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Research Article/Araştırma Makalesi

Assessing Food and Beverage Companies During a Time of Crisis: A Comparative MCDA Approach

Gıda ve İçecek Firmalarının Kriz Zamanında Değerlendirilmesi: Karşılaştırmalı Bir ÇKKA Yaklaşımı

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Abstract

Financial performance analysis plays a pivotal role in assisting companies achieve their future goals more decisively and in identifying the shortcomings in their competition with their rivals. Multi-Criteria Decision Analysis (MCDA) methods are used in complex scenarios where decisions can be made in different variations based on more than one criterion. During the pandemic, uncertainty increased in all capital markets and the volatility of financial instruments was intensely felt. To that end, the performance of 23 companies listed in the Food and Beverage index of Borsa Istanbul, which is an emerging market, between the years 2020 and 2022, corresponding to the pandemic period, will be analyzed in this study. In the research, where 6 accounting and valuation-based ratios were used as criteria, CRITIC objective weighting technique was integrated and analyzes were made with VIKOR, GRA, TOPSIS, SAW, FUCA, ELECTRE III and COPRAS methods. The results of this research are noteworthy as it is the first study on the relevant index that includes 7 different methods comparatively. Interestingly, as a result of the study, the VIKOR method provided the most sustainable success in this period of historical uncertainty, while the FUCA method took the second place.

Jel Codes: *D81, G11, G23*

Keywords: *Capital Markets, Share Return, MCDA*

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Öz

Şirketlerin gelecek ile ilgili belirlemiş oldukları rotalara daha kararlı bir şekilde varmaları ve rakipleri ile rekabetlerinde aksayan yönlerini tespit etmeleri açısından finansal performans analizleri pivot bir rol üstlenmektedir. Kararların birden fazla kriter üzerinden farklı varyasyonlarda verilebildiği karmaşık durumlarda Çok Kriterli Karar Analizi (ÇKKA) yöntemleri kullanılmaktadır. Pandemi sürecinde tüm sermaye piyasalarında belirsizlik artmış ve finansal varlıklarda artan düzeyde volatilite hissedilmiştir. Bu amaçla, bu çalışmada gelişmekte olan bir piyasa olan Borsa İstanbul'un Gıda ve İçecek endeksinde yer alan 23 şirketin pandemi dönemine denk gelen 2020-2022 yılları arasındaki performansı analiz edilecektir. Kriter olarak 6 muhasebe ve değerlemeye dayalı oranın kullanıldığı araştırmada, CRITIC objektif ağırlıklandırma tekniği tercih edilmiş ve VIKOR, GRA, TOPSIS, SAW, FUCA, ELECTRE III ve COPRAS yöntemleriyle analizler yapılmıştır. Bu çalışmanın sonuçları, ilgili endekste 7 farklı yöntemin karşılaştırmalı olarak kullanıldığı ilk çalışma olması açısından dikkat çekicidir. İlginçtir ki, çalışma sonucunda VIKOR yöntemi bu tarihi belirsizlik döneminde en sürdürülebilir başarıyı sağlarken, FUCA yöntemi ikinci sırada yer almıştır.

Jel Kodları: *D81, G11, G23*

Anahtar Kelimeler: *Sermaye Piyasaları, Hisse Getirisi, ÇKKA*

1. Introduction

Financial performance can be defined as the ability of a company to generate new resources from its daily activities within a selected time period (Aktan & Bulut, 2008). From this perspective, it is a type of financial check-up that shows how the company is managed compared to its competitors. Firms that have responsibilities to their investors, creditors and policy makers should perform regular financial health checks, that is, measure and manage their performance, in order to always be one step ahead in the modern competitive conditions shaped by sustainability. Calculating the financial performance of firms is a complex problem that needs to be decided on multiple issues, since it is based on multiple criteria and the financial performance of companies should be measured and ranked in portfolio selection. For this purpose, multi-criteria decision analysis (MCDA) applications have been utilized for the measurement of financial performance.

MCDA methods are exercised through mathematical methods that help decision makers by rational evaluation and ranking in complex situations that are encountered in real life and include multiple alternatives and criteria (Lootsma, 1999). This subject, on which many studies have been made, has created an area of interest that has been researched at an increasing rate since the 1960s and has not lost its popularity.

Türkiye's agricultural economy demonstrated significant boom, ranking first in Europe in 2020. In 2021, it created employment for approximately 18% of the working population in Türkiye and contributed to 5.5% of the GDP. The sector contribution to GDP in 2021 is approximately 45 billion US dollars (Investment Office, 2022). Although the Borsa Istanbul (BIST) Food and Beverage Index experienced shocks like other sectors in the first couple of months of the pandemic, it managed to show a better performance compared to the BIST100 index in the relevant period (Levent, 2020).

BIST Food and Beverage Index has been traded since 1996 and currently consists of 37 companies. During the pandemic, where health and high technology sectors outperformance positively, many sectors around the world, including Türkiye, were negatively affected by this phenomenon. In this study, companies traded in the BIST Food and Beverage index will be analyzed through various MCDA methods. In previous research concerning Food and Beverage companies listed on BIST, analyzes were conducted with only one or two methods. In this context, conducting this study with 7 different methods will fill an important gap in the literature. With the methodology applied in this study, the method that produced the most optimum results for financial decision makers will be revealed. Thus, the two hypotheses of the study were determined as follows.

H_1: There is a relationship between the stock returns of companies in the Food and Beverage sector and the method outputs calculated according to various MCDA applications.

H_2: There is a statistically significant association between the share returns of companies in the Food and Beverage sector and the outputs of various MCDA methods.

In this study, 23 enterprises traded on BIST Food and Beverage index in the 2 years between 2020 and the 2022, when the pandemic was at its peak, will be analyzed in terms of their financial performance. In practice, analyzes will be made with TOPSIS, COPRAS, SAW, FUCA,

VIKOR, ELECTRE III and GRA methods over the CRITIC objective weighting technique, and by establishing the relationship between the method scores that measure the financial performance of these firms and the returns of the relevant shares, the most appropriate methods will be suggested to the decision makers. Although this process draws the attention of many academics and investors, there is no comparative MCDA study on the financial performance of the Food and Beverage companies traded on BIST via implementing 7 popular methods from different schools during pandemic.

2. Literature Review

MCDA applications are used in complex scenarios where there is more than one criterion. Considering the fact that there are more than 200 methods, which method will give more optimum results in accordance with the structure of the problem to be solved is a phenomenon in itself. In this study, 7 MCDA methods, which are particularly used in financial performance studies, are analyzed. However, the multidisciplinary nature of MCDA applications makes it possible to use related methods to solve various problems in broad scope of scientific fields. To illustrate, VIKOR method has been used in the evaluation of metaverse platforms (Isabels et al., 2024), cyber security assessment in transportation systems (Tanaji & Roychowdhury, 2024), disease diagnosis (Mohammed et al., 2020), selection of a suitable location for an airport (Sennaroğlu & Çelebi, 2018) and supplier selection (Wu et al., 2016). GRA method has been preferred in transportation safety assessment (Zhou et al, 2024), supplier selection (Leong et al., 2022), healthcare industry management (Qahtan et al., 2022) and risk management (Korkusuz et al., 2020). TOPSIS method has been applied in environmental performance evaluation (Parashar et al., 2024), project management for renewable energy (Solangi et al., 2021), drug shortage management (Moosivand et al., 2021), energy planning (Ervural et al., 2018), project evaluation (You et al., 2017) and determination of charging station location for electric vehicles (Guo & Zhao, 2015). SAW method has been integrated into analyses for the selection of internet-based systems (Radulescu & Radulescu, 2024), the identification of erosion-prone land (Sampath & Radhakrishnan, 2024) and the selection of equipment for manufacturing (Venkateswarlu & Sarma, 2016). FUCA method has been used in road infrastructure assessment (Ruiz-Vélez et al., 2024), water pump selection (Trung et al., 2024), and brand value applications (Elma et al., 2024). ELECTRE III was the preferred method in the recent research concerning power station location selection (Mao et al., 2024), material selection (Chen et al., 2024) and geothermal energy analysis (Polatidis et al., 2015). COPRAS method has been used in studies covering treatment policy selection (Ali et al, 2024), waste management (Chaurasiya & Jain, 2022), supplier selection in the healthcare sector (Sumrit, 2020) and risk management (Wang et al., 2016). On the other hand, in addition to the methods used in this study, past financial performance studies on other methods frequently used in the literature are given below.

Chang (2006) investigated the Taiwanese banks via 20 accounting data derived between 2000 and 2002, using GRA method. As regards to the analysis findings, 15 banks examined were ranked according to their performance. Ho & Wu (2006) explored 3 Austrian banks through GRA. They suggested this method, because of its success in producing consistent results in

financial performance analysis. Bayrakdaroğlu & Ege (2008) examined 45 Turkish banks with AHP method, using the ratios obtained from their financial statements between 2001 and 2006. As a result of the financial performance analysis, deposit banks are found to be more successful than other type of banks.

In another study, companies operating in Lithuania were scrutinized with ARAS, TOPSIS and VIKOR methods in order to determine the sector with the highest financial performance (Balezentis et al., 2012). Türkmen & Çağıl (2012) scrutinized 12 BIST IT firms via utilizing 8 accounting metrics with TOPSIS, on the period of 2007-2010. As a result, they found that the company with the best performance has not changed for the whole period analyzed, in the financial performance ranking study. Uyguntürk & Korkmaz (2012) examined 13 BIST enterprises with 8 accounting data and TOPSIS, for the period of 2006-2010. They established that, the first two and the last two companies were found to be remained the same, while the companies in between changed through time, considering the performance ranking. Doğan (2013) inspected 10 banks in BIST with 10 accounting metrics and GRA, for the period of 2005-2011. He identified that the relative performance of banks with higher return on assets also found to be more successful in terms of financial performance.

TOPSIS method was used in a study examining the financial performance of 20 Food and Beverage companies traded on BIST between 2009 and 2012 (Aytekin & Sakarya, 2013). In the relevant study, rankings were made according to annual financial performance and the most successful companies were revealed. For the financial performance analysis of 16 banks operating in Iran, the electronic payment efficiency criterion was taken as a basis and calculations were made accordingly using DEA and TOPSIS methods (Hemmati et al., 2013). Related study integrated Entropy weighting method, and demonstrated that only 9 banks worked effectively and private banks performed higher among others. Özdemir & Demireli (2013) investigated 12 Turkish deposit banks by implementing the analytical network process (ANP) as the weighting method along with TOPSIS and VIKOR as the MCDA methods, for the period 2011-2012. In the study, 6 accounting ratios were used as criteria, and only one bank was found to be in the same order for both methods in the entire period examined.

TOPSIS method was used in the financial performance study on commercial and participation banks operating in Türkiye, and as a result participation banks were found to be more profitable and successful in the period analyzed between 2003 and 2011 (Bağcı, 2013). In addition, 12 commercial banks operating in Türkiye were analyzed through 17 financial ratios in another study using FAHP and Fuzzy TOPSIS methods (Akkoç & Vatansever, 2013). As a result of this research, which preferred fuzzy methods due to the uncertainty environment created by the global financial crisis, both methods were found to be produced similar rankings.

Bakırcı et al. (2014) scrutinized 14 BIST metal industry firms through DEA and TOPSIS methods. They exercised accounting metrics for the period 2009-2011, in order to rank the relevant companies in regards to their performance. According to the methodology of the study, the best performing companies in this sector were determined and the rankings created by the two methods were compared. Ultimately, the best performing company in both methods was found to be the same. Mandic et al. (2014) investigated 35 Serbian banks with utilizing fuzzy

AHP as the weighting technique and TOPSIS as the MCDA method. They applied 8 accounting metrics for the period of 2005-2010. They demonstrated that capital and net income factors were the most critical variables that affect the performance of banks. Akbulut & Rençber (2015) inspected 32 BIST manufacturing firms with TOPSIS via 10 criteria from the data between 2010 and 2012. Consequently, the association between share returns and the performance scores of the main metal industry has been found to be significant and positive.

Shaverdi et al. (2016) investigated the performance of 7 petrochemical companies operating in Iran using the fuzzy TOPSIS method along with fuzzy AHP technique. They integrated the ratios obtained from the financial statements between 2003 and 2013, and revealed that the companies were ranked in accordance with the sector averages. The performance of a company operating in the food sector in Türkiye between 2005 and 2014 was analyzed over 13 accounting ratios, in another study (Ömürbek & Eren, 2016). PROMETHEE, MOORA and COPRAS methods were preferred in that research, and the performance of the company was determined throughout the whole period analyzed. In the aforementioned analysis, MOORA and COPRAS methods were found to be produced similar results.

88 South East Asian banks were analyzed using the fuzzy AHP weighting method and ranked according to their financial performance using the TOPSIS method, in another research (Wanke et al., 2016). Chelmis et al. (2017) concentrated on measuring football clubs playing in the Greek Super League between 2012 and 2014, in regards to their performance. They integrated PROMETHEE II method, and revealed that most football teams were financially vulnerable and experienced economic turmoil. Interestingly, smaller teams have been found to be much healthier financially than larger teams.

Yüksel et al. (2017) examined 23 Turkish deposit banks via 13 accounting metrics retrieved from the financial statements of 2015. They performed the analyzes using DEMATEL weighting technique along with GRA and MOORA methods. The 9-month financial performance of 23 Food and Beverage businesses operating in BIST during the pandemic was analyzed with the MAIRCA method in a study (Kehribar et al., 2021). According to the analysis results, the relevant companies are ranked according to their performance. In another study, the financial performance of 26 companies traded in the BIST Food and Beverage index between 2015 and 2020 was examined through the PROMETHEE method (Akbulut & Şenol, 2021). In the study where annual financial performances were determined, companies were ranked according to their performances in the relevant years.

In a dynamic MCDA study about evaluating the credit risk of bank customers, analyzes were made with the ARAS-G, TOPSIS-G, COPRAS-G, VIKOR-G and SAW-G methods over the dynamic DEA weighting method (Dahooie et al., 2021). The results of the study were found to be in line with the findings of previous classical studies in the same field.

3. Methodology

The criteria used in this study were selected from both classical accounting-based and modern valuation-based ratios in order to capture the most accurate picture about the industry. The vital criticism about accounting-based ratios is that they only focus on the firms' past (Martin

& Petty, 2000). However, valuation-based ratios, which are perceived as vital in modern studies, are based on the cash flows that the firm will potentially create in the future (Erasmus, 2008). This study utilized return on equity (ROE), average collection period (ACP), earnings per share (EPS) and return on assets (ROA) as popular accounting metrics which regarded as critical in the performance studies integrating MCDA methods. In addition, market-to-book (M-to-B) and market value added (MVA) are used as valuation metrics.

ROA and ROE are the two most popular classical ratios in financial performance calculations (Wang, 2005). ROA is concerned with how much of a company's total assets are converted into profits. This ratio is benefit-based, and it can be said that the higher it is, the more advantageous it is for the company (Palepu et al., 2000). On the other hand, ROE indicates how much of the capital invested by the shareholders of the company is turned into profit. This ratio, which is benefit-based like ROA, is considered an important financial indicator because it can react very quickly to subtle changes in the financial structure of the company (Chacko & Evans, 2014).

Identifying the M-to-B ratio, in order to have an idea about the transformational status of the company, in terms of shareholder value, will add potential depth to the analyzes to be made (Bacidore et al., 1997). ACP is a critical performance criterion that shows how quickly companies turn their receivables into cash. Due to its ability to show how efficiently businesses' working capital is utilized, it is integrated to the analyzes as a criterion in financial performance studies (Mabandla & Makoni, 2019). On the other hand, MVA, one of the modern valuation-based ratios, has an important status in the performance analysis of companies (Stewart, 1990). This ratio is especially preferred in modern research because of its success in measuring how effectively company managers use scarce resources and whether they can make the business more valuable (Cheng et al., 2007). Additionally, the conversion of stocks into sales and ultimately into cash is critical for the liquidity that companies will use to shape their future investments (Iqbal & Zhuquan, 2015). Since the main purpose of finance is to increase shareholder value, EPS has been incorporated into the financial performance studies as a sensitivity indicator (Song et al., 2017).

3.1. Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS)

TOPSIS, which is exercised in countless scientific studies due to its simplicity and ease of use, comes from the American school methods and is powered by the quality and benefit information of the criteria (Yoon & Hwang, 1995). In this method, which can perform numerical solutions, the criteria must be measurable and in an ascending or descending format.

In the ranking research exercised using MCDA methods, the performance of 4 aviation companies was evaluated on 5 criteria utilizing AHP and F-TOPSIS (Aydoğan, 2011). In another study, TOPSIS method was used together with PROMETHEE and VIKOR in order to make financial risk estimation (Peng et al., 2011). The performance of companies competing in the same industry was analyzed via TOPSIS and AHP methods, in another research (Amiri et al., 2009). The application procedure for TOPSIS method is given below (Mousavi-Nasab & Sotoudeh-Anvari, 2017).

Firstly, a decision matrix containing alternatives and criteria for the problem to be solved is created. The values of this decision matrix are then normalized using the following equation. Thus, a normalized decision matrix is obtained.

$$F_{ij} = \frac{f_{ij}}{\sqrt{\sum_{i=1}^{m} f_{ij}^2}} \quad (1)$$

Then, the criterion weights established according to the predetermined weighting technique are integrated into the aforementioned matrix, as shown in the equation below.

$$v_{ij} = F_{ij} \times w_j \quad (2)$$

Afterwards, negative (A^-) and positive (A^+) ideal outcomes are determined, which will affect the overall results of this method, via following equations, where J depicts maximization objectives and J' defines minimization objectives.

$$A^+ = \left\{\left(Max_i(v_{ij}) \,\middle|\, j \in J\right), \left(Min_i(v_{ij}) \,\middle|\, j \in J'\right) \,\middle|\, i \in 1, 2, \dots, m\right\} = \left\{v_1^+, v_2^+, v_3^+, \dots, v_j^+, \dots, v_n^+\right\} \quad (3)$$

$$A^- = \left\{\left(Min_i(v_{ij}) \,\middle|\, j \in J\right), \left(Max_i(v_{ij}) \,\middle|\, j \in J'\right) \,\middle|\, i \in 1, 2, \dots, m\right\} = \left\{v_1^-, v_2^-, v_3^-, \dots, v_j^-, \dots, v_n^-\right\} \quad (4)$$

Penultimately, the distance values to the negative (S_{i-}) and positive (S_{i+}) ideal solutions, determined in the previous stage, are calculated through the following equations.

$$S_{i+} = \sqrt{\sum_{j=1}^{n} \left(v_{ij} - v_j^+\right)^2} \qquad i = 1, 2, 3, \dots, m \quad (5)$$

$$S_{i-} = \sqrt{\sum_{j=1}^{n} \left(v_{ij} - v_j^-\right)^2} \qquad i = 1, 2, 3, \dots, m \quad (6)$$

Ultimately, final results are obtained by calculating the relative distance of each value to the ideal solution (C_i).

$$C_i = \frac{S_{i-}}{S_{i-} + S_{i+}} \quad (7)$$

The final method scores calculated by applying the above equations respectively, are sorted from largest to smallest in order to obtain final performance rankings.

3.2. Simple Additive Weighting (SAW)

Simple Additive Weighting (SAW) method is popular among MCDA studies (Zavadskas et al., 2007). This technique was first partially integrated into the portfolio selection problem in the literature. It stands out with its mathematical simplicity and ease of calculation. This method is preferred in the performance measurement of companies operating in the banking and manufacturing sectors (Wu et al., 2009; Antil & Singh, 2013). SAW method's application procedure is given below (Wang et al., 2016).

As at the beginning of the application phases of every MCDA method, a decision matrix containing alternatives and criteria related to the problem to be solved is created primarily.

Afterwards, this decision matrix is normalized using equation (8) for benefit-based criteria and (9) for cost-based criteria.

$$F_{ij} = \frac{f_{ij}}{f_j^+} \; for\ a\ maximization, where\ f_j^+ = \; Max_{i\in m} f_{ij} \tag{8}$$

$$F_{ij} = \frac{f_j^-}{f_{ij}} \; for\ a\ minimization, where\ f_j^- = \; Min_{i\in m} f_{ij} \tag{9}$$

Already computed criterion weights, according to the weighting technique to be used in the analysis, are integrated into the aforementioned matrix, as shown in the formula below.

$$v_{ij} = F_{ij} \times w_j \tag{10}$$

Finally, the final method results are determined by summing the criterion values calculated for each alternative.

$$A_i = \sum_{j=1}^{n} v_{ij} \tag{11}$$

The final method scores of the alternatives are sorted from largest to smallest in order to reach the final performance rankings.

3.3. Complex Proportional Assessment (COPRAS)

This method is preferred in order to evaluate the importance and utility of alternatives by ranking them step by step. It explains alternatives proportionately based on criteria, taking into account ideal and non-ideal solutions (Thakkar, 2021). COPRAS has been exercised in the life cycle evaluation of building (Banaitiene et al., 2008), maintenance performance (Zavadskas & Vilutienė, 2006), best home investment identification by loan (Zavadskas et al., 2004), and project management of building (Kanapeckiene et al., 2010). Equations that summarize the mathematical background of this method are shown below. The application procedure for COPRAS method is given below (Mousavi-Nasab & Sotoudeh-Anvari, 2017).

A decision matrix containing the criterion values of all alternatives is created. Then, the normalized decision matrix is obtained through the equation (12).

$$F_{ij} = \frac{f_{ij}}{\sum_{k=1}^{m} f_{kj}} \quad i \in \{1,2,\dots,m\};\ j \in \{1,2,\dots,n\} \tag{12}$$

The weighted and normalized decision matrix is obtained by using the criterion weights calculated according to the weighting technique chosen for the analysis, as shown in equation (13).

$$v_{ij} = F_{ij} \times w_j \quad i \in \{1,2,\dots,m\};\ j \in \{1,2,\dots,n\} \tag{13}$$

The values determined for each alternative are summed using equation (14) for benefit-based criteria and (15) for cost-based criteria.

$$S_{i+} = \sum_{j=1}^{g} v_{ij} \quad i \in \{1,2,\dots,m\} \tag{14}$$

$$S_{i-} = \sum_{j=g+1}^{n} v_{ij} \quad i \in \{1,2,\dots,m\} \tag{15}$$

The relative importance of each value is calculated using equation (16), depending on whether the criteria are benefit and cost based.

$$Q_i = \begin{cases} S_{i+} + \frac{\sum_{i=1}^{m} S_{i-}}{S_{i-} \sum_{i=1}^{m} \frac{1}{S_{i-}}} & for\ both\ benefit\ and\ cost \\ S_{i+} & for\ only\ benefit \\ \frac{\sum_{i=1}^{m} S_{i-}}{S_{i-} \sum_{i=1}^{m} \frac{1}{S_{i-}}} & for\ only\ cost \end{cases} \quad (16)$$

Consequently, the method scores calculated for the alternatives are sorted from largest to smallest to create the final performance ranking.

3.4. Faire Un Choix Adéquat (FUCA)

FUCA method does not apply normalization to the decision matrix as in other methods (Fernando et al., 2011). Instead, it ranks the benefit-based criteria from largest to smallest and the cost-based criteria from smallest to largest and multiplies them with the previously determined criterion weights. It is used in different areas such as financial performance analysis and production process selection due to its simplicity and ability to produce effective results (Baydaş et al., 2022; Ouattara et al., 2022). The application procedure of the method is given below (Do, 2022).

Firstly, rank *1* is given to the alternative with the highest value in benefit-based criteria and the lowest value in cost-based criteria, and these rankings continue until the alternative with the worst ranking receives rank *m*.

Then, determined rankings of the alternatives for each criterion are multiplied and summed by their predetermined weights, as shown in the equation below.

$$v_i = \sum_{j=1}^{n} (r_{ij} \times w_j) \quad (17)$$

Ultimately, a performance ranking is created by listing the final method scores in an ascending order.

3.5. Vise Kriterijumska Optimizacija I Kompromisno Resenje (VIKOR)

The success of VIKOR manifests itself in scenarios where the decision maker cannot formalize his choice due to uncertainty, especially in the early stages of the decision-making process (Kang & Park, 2014). The VIKOR method has been exercised in many areas such as ranking companies in the automotive industry (Ghadikolaei et al., 2014), personnel selection (Çevikcan et al., 2009), supplier selection (Rostamzadeh et al., 2015), website efficiency (Burmaoğlu, & Kazancoğlu, 2012), determination of entrepreneurship policies (Tsai et al., 2014), career choice (Pekkaya, 2015), portfolio selection (Ho et al., 2011), bank performance evaluation (Chang & Tsai, 2016), health services evaluation (Chang, 2014) and financial performance measurement (Lin et al., 2009). The equations that need to be applied in order to reach the mathematical results of this method are shown below, respectively. The application procedure of VIKOR is summarized below (Yazdani & Graeml, 2014).

The best and worst values are determined for each criterion. If the criterion is benefit-based, equation (18) is used, if it is cost-based, equation (19) is used.

$$F_j^+ = Max_{i\in m} f_{ij} \text{ and } F_j^- = Min_{i\in m} f_{ij} \; for \; maximization \tag{18}$$

$$F_j^+ = Min_{i\in m} f_{ij} \text{ and } F_j^- = Max_{i\in m} f_{ij} \; for \; minimization \tag{19}$$

For every alternative analyzed, S_i and R_i values are computed afterwards. Term of w_j, used in the calculation of these values, represents the criterion weights.

$$S_i = \sum_{j=1}^{n} w_j \left(\frac{F_j^+ - f_{ij}}{F_j^+ - F_j^-}\right) \tag{20}$$

$$R_i = Max_{j\in n}\left[w_j \left(\frac{F_j^+ - f_{ij}}{F_j^+ - F_j^-}\right)\right] \tag{21}$$

The final Q_i values that will be used to reach the compromise ranking results are calculated using equation (22), according to the constraints shown in equation (23).

$$Q_i = \gamma \left(\frac{S_i - S^+}{S^- - S^+}\right) + (1-\gamma)\left(\frac{R_i - R^+}{R^- - R^+}\right) \tag{22}$$

$$\text{where } S^+ = Min_{i\in m} S_i,\; S^- = Max_{i\in m} S_i,\; R^+ = Min_{i\in m} R_i, R^- = Max_{i\in m} R_i \tag{23}$$

Finally, the calculated Q_i values are sorted from smallest to largest to reach the final performance rankings.

3.6. Élimination Et Choix Traduisant la Realité (ELECTRE III)

ELECTRE III is used to solve ranking problems where the relative importance of criteria can be calculated (Roy, 1991). It is preferred due to its features such as being able to compare a large number of alternatives and directly evaluating the original data. ELECTRE III has been utilized in many different scenarios such as university ranking (Giannoulis & Ishizaka, 2010), best management practice selection (Martin et al., 2007), supplier selection (Marbini & Tavana, 2011), transportation project valuation (Iniestra & Gutiérrez, 2009) mobile commerce partner selection (Guo, 2010), and portfolio selection (Vezmelai et al., 2015). The application procedure of ELECTRE III is given below (Mary & Suganya, 2016).

First, the decision matrix to which the method will be applied is created. Afterwards, the concordance matrix representing the harmony is created through the following equations.

$$C(a,b) = \sum_{j=1}^{n} w_j C_j(a,b) \tag{24}$$

$$\text{where } C_j(a,b) = \begin{cases} 1 & if\; F_j(b) - F_j(a) \le Q_j \\ 0 & if\; F_j(b) - F_j(a) > P_j \\ \frac{P_j - [F_j(b) - F_j(a)]}{P_j - Q_j} & if Q_j < F_j(b) - F_j(a) \le P_j \end{cases} \tag{25}$$

Afterwards, the discordance matrix representing the disharmony is obtained using the following equation.

$$D_j(a,b) = \begin{cases} 1 & if\; F_j(b) - F_j(a) > V_j \\ 0 & if\; F_j(b) - F_j(a) \le P_j \\ \frac{F_j(b) - F_j(a) - P_j}{V_j - P_j} & if P_j < F_j(b) - F_j(a) \le V_j \end{cases} \tag{26}$$

The credibility matrix is obtained by combining the above concordance and discordance matrices. For this process, equation (27) below is used.

$$S(a,b) = \begin{cases} C(a,b) & if\ D_j(a,b) \le C(a,b) \forall j \\ C(a,b) \prod_{j \in J(a,b)} \frac{1-D_j(a,b)}{1-C(a,b)} & otherwise \end{cases} \quad (27)$$

In order to create a ranking algorithm, λ_0 which is the maximum value of the credibility matrix is determined.

$$\lambda_0 = \max S(a,b) \qquad where\ a,b \in S \quad (28)$$

Ultimately, the cutoff level of λ_1 is determined using a $S(\lambda_0)$ discrimination threshold. The following equations are used for this computation.

$$\lambda_1 = \max S(a,b) \qquad where\ (S(a,b) < \left(\left(\lambda_0 - s(\lambda_0)\right)\right) \in S \quad (29)$$

$$S(\lambda_0) = \alpha + \beta\lambda \quad (30)$$

By combining the descending and ascending distillation procedures, scores are obtained leading to the final ranking results. The final performance ranking is obtained by sorting the method results from largest to smallest.

3.7. Grey Relational Analysis (GRA)

GRA method identifies similarities and differences between two sequences based on their degree of relationship (Julong, 1989). GRA has been preferred in many researches such as measuring financial performance evaluation (Wang, 2009), evaluating and improving service quality (Kuo & Liang, 2011), measuring earthquake resistance (Peng, 2015), measuring business performance (Hsu, 2014), optimizing process performance (Gauri & Pal, 2010), determining the global production and logistics strategy (Tzeng & Huang, 2012) and measuring the business performance of banks (Wu et al., 2010). The equations that must be applied in order to perform the mathematical calculations for GRA are shown below, respectively (Nguyen et al., 2020).

Firstly, linear max-min normalization is applied to the decision matrix with equations shown below. Thus, a normalized decision matrix is obtained.

$$F_{ij} = \frac{f_{ij} - min_{i \in m} f_{ij}}{max_{i \in m} f_{ij} - min_{i \in m} f_{ij}} \quad for\ maximization \quad (31)$$

$$F_{ij} = \frac{max_{i \in m} f_{ij} - f_{ij}}{max_{i \in m} f_{ij} - min_{i \in m} f_{ij}} \quad for\ minimization \quad (32)$$

Reference network points are determined using equation (33) shown below.

$$F_j^+ = max_{i \in m} F_{ij} \quad (33)$$

Thereafter, the difference matrix is calculated through equation below.

$$\Delta I_{ij} = |F_j^+ - F_{ij}| \quad (34)$$

The gray relational coefficient (GRC_i) of each optimal value is calculated using formula below.

$$GRC_i = \frac{1}{m}\sum_{j=1}^{n} \frac{\Delta min + \Delta max}{\Delta I_{ij} + \Delta max} \quad (35)$$

The computed method scores are sorted from largest to smallest in order to create the final performance ranking.

3.8. Criteria Importance Through Inter-criteria Correlation (CRITIC)

The CRITIC weighting method calculates the importance weight of the information of the criteria using both standard deviation and correlation (Diakoulaki et al., 1995). The application stages of this technique, in which criterion weights are calculated solely based on the mathematical association, are summarized below (Diakoulaki et al., 1995).

Firstly, the decision matrix for the problem to be solved is created and normalized using equation below.

$$r_{ij} = \frac{x_{ij} - x_j min}{x_j max - x_j min} \quad (36)$$

This technique utilizes multiple correlations and standard deviation for the correlation density calculations for each criterion. The following equation is used for this mathematical operation.

$$C_j = \sigma_j \sum_{i=1}^{m} (1 - r_{ij}) \quad (37)$$

Afterwards, the objective weight of each criterion is calculated by using the correlation densities as shown in equation below.

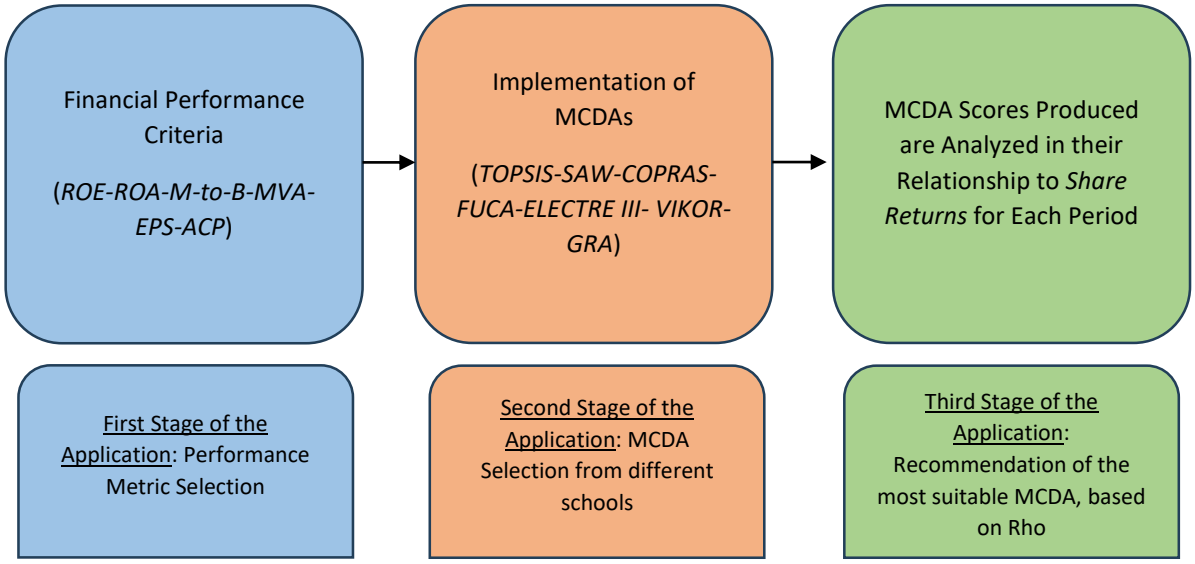
$$w_j = \frac{C_j}{\sum_{i=1}^{m} C_i} \quad (38)$$

CRITIC does not include expert opinions and calculates the weights mathematically. Thus, the calculability of the criterion weights escalates and subjectivity is eliminated.

4. Application

The financial performance of 23 enterprises listed in BIST Food and Beverage Index during the pandemic period was examined for 8 quarters, in this comprehensive research. Calculations were made by integrating the decision matrix created according to 6 financial metrics of the relevant companies into 7 different MCDA methods. In the analysis, CRITIC, which is regarded as one of the most popular objective weighting methods, was utilized. The scores produced by the MCDA methods were analyzed with the Spearman coefficient in terms of their association with the share returns of the relevant firms, and the methods were compared accordingly. A summary of the framework used in this study is shown in Figure 1 below.

Figure 1. The Application Steps of the Financial Performance Analysis Performed in this Study



The data of performance metrics and stock returns for 23 Food and Beverage companies were retrieved from FINNET database. Criterion weights were determined for all 8 quarters according to the CRITIC weighting technique, which is preferred due to its computability. In this context, decision matrices were created for each period and separate calculations were made for 7 MCDA methods according to the relevant equations given above. Excel software was used for this vast quantity of computations. At the end of the analysis, among the methods examined the method that accomplished the highest share return association has been suggested to financial participants.

4.1. Findings and Results

In this comparative research, in which the most suitable MCDA method will be proposed to help financial participants determine the most appropriate alternatives in their decisions, the financial performance of 23 companies in the BIST Food and Beverage index during the pandemic period was evaluated with 7 MCDA methods. 6 dynamic accounting and valuation metrics calculated for each company were used, while creating the decision matrices. Among the integrated criteria, only ACP is cost-based, while the others are benefit-based. In this context, the decision matrix created for the first quarter is given in Table 1.

Table 1: The Decision Matrix of the Analysis for the First Quarter of the Study

	ROA ↑	ACP ↓	EPS ↑	M-to-B ↑	MVA ↑	ROE ↑
AEFES	0.124548	-0.42649	0.076317	0.141889	-2.1477	0.096481
AVOD	-0.7836	-0.20552	-0.77918	0.05146	0.138396	-0.79481
BANVT	0.711689	-0.31175	0.828361	1.28854	1.982405	1.027765
CCOLA	-0.03933	-0.49823	-0.11352	0.628781	2.168587	-0.00659
DARDL	-0.0882	-0.35927	-0.04446	0.048596	0.37888	-0.2708
ERSU	0.237408	-0.34994	0.338952	-0.12587	-0.12245	0.284137
FADE	14.50046	-0.22176	15.17366	-0.1178	-0.15518	14.16733
FRIGO	0.422909	-0.46464	1.879467	-0.3684	-0.17819	0.988584
KERVT	2.901172	-0.19386	3.21285	-0.19204	0.024952	2.093431
KRVGD	0.30998	-0.24022	0.695265	0.155387	1311.053	-0.07607
KNFRT	0.045636	-0.40124	0.198688	-0.13798	-0.16394	0.170247
KRSTL	0.295034	-0.51895	0.252349	0.58374	1.663645	0.133369
OYLUM	0.234755	-0.2987	0.249387	-0.07426	-0.0936	0.227822
PENGD	-1.05122	-0.32182	-1.04936	0.012966	0.067865	-1.04712
PETUN	0.359498	-0.17229	0.402577	-0.18764	-0.46104	0.285593
PINSU	0.536514	-0.58537	0.729063	-0.66593	-0.24992	-0.37106
PNSUT	0.041058	-0.23543	0.039113	0.065728	-0.72477	0.034323
SELGD	0.720853	-0.30996	0.602689	0.012684	0.027459	0.590426
TATGD	1.310996	0.429964	1.263893	-0.11056	-0.05018	0.952466
TUKAS	0.153421	-0.34761	0.235869	-0.31512	-0.09586	-0.13524
ULUUN	0.173788	-0.38876	0.015149	0.106717	0.183151	0.020904
ULKER	0.276809	-0.28448	0.385321	-0.04482	-0.09211	0.307216
VANGD	0.772215	2.39019	1.004878	0.118285	0.262897	0.824364

The criteria weights for which objective calculations were made are shown in Table 2 below, for each period. ACP stood out as a pivot criterion demonstrating the importance of credit and liquidity needs during the period when pandemic-related shocks were experienced in capital markets. In addition, M-to-B and MVA, which are valuation-based ratios, have found to be produced the highest weights in almost all periods. The cruciality of valuation-based ratios in financial calculations is increasing since its inception (Sandoval, 2001). The objective weighting technique exercised in this study has clearly demonstrated the significance of valuation-based ratios.

Table 2: Computed CRITIC Weights for Each Quarter Analyzed in this Study

CRITIC	20-IV	21-I	21-II	21-III	21-IV	22-I	22-II	22-III
ROA	0.125487	0.14208	0.127342	0.130025	0.122865	0.127441	0.112472	0.120761
ACP	0.205124	**0.21914**	0.176706	**0.20578**	**0.231252**	**0.277862**	**0.241938**	0.170677
EPS	0.126223	0.14055	0.136163	0.130624	0.129332	0.12837	0.114363	0.117354
M-to-B	**0.207346**	**0.190483**	**0.201599**	**0.232746**	**0.205571**	0.153465	**0.232079**	**0.240165**
MVA	**0.210672**	0.169326	**0.22778**	0.172488	0.178594	**0.188657**	0.185929	**0.239268**
ROE	0.125149	0.13842	0.13041	0.128338	0.132385	0.124205	0.113219	0.111775

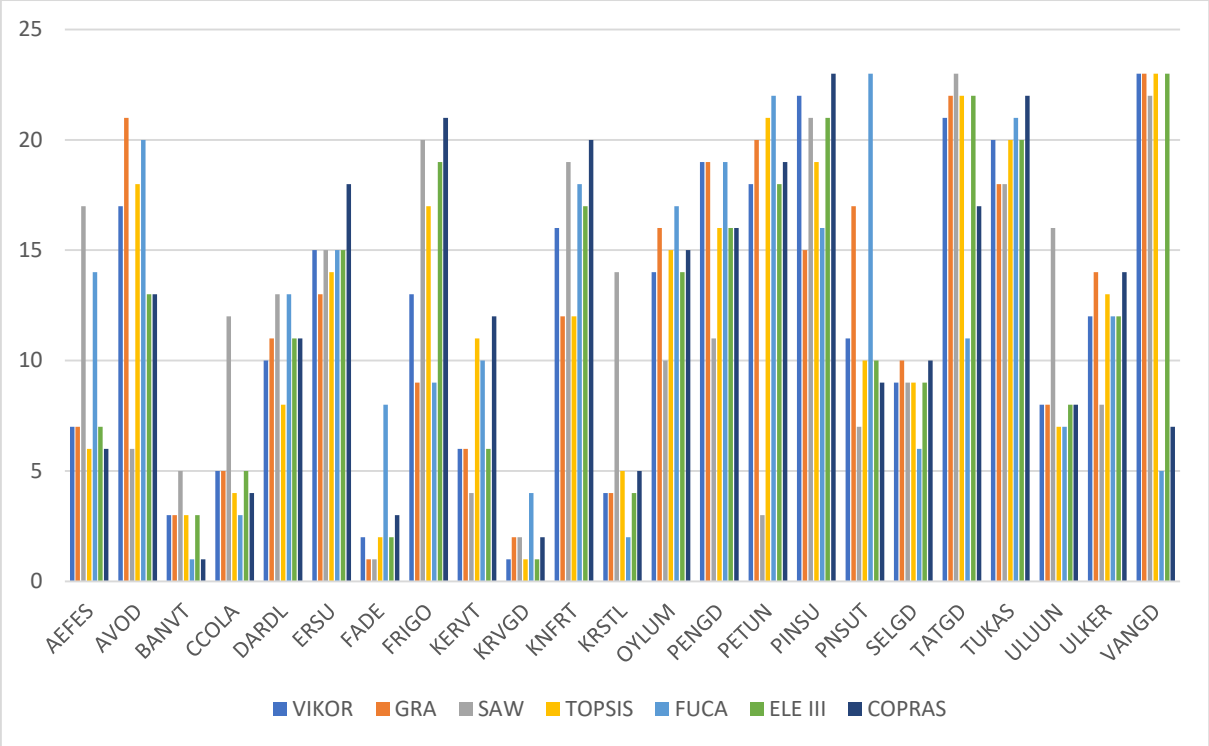
In this study, where the performance of 23 Food and Beverage companies listed in BIST was investigated, the VIKOR method managed to create a consistent relationship with share returns of relevant firms in all periods examined. Final scores for each method were established using the formulas (1) to (35), and objective criteria weights were determined for each period using equations (36) to (38) above. To illustrate, Table 3 shows the scores produced by different methods for every alternative examined, for the first quarter.

Table 3: Performance Outputs Generated by 7 Methods Analyzed in this Study, for The First Quarter

	VIKOR	GRA	SAW	TOPSIS	FUCA	ELE III	COPRAS
AEFES	0.816918	0.606116	0.306593	0.402156	12.93896	-0.45839	0.042277
AVOD	0.862012	0.58539	0.572257	0.371189	15.73974	-1.39765	0.013939
BANVT	0.676705	0.668987	0.61495	0.503862	5.186557	8.571875	0.330549
CCOLA	0.757869	0.628227	0.341189	0.449522	8.739364	2.647174	0.154862
DARDL	0.835063	0.597791	0.338571	0.387494	12.43048	-1.06723	0.017763
ERSU	0.844832	0.595676	0.330238	0.375649	13.13925	-1.84434	-0.01617
FADE	0.498233	0.828839	0.899336	0.527312	10.96805	19.90907	0.233849
FRIGO	0.843393	0.602152	0.227143	0.373781	11.26804	-3.85236	-0.06271
KERVT	0.802514	0.609843	0.658809	0.379849	11.32051	2.062037	0.016163
KRVGD	0.106757	0.682807	0.743319	0.54771	8.839376	20.13861	0.26475
KNFRT	0.846239	0.596549	0.280582	0.377615	14.53519	-1.98427	-0.02269
KRSTL	0.754956	0.629592	0.331411	0.449102	6.523167	2.77574	0.148446
OYLUM	0.844017	0.594329	0.396138	0.375349	13.62457	-1.43972	-0.00322
PENGD	0.864561	0.587358	0.348127	0.375169	15.10098	-1.85314	-0.00512
PETUN	0.863005	0.586368	0.675656	0.356659	16.18924	-2.57205	-0.02072
PINSU	0.887176	0.594602	0.105356	0.361458	13.57762	-5.47012	-0.14841
PNSUT	0.838815	0.594026	0.521461	0.380795	16.31416	-0.99251	0.029291
SELGD	0.823658	0.601034	0.405901	0.386839	9.900969	-0.95513	0.023861
TATGD	0.876444	0.573906	-0.26679	0.315595	11.65808	-6.3131	-0.01368
TUKAS	0.870711	0.588651	0.296803	0.360144	15.84455	-3.90339	-0.06466
ULUUN	0.821706	0.602882	0.327882	0.396309	10.64492	-0.716	0.034508
ULKER	0.8397	0.595289	0.42317	0.377334	12.40658	-1.24053	0.005698
VANGD	0.997862	0.537274	-0.00884	0.197639	9.109917	-20.0446	0.041412

The ranking results of the 23 companies analyzed in the first period are shown in Figure 2 below. When the method results are examined, Kervan Food (KRVGD), Frigo Food (FRIGO) and Banvit Food (BANVT) stand out as the best performing companies, respectively, in the relevant period. Tukaş Food (TUKAS), Tat Food (TATGD) and Pınar Water (PINSU) were calculated as the worst performing companies, respectively, in the relevant period.

Figure 2. Rankings of Companies obtained through Analyzed Methods for the First Period



The final scores of all methods were calculated for 8 quarters during the pandemic and their association with the share returns of the relevant company in the examined period was revealed. Performance results in this period of increased volatility show that VIKOR creates a significant level of association with share returns compared to other methods, via Spearman's correlation coefficient. Considering that the 4 methods examined produced statistically insignificant results, it should be underlined that the VIKOR method provided the association with statistically significant results ($p \leq 0.05$). It is of vital importance that the results produced by a method can establish a consistent and significant relationship with the share returns shaped by millions of stock investors.

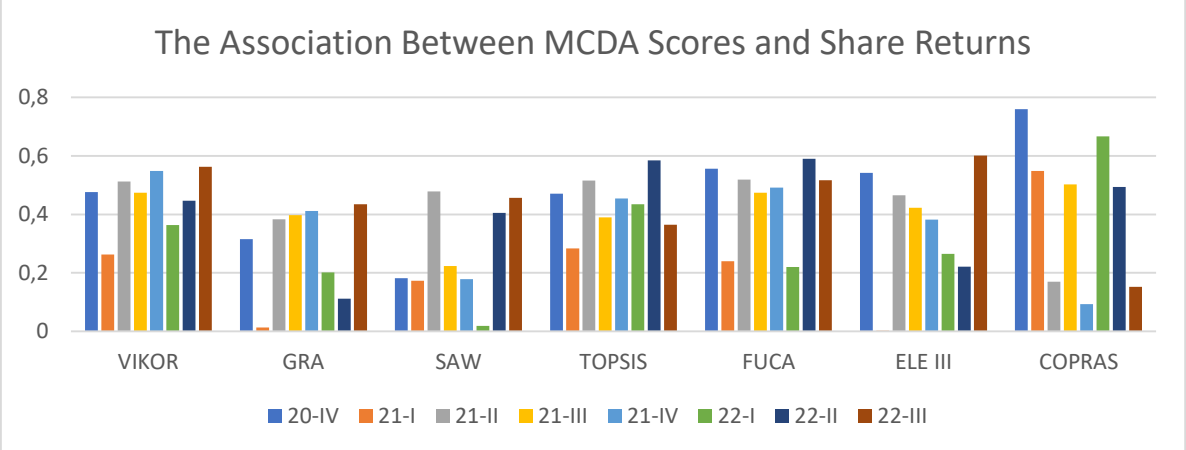
Among other methods, FUCA produced statistically strong results and came in second place. Afterwards, TOPSIS method placed third with a slight difference. On the other hand, GRA and SAW methods provided the lowest level of association with share returns in this analysis period where uncertainty and volatility increased. Additionally, the level of relationship they produce are statistically insignificant. The Spearman correlation coefficients of all methods are given in Table 4 below for each quarter and the entire analysis period.

Table 4: The Association Between MCDA Outputs and Stock Returns for Every Quarter

	20-IV	21-I	21-II	21-III	21-IV	22-I	22-II	22-III	Average
VIKOR	47.60%	26.30%	51.20%	47.40%	54.80%	36.30%	44.70%	56.30%	***45.58%***
	0.02	0.23	0.01	0.02	0.01	0.09	0.03	0.01	***0.05***
GRA	31.50%	1.30%	38.30%	39.70%	41.20%	20.10%	11.20%	43.50%	28.35%
	0.14	0.95	0.07	0.06	0.05	0.36	0.61	0.04	0.29
SAW	18.20%	17.30%	47.80%	22.30%	17.80%	1.80%	40.50%	45.60%	26.41%
	0.41	0.43	0.02	0.31	0.42	0.94	0.06	0.03	0.33
TOPSIS	47.10%	28.40%	51.60%	39%	45.40%	43.40%	58.40%	36.40%	***43.71%***
	0.02	0.19	0.01	0.07	0.03	0.04	0.00	0.09	***0.06***
FUCA	55.60%	24%	51.90%	47.40%	49.10%	22%	59%	51.70%	***45.09%***
	0.01	0.27	0.01	0.02	0.02	0.31	0.00	0.01	***0.08***
ELE III	54.20%	0.20%	46.50%	42.20%	38.20%	26.50%	22.10%	60.10%	36.25%
	0.01	0.99	0.03	0.05	0.07	0.22	0.31	0.00	0.21
COPRAS	76%	54.80%	17%	50.20%	9.30%	66.70%	49.40%	15.20%	42.33%
	0.00	0.01	0.44	0.02	0.67	0.00	0.02	0.49	0.20

As seen in Figure 3 below, the VIKOR method results were able to produce a consistent and statistically significant relationship in every quarter except the second period. FUCA and TOPSIS methods shared the second and third places with different significance levels. These results are in line with previous findings (Baydaş & Elma, 2021; Baydaş et al., 2022; Elma, 2023). The GRA method is one of the methods that produces the least successful results in this analysis performed on the data set consisting of exact numbers. In addition, due to the negative data in the decision matrix as a result of the volatility brought by the uncertainty environment, the association level produced by the SAW method results was also determined to be weak and insignificant.

Figure 3: Overall Performance of the Methods in terms of their Relationship with Share Returns, for each Quarter



The most and least successful companies for each MCDA method during the period examined are given in Table 5 below. According to the VIKOR method, which gives the most consistent results in the ranking, Kervan Food (KRVGD) was determined as the company that produced the highest scores in the first period. In the following quarters, Fade Food (FADE), Ulusoy Flour (ULUUN), Oylum Food (OYLUM), Kristal Cola (KRSTL), Kristal Cola (KRSTL), Penguen Food (PENGD) and Kervan Food (KRVGD) firms achieved the highest performance for the aforementioned method, respectively.

Table 5: Top and Bottom Performer Companies for each MCDA Method in the Whole Period

Method	Ranking	20-IV	21-I	21-II	21-III	21-IV	22-I	22-II	22-III
VIKOR	Top	**KRVGD**	**FADE**	**ULUUN**	OYLUM	**KRSTL**	**KRSTL**	**PENGD**	KRVGD
	Bottom	VANGD	CCOLA	FRIGO	FADE	AVOD	VANGD	AEFES	BANVT
GRA	Top	FADE	AVOD	**ULUUN**	PENGD	SELGD	**KRSTL**	PETUN	FRIGO
	Bottom	VANGD	AEFES	FRIGO	ERSU	AVOD	KERVT	AEFES	BANVT
SAW	Top	FADE	AVOD	**ULUUN**	DARDL	PENGD	ULKER	PETUN	AVOD
	Bottom	TATGD	ERSU	FRIGO	ERSU	ULUUN	KERVT	ERSU	BANVT
TOPSIS	Top	**KRVGD**	**FADE**	**ULUUN**	PENGD	**KRSTL**	**KRSTL**	**PENGD**	FRIGO
	Bottom	VANGD	AEFES	FRIGO	ERSU	AVOD	KERVT	AEFES	ERSU
FUCA	Top	BANVT	**FADE**	**ULUUN**	FRIGO	**KRSTL**	ULKER	SELGD	FRIGO
	Bottom	PNSUT	ULUUN	FRIGO	KNFRT	AVOD	KERVT	AEFES	BANVT
ELE III	Top	**KRVGD**	**FADE**	**ULUUN**	PENGD	**KRSTL**	**KRSTL**	**PENGD**	FRIGO
	Bottom	VANGD	AEFES	FRIGO	ERSU	AVOD	KERVT	AEFES	BANVT
COPRAS	Top	BANVT	**FADE**	KERVT	PENGD	ULUUN	OYLUM	PETUN	AVOD
	Bottom	PINSU	PENGD	BANVT	PETUN	PENGD	KRSTL	AEFES	BANVT

The most successful companies produced by the TOPSIS method are the same as the VIKOR method, except for two periods. On the other hand, in the FUCA method, the most successful companies are similar to the VIKOR method for only three periods. As VIKOR shows the most consistent success compared to other analyzed methods in the above analysis, it is especially recommended for financial decision makers who are in search for answers about financial instruments listed in capital markets during times of uncertainty.

5. Discussion

The motivation of this study is to determine, through a comparative method, the most appropriate MCDA application, among 7 methods, that can guide the selection of the suitable shares for the portfolio via financial performance analysis, which has an important place in the capital market literature. For this purpose, the financial performance of 23 companies listed in the BIST Food and Beverage Index during the pandemic period was examined. According to the results of a comprehensive and systematic literature research on 657 finance studies indexed in Web of Science between 2000 and 2018, financial performance analysis has

become the second most researched topic in the field of finance, right after portfolio optimization (Almeida- Filho et al., 2020). The notable results of the research are listed below:

• While MCDA studies on the Food and Beverage index of BIST generally focused on one or two methods, in this study the analysis was carried out through 7 methods.

• CRITIC, one of the popular objective weighting techniques, was used to increase the objectivity and calculability of the results.

• This study reveals a systematic approach for performance evaluation by exhibiting a sustainable financial performance measurement based on various MCDAs, for the financial information users. In multiple criteria problems, decision makers need to choose among more than 200 MCDA methods. Which method is more suitable for the given real-life scenario is one of the most debated topics in the MCDA literature. On the other hand, special conditions of the companies may offer a different solution opportunity. The firm's internal financial performance and external stock return data move simultaneously to a certain extent. For example, achieving a higher financial performance and a higher stock return for a firm are two different objectives. The association between MCDA-based performance outputs of firms and the share prices in the same period is a special and natural opportunity that should be utilized for MCDA selection. In short, an MCDA method that has more association with the share prices should be regarded as a superior method in terms of financial performance.

• VIKOR's performance during the pandemic, where there is disproportionate uncertainty for an average investor, is ahead of remaining 6 models used in this study. It can be deduced that VIKOR's success in solving complex problems where uncertainty is intense can be a factor for these findings. In addition, another important advantage of this method for financial decision makers is that it can produce effective results in cases where the decision maker is not experienced. It should be noted that in the analysis of this study, expert opinions were not included and the criterion weights were solely calculated with CRITIC, an objective technique.

• As a result of the research, both 2 hypotheses were accepted. The relationship between the stock returns of the companies traded in the BIST Food and Beverage Index and the financial performance outcomes of the relevant companies calculated through 7 different methods was revealed. Additionally, VIKOR method outputs of the relevant companies were able to establish a stronger and more significant association with stock returns compared to other methods.

• Moreover, FUCA and TOPSIS methods came to the fore as the other successful MCDA methods, for financial stakeholders. These results are consistent with previous literature (Baydaş & Elma, 2021; Baydaş et al. 2022; Elma, 2023).

6. Conclusion

Making financial decisions requires taking a result-oriented position by taking into account many complex criteria. MCDA methods are used in financial performance analysis so that relevant stakeholders can make the most appropriate decision. Although there are many methods, studies on the most appropriate method to be applied in solving a specific problem

is scarcely found. Additionally, each method has advantages and disadvantages compared to other methods. Thus, the number of methods with different normalization and mathematical algorithms is increasing every year, in order to address various needs of decision makers.

Observing the financial performance of companies in this uncertainty process via MCDAs from different schools is vital in order to capture the systematic mechanism of capital markets and aid financial decision makers. The performance of companies, which attract the attention of company executives, partners, policy makers and potential shareholders, is examined in this study with a comparative MCDA analyses approach. The relationship between the stock returns generated by the buy & sell decisions of millions of investors and the scores produced by the methods was examined in the third stage of the analysis, in order to make this comparison. This approach has been used to find the most appropriate method for financial decision makers. To that end, in the analysis using 6 performance metrics based on accounting and valuation, 23 Food and Beverage companies traded in BIST were examined with 7 different MCDA methods for 8 quarters during the pandemic.

Investors who are at the decision-making stage where market conditions are constantly changing need to take many parameters into account. For this purpose, MCDAs can be used as decision support systems to make critical decisions more effective and efficient. Determining the most optimal MCDA application for the problem under consideration poses a challenging dead-end. This study was performed in order to determine the most optimum method, under study limitations, in financial markets where volatility and uncertainty are frequently experienced, and companies traded in the Food and Beverage Index were observed during the pandemic period.

VIKOR method has demonstrated a more successful performance than other methods by consistently providing more statistically significant association levels in almost every period. The FUCA method that followed it also achieved noteworthy results. As a result of this study, VIKOR method is recommended to financial participants since it produced more consistent results than any other method exercised in the analysis.

In future studies, a comparative analysis can be performed with more methods on a comprehensive data set that will cover the pre-pandemic and post-pandemic period. In addition to the objective ones, criteria weighting can also be exercised with subjective weighting methods. The performance of firms listed in the markets of developed and developing countries, can be analyzed through separate clusters, in order to add the comparative MCDA studies additional depth. In addition, the MCDA methods applied here can be integrated into machine learning applications, and predictions can be made for the future performance of Food and Beverage companies.

Limitations of the Study

In this study, the financial performance of Food and Beverage companies listed on BIST during the pandemic period was analyzed using six specific criteria. Implementation of these criteria represents a limitation for the study, as incorporating different metrics used in financial performance research could yield different outcomes. The findings demonstrate performance

outcomes for enterprises within a developing financial market, suggesting that the results do not imply absolute superiority of certain methods. In the future, studies focused on analyzing companies in developed countries via using a comparative MCDA analysis approach would provide clearer insights for financial decision-makers regarding the consistency of various methods from different schools. In addition, the inclusion of new MCDA methods in these future studies can increase the depth of comparative analyzes to be performed. Despite these limitations, it remains critical for financial decision-makers to identify a method that ensures sustainable success amid the increasing complexity and uncertainty of capital markets.

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Ethical Approval: The authors declare that ethical rules are followed in all preparation processes of this study. In the case of a contrary situation, Fiscaoeconomia has no responsibility, and all responsibility belongs to the study's authors.