respect to the ideal and anti–ideal solution. The utility function of the alternatives is calculated using the Equation (16). $f(K_i^+)$ represents the utility function of ideal solution and calculated with Equation (17). $f(K_i^-)$ represents the utility function of anti–ideal solution and calculated with Equation (18).

$$f(K_i) = \frac{K_i^+ + K_i^-}{1 + \frac{1 - f(K_i^+)}{f(K_i^+)} + \frac{1 - f(K_i^-)}{f(K_i^-)}} \qquad (16)$$

$$f(K_i^+) = \frac{K_i^-}{K_i^+ + K_i^-} \qquad (17)$$

$$f(K_i^-) = \frac{K_i^+}{K_i^+ + K_i^-} \tag{18}$$

Seventh Step : Ranking the alternatives.

During the final step of the solution phase, the alternatives are ranked based on the final values of their respective utility functions. During the final step of the solution phase, the alternatives are ranked based on the final values of their respective utility functions. These final values are obtained using Equation (16). It is important that the utility function has the highest value, as the alternative with the highest value will be considered the most preferred option.

2.4. ARAS

ARAS, or Additive Ratio Assessment, is a Multiple Criteria Decision Making (MCDM) method proposed by Zavadskas and Turskis in 2010 (Zavadskas and Turskis, 2010). The ARAS method is unique in that it compares the utility function values of alternatives with the utility function value of the optimal alternative added by the researcher (Sliogeriene et al., 2013). The ARAS method determines the proportional similarity of all alternatives in the application phase to the ideal alternative (Dadelo et al., 2012). The ARAS method is carried out in four steps (Zavadskas and Turskis, 2010):

First Step*:* Creating the decision matrix.

In the method, a row consisting of the optimal values of each criterion is added at the top row while creating the decision matrix.

The decision matrix is denoted as X;

$$X = \begin{bmatrix} x_{01} & x_{0j} & \dots & x_{on} \\ x_{i1} & x_{ij} & \dots & x_{in} \\ \dots & \dots & \dots & \dots \\ x_{m1} & x_{mj} & \dots & x_{mn} \end{bmatrix} \quad ; \quad i = 0,1,\dots,m \quad j = 0,1,\dots,n \tag{19}$$

"m: number of alternatives",

"n: number of criteria",

" x_{ij} : the value of alternative I for criteria j",

" x_{oj} : the optimal value of criteria j.

If the optimal value of a criterion is uncertain or unknown for the decision problem, the optimal value is determined using Equation (20) and Equation (21), depending on the beneficial/cost characteristic of the criterion.

If it is a beneficial criteria : $x_{oj} = \max_i x_{ij}$ (20)

If it is a cost criteria : $x_{oj} = \min_i x_{ij}$ (21)

Second Step: Normalizing the decision matrix. The normalized decision matrix $\bar{X}$ is determined by $\bar{x}_{ij}$ values. $\bar{x}_{ij}$ values are calculated according to the beneficial/cost characteristics of the criterion. If it is a beneficial criterion, the normalized values are calculated using the Equation (22).

$$\bar{x}_{ij} = \frac{x_{ij}}{\sum_{i=0}^{m} x_{ij}} \tag{22}$$

If the criterion is desired to be minimized, the normalization process is two phased. First phase is to transform the cost criteria to beneficial criteria and second phase is to normalize the value. These steps are calculated using Equation (23) and Equation (24).

$$x_{ij}^{*} = \frac{1}{x_{ij}} \tag{23}$$

$$\bar{x}_{ij} = \frac{x_{ij}^{*}}{\sum_{i=0}^{m} x^{*ij}} \tag{24}$$

Third Step: Creating the weighted normalized decision matrix.

$\hat{X}$ weighted normalized decision matrix is calculated by Equation (25) using the obtained w_{ij} weigths and the normalized decision matrix. Each weights assigned to a criteria must be between 0 and 1. The condition in Equation (25) must be met.

$$\hat{x}_{ij} = \bar{x}_{ij}\, w_{ij} \tag{25}$$

$$\sum_{j=1}^{n} w_j = 1 \tag{26}$$

Fourth Step: Calculating optimality values.

In this stage, the optimality values for each alternative in the weighted decision matrix are obtained. The Si values of the alternatives are calculated using Equation (27).

$$S_i = \sum_{j=1}^{n} \hat{x}_{ij}, \qquad i= 0,1,...,m \tag{27}$$

S_i : refers to the optimality function value of alternative i.

The S_i values of the alternatives are divided by the optimal value of S_0 and the K_i utility degrees are obtained using Equation (28).

$$K_i = \frac{S_i}{S_0}, \qquad i= 0,1,...,m \tag{28}$$

In the last step, the calculated values are ranked from largest to smallest. The alternative with the largest value is expressed as the most preferred alternative.

The data set of the study consists of companies included in the BIST Corporate Governance Index. As frequently encountered in the literature, companies belonging to financial institutions were excluded from the 51 companies in the index due to the different structure of their balance sheets, and 32 companies were included in the data set. The year-end balance sheet averages of these companies for the years 2020, 2021 and 2022 were used in the data set. Public Disclosure Platform (KAP) and Stockeys (stockeys.com) were utilized to create the data set.

The study evaluated companies' financial performance based on six criteria listed in Table 1. These criteria were determined by reviewing the criteria used in similar studies.

Table 1. Variables Used in the Study

The Group Variables	Name of the Variable	Abbreviation
Liquidity Ratios	**Current Ratio**	**CR**
	Cash Ratio	CashR
Profitability Ratios	Return on Assets	ROA
	Return on Equity	ROE
Financial Structure Ratios	Leverage Ratio	LR
Operating Ratios	Asset Turnover	AT

Among the variables used, the "Leverage Ratio" within the financial structure ratios is taken as cost criteria, while the other criteria are considered as beneficial criteria. The 32 companies evaluated for the analysis and their codes are presented in detail in Table 2.

Table 2. Companies and Their Codes

“Aksa Akrilik Kimya Sanayi A.Ş.””	Q1
“Aksa Enerji Üretim A.Ş.”	Q2
“Anadolu Efes Biracılık ve Malt Sanayii A.Ş.”	Q3
“Arçelik”	Q4
“Aselsan Elektronik Sanayi ve Ticaret A.Ş.”	Q5
“Aydem Yenilebilir Enerji A.Ş.”	Q6
“Aygaz A.Ş.”	Q7
“Batıçim Batı Anadolu Çimento Sanayi A.Ş.”	Q8
“Biotrend Çevre ve Enerji İşletmeciliği ve Hizmetleri A.Ş.”	Q9
“Coca-Cola İçecek A.Ş.”	Q10
“Consus Enerji İşletmeciliği ve Hizmetleri A.Ş.”	Q11
“Doğuş Otomotiv Servis ve Ticaret A.Ş.”	Q12
“Enerjisa Enerji A.Ş.”	Q13
“Enka İnşaat ve Sanayi A.Ş.”	Q14
“Ereğli Demir Çelik Fabrikaları A.Ş.”	Q15
“Galata Wınd Enerji A.Ş.”	Q16
“Hürriyet Gazetecilik ve Matbaacılık A.Ş.”	Q17
“İhlas Ev Aletleri İmalat Sanayi Ve Ticaret A.Ş.”	Q18
“İskenderun Demir ve Çelik A.Ş.”	Q19
“Kimteks Poliüretan Sanayi ve Ticaret A.Ş.”	Q20
“Konrtolmatik Teknoloji Enerji ve Mühendislik A.Ş.”	Q21
“Logo Yazılım Sanayi Ve Ticaret A.Ş.”	Q22
“Migros Ticaret A.Ş.”	Q23
“Otokar Otomotiv Ve Savunma Sanayi A.Ş.”	Q24
“Park Elektrik Üretim Madencilik Sanayi ve Ticaret A.Ş.”	Q25
“Pegasus Hava Taşımacılığı A.Ş.”	Q26
“Pınar Entegre Et ve Un Sanayi A.Ş.”	Q27
“Pınar Su ve İçecek Sanayi ve Ticaret A.Ş.”	Q28
“Pınar Süt Mamulleri Sanayii A.Ş.”	Q29
“Qua Granıte Hayal Yapı ve Ürünleri Sanayi Ticaret A.Ş.”	Q30
“Türk Prysmian Kablo ve Sistemleri A.Ş.”	Q31
“Türkiye Şişe ve Cam Fabrikaları A.Ş.”	Q32

Source: Company names are taken from Public Disclosure Platform (KAP, n.d.).

3. RESULTS

CRITIC method was applied to the analysis to determine the weights of the criteria. The application results of the CRITIC method are as follows.

3.1. CRITIC Result

The Decision Matrix for the CRITIC method is presented in Table 3.

Table 3. Decision Matrix

Companies	CR	LR	AT	ROA	ROE	CashR
Q1	1.300	60.610	1.243	19.570	51.783	46.503
Q2	1.207	47.673	1.137	11.097	23.460	14.313
Q3	1.163	54.033	0.653	2.130	9.510	56.337
Q4	1.340	74.873	1.093	5.217	20.743	40.273
Q5	1.420	46.280	0.540	17.357	32.423	22.447
Q6	1.420	53.660	0.107	-0.723	-1.653	97.857
Q7	1.120	59.080	2.427	15.727	38.827	40.087
Q8	0.567	79.830	0.700	-12.870	-60.617	5.227
Q9	1.157	74.300	0.410	7.187	28.883	28.100
Q10	1.617	56.847	0.940	8.370	21.797	83.477
Q11	0.547	64.047	0.363	2.127	5.957	7.850
Q12	1.303	55.453	3.057	32.230	75.563	48.803
Q13	0.810	68.240	1.320	14.903	45.660	12.763
Q14	2.893	23.187	0.310	5.033	6.520	225.043
Q15	2.690	31.457	0.733	11.703	17.687	95.673
Q16	3.460	36.567	0.370	23.397	36.123	254.100
Q17	0.807	33.733	0.297	0.617	1.130	1.340
Q18	5.440	17.727	1.080	17.957	21.910	8.457
Q19	3.317	27.623	0.833	11.797	16.217	50.790
Q20	1.323	72.437	1.307	15.580	56.273	42.687
Q21	1.883	66.030	0.817	16.013	49.770	55.740
Q22	1.107	53.313	0.600	16.343	37.733	61.557
Q23	0.710	95.197	2.290	2.937	9.543	29.950
Q24	1.313	78.970	0.883	16.703	75.737	21.420
Q25	1.747	12.500	0.100	22.370	25.640	79.453
Q26	0.950	83.220	0.340	-1.033	-3.940	59.713
Q27	1.420	29.073	0.777	9.930	13.840	10.087
Q28	0.400	69.693	0.630	-9.633	-39.420	5.137
Q29	1.110	43.453	1.100	4.683	8.237	1.500
Q30	1.453	55.717	0.850	28.857	68.413	30.913
Q31	1.187	75.707	2.043	4.327	19.027	18.143
Q32	2.177	44.587	0.573	11.167	24.677	55.863

After obtaining the decision matrix, the weights of the criteria were calculated with the stages of the CRITIC method. The resulting criteria weights are presented in Table 4.

Table 4. Criteria Weights Abtained From CRITIC Method

Criteria	**CR**	**LR**	**AT**	**ROA**	**ROE**	**CashR**
W_j	0.1367	0.1912	0.2256	0.1243	0.1411	0.1810

Based on the calculations, ADR (Asset Turnover Rate) is the criterion with the highest importance weight. The weights of the criteria will be used in the application process of the MARCOS and ARAS methods to rank the alternatives.

3.2. MARCOS Result

Table 5 shows the results obtained using the MARCOS method, based on the decision matrix in Table 3 and the criteria weights in Table 4.

Table 5. Ranking Result of the MARCOS Method

Companies	“ S_i ”	“ K_i^- ”	“ K_i^+ ”	“ $f(K^-)$”	“ $f(K^+)$”	“ $f(K)$”	**Rank**
Q1	0.369	-3.0989	0.3690	-0.1352	1.1352	0.3631	8
Q2	0.261	-2.1927	0.2611	-0.1352	1.1352	0.2569	21
Q3	0.188	-1.5769	0.1878	-0.1352	1.1352	0.1848	26
Q4	0.234	-1.9633	0.2338	-0.1352	1.1352	0.2301	23
Q5	0.271	-2.2722	0.2706	-0.1352	1.1352	0.2663	19
Q6	0.152	-1.2761	0.1519	-0.1352	1.1352	0.1495	27
Q7	0.409	-3.4375	0.4093	-0.1352	1.1352	0.4028	5
Q8	-0.063	0.5290	-0.0630	-0.1352	1.1352	-0.0620	32
Q9	0.193	-1.6214	0.1931	-0.1352	1.1352	0.1900	25
Q10	0.284	-2.3887	0.2844	-0.1352	1.1352	0.2799	16
Q11	0.103	-0.8632	0.1028	-0.1352	1.1352	0.1011	30
Q12	0.601	-5.0506	0.6014	-0.1352	1.1352	0.5918	1
Q13	0.304	-2.5571	0.3045	-0.1352	1.1352	0.2996	14
Q14	0.391	-3.2800	0.3905	-0.1352	1.1352	0.3844	7
Q15	0.344	-2.8889	0.3440	-0.1352	1.1352	0.3385	11
Q16	0.518	-4.3520	0.5182	-0.1352	1.1352	0.5100	2
Q17	0.118	-0.9950	0.1185	-0.1352	1.1352	0.1166	28
Q18	0.467	-3.9256	0.4674	-0.1352	1.1352	0.4600	3
Q19	0.343	-2.8833	0.3433	-0.1352	1.1352	0.3379	12
Q20	0.358	-3.0071	0.3581	-0.1352	1.1352	0.3524	9
Q21	0.338	-2.8388	0.3380	-0.1352	1.1352	0.3327	13
Q22	0.294	-2.4702	0.2941	-0.1352	1.1352	0.2895	15
Q23	0.262	-2.2041	0.2624	-0.1352	1.1352	0.2583	20
Q24	0.349	-2.9333	0.3493	-0.1352	1.1352	0.3437	10

Q25	0.433	-3.6381	0.4332	-0.1352	1.1352	0.4263	4
Q26	0.109	-0.9146	0.1089	-0.1352	1.1352	0.1072	29
Q27	0.247	-2.0704	0.2465	-0.1352	1.1352	0.2426	22
Q28	-0.016	0.1350	-0.0161	-0.1352	1.1352	-0.0158	31
Q29	0.199	-1.6679	0.1986	-0.1352	1.1352	0.1954	24
Q30	0.403	-3.3843	0.4030	-0.1352	1.1352	0.3966	6
Q31	0.277	-2.3288	0.2773	-0.1352	1.1352	0.2729	18
Q32	0.279	-2.3472	0.2795	-0.1352	1.1352	0.2751	17
AI	1.000						

The MARCOS method results indicate that 'Doğuş Otomotiv Servis ve Ticaret A.Ş.' with the code Q12 is the best performing company. Following closely are Q16 'Galata Wind Enerji A.Ş.' and Q18 'İhlas Ev Aletleri İmalat Sanayi ve Ticaret A.Ş.' as the second and third best performing companies, respectively. On the other hand, the three worst performing companies are Q8 'Batıçim Batı Anadolu Çimento Sanayi A.Ş.', Q28 'Pınar Su ve İçecek Sanayi ve Ticaret A.Ş.', and Q11 'Consus Enerji İşletmeciliği ve Hizmetleri A.Ş.'

3.3. ARAS Result

The decision matrix for the ARAS method analysis was created by adding the optimal value to the decision matrix in Table 3. The ARAS method was then applied, taking into account the criteria weights obtained through the CRITIC method. The results of the ARAS method application can be found in Table 6.

Table 6. Optimality Function Values of the ARAS Method

	Σ	**K**	**Rank**
Optimal Value	0.102		
Q1	0.036	0.351	8
Q2	0.025	0.245	21
Q3	0.020	0.192	24
Q4	0.023	0.228	23
Q5	0.026	0.255	19
Q6	0.018	0.172	27
Q7	0.039	0.386	6
Q8	-0.005	-0.052	32
Q9	0.019	0.187	25
Q10	0.029	0.287	15
Q11	0.010	0.098	30
Q12	0.057	0.562	1
Q13	0.029	0.282	16
Q14	0.044	0.432	4
Q15	0.035	0.348	9
Q16	0.056	0.553	2
Q17	0.012	0.113	29

Q18	0.045	0.439	3
Q19	0.034	0.335	11
Q20	0.035	0.340	10
Q21	0.033	0.327	12
Q22	0.029	0.288	14
Q23	0.025	0.250	20
Q24	0.033	0.326	13
Q25	0.044	0.428	5
Q26	0.012	0.120	28
Q27	0.024	0.232	22
Q28	-0.001	-0.009	31
Q29	0.019	0.185	26
Q30	0.038	0.376	7
Q31	0.027	0.260	18
Q32	0.028	0.275	17

Based on the ARAS method, 'Doğuş Otomotiv Servis ve Ticaret A.Ş.' with the code Q12 is the best performing company, according to the MARCOS method. The second and third best performing companies are Q16 'Galata Wind Enerji A.Ş.' and Q18 'İhlas Ev Aletleri İmalat Sanayi ve Ticaret A.Ş.', respectively. The top three worst performing companies are Q8 'Batıçim Batı Anadolu Çimento Sanayi A.Ş.', Q28 'Pınar Su ve İçecek Sanayi ve Ticaret A.Ş.' and Q11 'Consus Enerji İşletmeciliği ve Hizmetleri A.Ş.'.

The financial performance of the companies in the BIST Corporate Governance Index was analyzed using the MARCOS and ARAS methods. Table 7 displays the differences in company rankings between the two methods. To examine the relationship between the rankings obtained, Spearman's rank correlation coefficient was calculated. The data in Table 7 were used for the calculation.

Table 7. MARCOS and ARAS Ranking of Companies Indexed in XKURY

Companies	**MARCOS Ranks**	**ARAS Ranks**
Q1	8	8
Q2	21	21
Q3	26	24
Q4	23	23
Q5	19	19
Q6	27	27
Q7	5	6
Q8	32	32
Q9	25	25
Q10	16	15
Q11	30	30
Q12	1	1
Q13	14	16

Q14	7	4
Q15	11	9
Q16	2	2
Q17	28	29
Q18	3	3
Q19	12	11
Q20	9	10
Q21	13	12
Q22	15	14
Q23	20	20
Q24	10	13
Q25	4	5
Q26	29	28
Q27	22	22
Q28	31	31
Q29	24	26
Q30	6	7
Q31	18	18

The STATA program was used to calculate Spearman's rank correlation coefficient. The null and alternative hypotheses for the calculation were established.

h_0: There is no relation between the ranking of MARCOS method and ARAS method.

h_A: There is a relation between the ranking of MARCOS method and ARAS method.

The data obtained as a result of the calculation is presented in Table 8.

Table 8. Result of the Spearman's Rank Correlation

Observations Number (Companies)	32
Spearman's Rank	0.9919
Prob.	0.00

Upon examination of the analysis results, the null hypothesis of 0.00<0.05 is rejected. This indicates a positive, high linear relationship in the same direction between the ranking obtained from the MARCOS method and the ranking obtained from the ARAS method, with a 95% confidence level. Therefore, Spearman's rank correlation analysis supports the reliability of the results from both methods.

4. CONCLUSION and RECOMMENDATIONS

This study analyzes the financial performance of companies included in the BIST Corporate Governance Index using the MARCOS and ARAS methods to measure and rank performance based on six criteria. The CRITIC method is used to determine the weights of

the criteria, with the asset turnover rate being the most important criterion. The asset turnover rate is considered to be more important than other criteria in determining a company's performance.

Based on the MARCOS and ARAS method, 'Doğuş Otomotiv Servis ve Ticaret A.Ş.' was identified as the best performing company among 32 companies due to its high asset turnover ratio, which had a determining effect on the weights of other criteria. Additionally, the company's high return on assets and return on equity contributed to its high performance. 'Galata Wind Enerji A.Ş.' was identified as the second highest performing company. The company's cash ratio is significantly higher than that of its competitors. Among the companies evaluated, İhlas Ev Aletleri İmalat Sanayi ve Ticaret A.Ş. performed the third best, likely due to its very low leverage ratio. The worst performing companies were Batıçim Batı Anadolu Çimento Sanayi A.Ş., Pınar Su ve İçecek Sanayi ve Ticaret A.Ş., and Consus Enerji İşletmeciliği ve Hizmetleri A.Ş. These companies share a common characteristic of having high leverage ratios and negative return on assets and equity, which has negatively impacted their performance.

In the study, the reliability of company rankings was tested by using two different MCDM methods. In the performance ranking of the companies, it is seen that the companies in the top three and the last three in both methods are the same companies. However, there were some changes in the general rankings of the companies, although they were very similar. The correlation between the company rankings obtained from both methods was analyzed using Spearman's rank correlation coefficient. The results indicate a strong positive correlation between the rankings obtained from both methods, confirming the reliability of the results obtained from MARCOS and ARAS methods. Thus, the reliability of the results obtained from MARCOS and ARAS methods has been confirmed once again.

This study analyses the financial performance of companies in XKURY and ranks them accordingly. The aim is to determine the position of these companies within similar company groups. Additionally, this study is expected to provide companies with a fresh perspective on their competitive environment and offer insights into the key factors they should consider when competing with rivals. The study is also anticipated to contribute to new research and aid in the analysis of financial performance among various company groups that employ different MCDM methods. Various criteria can be addressed in different studies. Additionally, the impact of situations such as pandemics, natural disasters, and financial crises on company performance can be examined in detail. This study is expected to provide guidance for researchers. The findings of the study comprise a ranking of the companies included in the XKURY index over the specified period. It is therefore thought that comparisons with the results obtained in similar studies conducted over different periods may lead to the generation of misleading interpretations.

The purpose of this study was to rank the financial performance of companies in the corporate governance index for academic purposes only. The data used and ranking results obtained were solely for this purpose and do not provide any investment advice. The study

ranked the financial performances of companies in the index but did not measure the effect of their inclusion in the index. In future studies, researchers could expand the scope to measure the effect of inclusion in the corporate governance index compared to exclusion from the index.

Statement of Research and Publication Ethics

In all stages of the research and publication process, the principles of research and publication ethics set out by the Journal of Manisa Celal Bayar University Graduate School of Social Sciences were adhered to.

Contribution Rate of Authors to the Article

All authors were responsible for making an equal contribution to the study.

Declaration of Interest

The authors have no financial or personal interests that could be perceived as influencing their work.

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