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Comparative Analysis of Financial Structures: An Application on the BIST Sustainability Participation Index Using the Mabac Method

Fırat KINALI[a]

Abstract

This study aims to analyze the financial structure performance of companies listed in the Borsa Istanbul Sustainability Participation Index using the MABAC method based on 2023 data. Eight different financial ratios were used in the study, and all criteria were given equal weight. The difference of this study is that it focuses on an index (XSRDK) determined solely by sustainability and participation principles and analyzes the concept of sustainable financial structure within a multi-criteria decision-making framework. In the literature, MABAC has often been used in conjunction with objective weighting methods such as CRITIC and AHP. In this study, however, a more direct approach was adopted by assigning equal weight to all criteria. Additionally, this method, aims to provide investors and decision-makers with a comprehensive perspective. According to the findings, Galata Wind (A10) ranks first, followed by Akçansa Çimento (A1), Aksa Akrilik (A2), Margün Enerji (A16), and Esenboğa Elektrik (A9).

Keywords:
Multi-Criteria Decision Making, Mabac Method, Financial Structure Performance.

JEL Classification:
C44, D81, L25

Finansal Yapıların Karşılaştırmalı Analizi: Mabac Yöntemiyle BİST Sürdürülebilirlik Katılım Endeksi Üzerine Bir Uygulama

Öz

Bu çalışma, Borsa İstanbul Sürdürülebilirlik Katılım Endeksi'nde yer alan şirketlerin mali yapı performanslarını 2023 yılı verileri üzerinden MABAC yöntemiyle analiz etmeyi amaçlamaktadır. Çalışmada, sekiz farklı finansal oran kullanılmış ve tüm kriterlere eşit ağırlık verilmiştir. Bu çalışmanın farkı, sadece sürdürülebilirlik ve katılım ilkelerine göre belirlenmiş bir endekse (XSRDK) odaklanması ve sürdürülebilir mali yapı kavramını çok kriterli karar verme çerçevesinde analiz etmesidir. Literatürde MABAC sıklıkla CRITIC ve AHP, gibi objektif ağırlıklandırma yöntemleriyle entegre edilerek kullanılmıştır. Bu çalışmada ise tüm kriterlere eşit ağırlık verilerek daha doğrudan bir yaklaşım benimsenmiştir. Ayrıca, yatırımcılara ve karar alıcılara bütüncül bir perspektif kazandırılması hedeflenmiştir. Elde edilen bulgulara göre, Galata Wind (A10) ilk sırada yer alırken, bu şirketi sırasıyla Akçansa Çimento (A1), Aksa Akrilik (A2), Margün Enerji (A16) ve Esenboğa Elektrik (A9) takip etmektedir.

Anahtar Kelimeler:
Çok Kriterli Karar Verme, Mabac Yöntemi,
Mali Yapı Performansı.

JEL Sınıflandırması:
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[a] PhD., Selçuk University, Vocational School of Social Sciences, Department of Accounting and Tax, Türkiye, firatkinali@selcuk.edu.tr, ORCID: 0000-0002-4908-4351

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1. Introduction

The financial structure of a firm pertains to the origins of the assets reflected in its balance sheet, namely its obligations. The financial structure of a firm addresses questions like its reliability for lenders, the equilibrium between liabilities and equity, the financing methods for assets, and the influence of borrowing on the company's profitability. The financial structure comprises two primary components: equity and liabilities. Equity capital comprises the funds contributed by the firm owners and the retained earnings, which represent the profits not distributed, reflecting the company's financial robustness and autonomy. Foreign liabilities denote the company's foreign borrowings, encompassing sources such as bank loans, bond issuances, and trade debts. For organizations to sustain operations, it is essential to maintain high profitability, minimize costs, and enhance productivity. Realizing these objectives is contingent upon management making appropriate judgments. The phases of the decision-making process are enumerated as follows (Devi and Devaki, 2019: 570);

- Defining the objective or problem
- Gathering the necessary information
- Identifying options
- Evaluating the options
- Selecting the most appropriate one among the options

Multi-Criteria Decision Making (MCDM) is a methodology that concurrently evaluates many alternatives to identify the most suitable solution. This strategy assists decision-makers in achieving optimal decisions aligned with the problem and criteria by evaluating aspects that are mutually independent and exert varying influences. Simultaneously, it streamlines the decision-making process by offering a standardized evaluation technique in instances where criteria conflict or cannot be quantified (Karaatlı et al., 2015: 216). Multi-criteria decision making is categorized into two types: multi-objective decision making (MODM) and multi-attribute decision making (MADM). Problems that include assessing options by scoring specific features to identify the optimal choice are referred to as multi-attribute decision-making problems. Multi-objective decision-making challenges seek to identify the best suitable alternative among competing objectives. In both categories of situations, one or more decision-makers may engage in the decision-making process (Phua and Minowa, 2005: 217).

The Multi-Attributive Border Approximation Area Comparison (MABAC), a Multi-Criteria Decision Making (MCDM) technique employed in this work, was initially presented in the literature by Pamučar and Ćirović (2015). The MABAC approach is distinguished by its straightforward computational procedure and its capacity to consider gain-loss values that are not immediately apparent. The approach assesses the decision alternatives according to each criterion and computes the distances of the alternatives to the border approximation region based on this assessment. These distances facilitate the rating of the respective success levels of the alternatives. The MABAC approach yields robust outcomes

for computational stability and reliability, offering benefits across various decision-making contexts due to its adaptability for integration with other CRM methodologies (Altın, 2021: 215). This study aims to assess the financial structure performance of firms in the Borsa Istanbul Sustainability Participation Index (XSRDK) using the MABAC method, a multi-criteria decision-making approach.

The analysis utilized 8 distinct ratios pertaining to the financial structures of 24 companies included in the index as of 2023, with data sourced from the Public Disclosure Platform (PDP) and the official websites of the organizations. The analysis was performed by assigning equal importance to all criteria. It is possible to find studies in the literature where weights are used equally (Ömürbek and Özcan, 2016: 66; Ulaş, 2017: 171; Mercan and Çetin, 2020: 125). The study's limitations encompass the exclusive consideration of data from 2023, the inclusion of only enterprises listed on XSRDK, and the exclusion of banks and conglomerates. Notwithstanding these constraints, the study offers a distinctive contribution by comparatively assessing the financial frameworks of firms functioning under the concepts of sustainability and participatory financing. Consequently, based on the analysis performed using the MABAC method, organizations were rated according to their financial structure performance, identifying those with the highest performance. Consequently, a comprehensive assessment has been proposed to inform both scholarly literature and investors.

2. Literature Review

In a highly competitive landscape, organizations can assess their existing circumstances and formulate strategic plans for the future by meticulously analyzing their financial data. Ratios, derived from fundamental financial statements, are essential for assessing the efficacy of the accounting system and the financial architecture of the organization (Chen and Chimerda, 1981: 53-54). The effectiveness of numerous criteria in analyzing financial performance needs the application of Multi-Criteria Decision Making (MCDM) methodologies (Temizel and Bayçelebi, 2016: 161). The literature research indicates that the MABAC method has been utilized little to assess the financial performance of firms and is predominantly employed in case study contexts. This study analyzed national and international sources on the subject, selecting and summarizing the most pertinent studies.

The primary aim of the research conducted by Sonar and Kulkarni (2021) is to introduce a cohesive methodology that amalgamates the analytical hierarchy process (AHP) and the multi-attribute boundary approach (MABAC) to discern and prioritize the most appropriate alternatives among electric vehicles. The AHP approach was employed to ascertain the weights of the criteria, while the MABAC method was utilized to evaluate the electric car options. The research was performed on a sample of six feasible possibilities. The distinctive feature of the study is that the integrated AHP-MABAC methodology has not previously been employed in this domain. Say (2022a) examined the financial statements of state-owned deposit banks in Turkey over an 11-year period from 2010 to 2020. The objective of the study is to assess the asset quality of banks and to rank them utilizing the

combined Entropy-TOPSIS technique. The findings indicated that Ziraat Bank (designated B1) consistently achieved the highest ranking over the 11-year duration. Çilek (2022) sought to construct the optimal portfolio utilizing the SD-MABAC method, grounded in nine distinct financial criteria for firms included in the BIST Real Estate Investment Trust index over the 2019-2021 timeframe. The study's findings indicate that the financial leverage ratio is the most significant criterion, whilst the net profit margin is the least significant criterion. The study's results indicate that Alarko Gayrimenkul Yatırım Ortaklığı A.Ş. (ALGYO) was the most successful firm in 2019 and 2020, whereas Pera Yatırım Holding A.Ş. (PEGYO) attained this distinction in 2021. Demir's (2022) study aims to develop an integrated model that combines the PSI-SD and MABAC methodologies for assessing and evaluating firm-level performance. This study employs different performance measures of Anadolu Sigorta, which holds significant importance for the Turkish insurance business, for the period 2013-2020. In the initial phase, objective weight coefficients for the performance parameters chosen to assess firm performance were established via PSI and SD methodologies. In the second stage, the weight values are amalgamated utilizing the Bayesian methodology to derive the ideal weight scores for the evaluation criteria. The results derived using the Bayesian method indicate that the primary performance metric for the firm is the retention ratio. The MABAC ranking results indicate that Anadolu Sigorta's most successful year was 2013, whereas its least successful year was 2018. Akyüz (2022) examined the financial performance of non-life insurance firms from 2014 to 2022 with TOPSIS and MABAC methodologies, employing financial ratios as criteria. The study revealed a positive correlation between TOPSIS and MABAC rankings. Bektaş (2023) investigates the financial performance of the insurance firms listed in the XSGRT Index over the four quarters of 2021. For this purpose, eight performance criteria are specified and assessed by means of three multi-criteria decision-making techniques—MEREC, MABAC, and CoCoSo. Findings obtained from the MABAC procedure indicate that AGESA attains the highest performance in the first and third quarters, whereas TURSG ranks first in the second and fourth quarters. Kundakçı and Arman (2023) sought to assess the financial performance of real estate investment trusts (REITs) listed in the BIST / XKURY for the years 2020-2022, employing the enhanced IDOCRIW and MABAC methodologies. The results derived from the enhanced IDOCRIW approach indicate that the significance levels of the criterion fluctuate over time. Analyses utilizing the MABAC approach indicated that AKMGY and HLGYO demonstrated superior and more consistent performance relative to other REITs. The research findings indicate that the proposed integrated model serves as an effective instrument for performance evaluation and enhancement procedures. In their study, Yavuz and Sönmez (2023) evaluated companies' BIST Cor. Gover. Ind. financial performanc utilizing the CRITIC-MABAC and ENTROPI-MABAC methodologies, based on data from the years 2019-2021. Seven distinct ratios were employed as assessment criteria in the study. The criteria weights were determined using the objective methodologies CRITIC and ENTROPI, followed by the annual ranking of the companies' financial performance using the MABAC method. The rankings derived from the CRITIC-MABAC and ENTROPI-MABAC systems are compared. The analysis indicated that LOGO was the top-performing company in 2019 according to both methodologies, although PRKME excelled in 2020 and 2021. Doğan and Karaçayır (2023) evaluated the fiscal success of corporations

in the Bist technology index with TOPSIS and MABAC methodologies. An examination of the financial performance of technology enterprises was conducted for the period 2019, 2020, 2021 and 2022. The analytical results indicated that Papıl and Ard Grup exhibit the highest performance, whereas Netaş demonstrates the lowest performance across many techniques and years of evaluation. Furthermore, Escom and Kfein were recognized as the companies exhibiting significant performance volatility throughout the investigation period. Çetin and Karataş (2024) sought to assess how well enterprises in the automobile industry are doing in terms of profitability. A 10-year data collection covering the period from 2013 to 2022 was compiled for eight automotive manufacturers operating on Borsa Istanbul. Seven ratios frequently employed to assess profitability performance were analyzed, and the LOPCOW and MABAC procedures from MCDM methods were utilized. The results indicate that Otokar Oto. exhibited the highest profitability performance in 2020 and 2021, while Doğuş Oto. achieved this distinction in 2022. Yıldırım (2024) sought to assess the status of factoring firms within the factoring sector in Turkey and globally, as well as to analyze the performance of those organizations operating in this domain. The research utilizes six distinct predefined ratios for the years 2021 and 2022. The CRITIC method was utilized for weighing these ratios, while the MAIRCA and MABAC procedures were employed for performance analysis. The research demonstrated that the performance achievement rankings derived from the MAIRCA and MABAC methodologies were identical; however, the rankings fluctuated with alterations in the weighting method.

3. Data Set and Method

This study assessed the financial and sustainability data of 24 businesses listed in the Borsa Istanbul (BIST) Sustainability Participation Index for the year 2023. The requisite information regarding the criteria employed in the study was sourced from reports disseminated via the Public Disclosure Platform (PDP) and the content provided by the pertinent companies on their official websites. The codes and names of the companies listed in the index and incorporated in the dataset of this study are elaborated in Table 1.

Table 1. Company Names and Code

Code	Company Names
A1	Akçansa Çimento
A2	Aksa Akrilik Kimya
A3	Aksa Enerji
A4	Aselsan Elektronik
A5	Bim Birleşik Mağazalar
A6	Doğuş Otomotiv
A7	Enerjisa Enerji
A8	Ereğli Demir ve Çelik
A9	Esenboğa Elektrik
A10	Galata Wind Enerji
A11	İskenderun Demir ve Çelik
A12	Kardemir Karabük -A

Table 1. Continued

A13	Kardemir Karabük -B
A14	Kardemir Karabük. -D
A15	Logo Yazılım
A16	Margün Enerji
A17	Mavi Giyim
A18	Mlp Sağlık
A19	Naturel Yenilenebilir Enerji
A20	Qua Granite Hayal
A21	Sun Tekstil.
A22	Tüpraş
A23	Vestel Beyaz Eşya
A24	Vestel Elektronik

Source: https://www.kap.org.tr/tr/Endeksler

Comprehensive information regarding the criteria evaluated in this study and their orientations is provided in Table 2. The study assumes that all criteria weights are uniform. Numerous studies in the literature assume equal criteria weights (Mercan and Çetin, 2020: 125; Say, 2022b: 512). This methodology was implemented to guarantee the study's uniformity and enhance comparability.

Table 2. Company Ratios and Codes

Code	Ratios	Purpose (Direction)
K1	Total Debt / Total Assets	Minimum
K2	Equity / Total Debt	Maksimum
K3	Total Debt / Equity	Minimum
K4	Short-term Debt / Total Assets	Minimum
K5	Long-term Debt / Total assets	Minimum
K6	Equity / Total Assets	Maksimum
K7	Tangible Fixed Assets / Equity	Maksimum
K8	Fixed Assets / Permanent Capital	Maksimum

The ratios in Table 2 are the basic ratios used in many academic articles (Akbulut, 2020: 474; Say, 2022b: 512; Doğan and Karaçayır, 2023: 947).

3.1. Mabac Method

The MABAC (Multi-Attributive Border Approximation Area Comparison) approach was initially developed and presented in the literature by Pamučar and Ćirović in 2015. This method assesses choice alternatives by measuring the proximity of each alternative to the border approximation region in accordance with the criterion functions. The MABAC approach is notable for its usefulness in both human and organizational decision-making processes, facilitating the identification of the best suitable option among alternatives in complicated decision issues with numerous criteria. This method provides a systematic and effective solution for multi-criteria decision-making problems and has diverse applications.

The phases of the MABAC method's implementation are elucidated in full below (Yavuz and Sönmez, 2023: 285-286).

Stage 1: During this stage, the decision matrix is formulated. The choice matrix is represented by Equation (1). "m" represent the quantity of possibilities and "n" denote the quantity of criteria.

$$X=[X_{ij}]_{mxn} \qquad i = 1,2,3,\dots,m \;;\; j = 1,2,3,\dots n \tag{1}$$

Stage 2: At this stage, the values obtained from various units are standardized. The normalization procedure standardizes each number to a range between [0, 1], as illustrated in Equation (2).

$$N = [X_{ij}]_{mxn} \qquad i = 1,2,3,\dots,m \;;\; j = 1,2,3,\dots n \tag{2}$$

Due to the criteria in the study being expressed in various units and scales, a normalizing method was implemented to assure comparability. Consequently, all criterion values were normalized to the range [0, 1], establishing a uniform evaluative basis among the criteria. The formulations employed in the normalization process vary based on the criterion's orientation:

Equation (3) was utilized for benefit-oriented criteria, whereas

Equation (4) was applied for cost-oriented criteria.

The performance of each option is effectively adjusted based on the orientation of the criterion, resulting in a uniform data structure for subsequent analytical phases.

$$n_{ij} = \frac{X_{ij} - X_{i\,max}}{X_{i\,max} - X_{i\,min}} \tag{3}$$

$$n_{ij} = \frac{X_{ij} - X_{i\,max}}{X_{i\,min} - X_{i\,max}} \tag{4}$$

Here $X_{i\,max}$ values in the direction of benefit, $X_{i\,min}$ on the other hand, shows cost-side values.

Stage 3: At this stage, the decision matrix is assigned weights utilizing Equation (5).

$$v_{ij}=w_i\,n_{ij} + w_i \tag{5}$$

Stage 4: In this stage, boundary proximity area values for all criteria are derived using Equation (20), and the boundary proximity area matrix is established using Equation (6).

$$g_i = (\Pi_{j=1}^{m} v_{ij})^{1/m}$$
$$G = [g_1 \quad g_2 \quad \cdots \quad g_n] \tag{6}$$

Stage 5: In this stage, Equation (7) is employed to derive the matrix of the distances of options to the area that is close to the boundary.

$$Q = V - G = \begin{bmatrix} v_{11} - g_1 & v_{12} - g_2 & \cdots & v_{1n} - g_n \\ v_{21} - g_1 & v_{22} - g_2 & \cdots & v_{2n} - g_n \\ \cdots & \cdots & \ddots & \cdots \\ v_{m1} - g_1 & v_{m2} - g_2 & \cdots & v_{mn} - g_2 \end{bmatrix} = \begin{bmatrix} q_{11} & q_{12} & \cdots & q_{1n} \\ q_{21} & q_{22} & \cdots & q_{2n} \\ \cdots & \cdots & \ddots & \cdots \\ q_{m1} & q_{m2} & \cdots & q_{mn} \end{bmatrix} \tag{7}$$

Stage 6: In this stage, Equation (8) is employed to ascertain the locations based on the boundary proximity region.

$$A_i = \begin{cases} G^+ & \text{if } q_{ij} > 0 \text{ ise} \\ G & \text{if } q_{ij} = 0 \text{ ise} \\ G^- & \text{if } q_{ij} < 0 \text{ ise} \end{cases} \tag{8}$$

Equation (8) indicates that an alternative can fill three spots. For an alternative to be deemed the optimal choice, it must possess the majority of its values for the criterion in the higher range (G^+) must be present. qij>0 status A_i demonstrates the proximity of the alternative to the optimal alternative q_{ij}<0 the situation is A_i demonstrates the proximity of the alternative to the negative ideal alternative.

Stage 7: In this concluding stage, Equation (9) is employed to ascertain the distance to the proximity area for each possibility (q_{ij}) values are summed up Si values are acquired. The optimal alternative is identified as the one with the greatest S_i value.

$$S_i = \sum_{j=1}^{n} q_{ij} \qquad i = 1,2,3, \ldots, m \; ; \; j = 1,2,3, \ldots n \tag{9}$$

3.2. Findings

This study employed the MABAC (Multi-Attributive Border Approximation Area Comparison) method based on the premise that the criteria weights are uniform. The studies utilize the financial and sustainability data of the firms for the year 2023, and based on this data, the rankings of the companies are established according to their financial structures. The resultant ranking facilitates a comparative evaluation of each company's performance based on the established criteria. The choice matrix for firms and criteria is comprehensively detailed in Table 3, and the facts supporting the analysis can be examined through this table.

Table 3. Decision Matrix

	K1	K2	K3	K4	K5	K6	K7	K8
A1	0,30	2,37	0,42	0,27	0,02	0,70	0,86	0,86
A2	0,33	2,02	0,49	0,28	0,06	0,67	0,91	0,84
A3	0,38	1,64	0,61	0,25	0,13	0,62	1,12	0,92
A4	0,41	1,42	0,70	0,33	0,08	0,59	0,88	0,77
A5	0,53	0,89	1,12	0,37	0,16	0,47	1,34	1,00
A6	0,38	1,61	0,62	0,27	0,11	0,62	0,83	0,70
A7	0,56	0,78	1,29	0,36	0,20	0,44	1,58	1,09
A8	0,38	1,62	0,62	0,29	0,09	0,62	0,92	0,80
A9	0,34	1,90	0,53	0,11	0,24	0,66	1,40	1,03
A10	0,23	3,31	0,30	0,04	0,19	0,77	1,26	1,01
A11	0,37	1,74	0,58	0,28	0,09	0,63	0,91	0,80
A12	0,39	1,59	0,63	0,32	0,06	0,61	0,94	0,85
A13	0,39	1,59	0,63	0,32	0,06	0,61	0,94	0,85
A14	0,39	1,59	0,63	0,32	0,06	0,61	0,94	0,85
A15	0,57	0,76	1,32	0,48	0,09	0,43	1,58	1,32
A16	0,34	1,98	0,50	0,10	0,24	0,66	1,39	1,02
A17	0,52	0,92	1,08	0,44	0,08	0,48	0,56	0,48
A18	0,55	0,83	1,20	0,31	0,23	0,45	1,55	1,02
A19	0,35	1,82	0,55	0,12	0,23	0,65	1,39	1,02
A20	0,46	1,16	0,87	0,43	0,04	0,54	0,80	0,75
A21	0,42	1,40	0,72	0,34	0,08	0,58	0,78	0,68
A22	0,45	1,24	0,81	0,42	0,02	0,55	0,82	0,78
A23	0,58	0,74	1,36	0,50	0,08	0,42	1,13	0,95
A24	0,67	0,48	2,06	0,62	0,05	0,33	1,89	1,64

Subsequent to the formulation of the decision matrix, the normalizing procedure was executed as the subsequent phase of the analytical process. At this juncture, normalized values were computed from the raw data in Table 3, aligned with the criteria's orientation. The normalized choice matrix for the companies analyzed in the study for 2023 is elaborated in Table 4. The normalized matrix serves as the fundamental data structure for subsequent phases in the MABAC approach.

Table 4. Normalized Decision Matrix

	K1	K2	K3	K4	K5	K6	K7	K8
A1	0,84	0,67	0,93	0,60	1,00	0,84	0,23	0,33
A2	0,77	0,54	0,89	0,59	0,82	0,77	0,26	0,31
A3	0,66	0,41	0,82	0,64	0,50	0,66	0,42	0,38
A4	0,59	0,33	0,77	0,50	0,73	0,59	0,24	0,25
A5	0,32	0,14	0,53	0,43	0,36	0,32	0,59	0,45
A6	0,66	0,40	0,82	0,60	0,59	0,66	0,20	0,19
A7	0,25	0,11	0,44	0,45	0,18	0,25	0,77	0,53
A8	0,66	0,40	0,82	0,57	0,68	0,66	0,27	0,28
A9	0,75	0,50	0,87	0,88	0,00	0,75	0,63	0,47
A10	1,00	1,00	1,00	1,00	0,23	1,00	0,53	0,46
A11	0,68	0,45	0,84	0,59	0,68	0,68	0,26	0,28
A12	0,64	0,39	0,81	0,52	0,82	0,64	0,29	0,32
A13	0,64	0,39	0,81	0,52	0,82	0,64	0,29	0,32
A14	0,64	0,39	0,81	0,52	0,82	0,64	0,29	0,32
A15	0,23	0,10	0,42	0,24	0,68	0,23	0,77	0,72
A16	0,75	0,53	0,89	0,90	0,00	0,75	0,62	0,47
A17	0,34	0,16	0,56	0,31	0,73	0,34	0,00	0,00
A18	0,27	0,12	0,49	0,53	0,05	0,27	0,74	0,47
A19	0,73	0,47	0,86	0,86	0,05	0,73	0,62	0,47
A20	0,48	0,24	0,68	0,33	0,91	0,48	0,18	0,23
A21	0,57	0,33	0,76	0,48	0,73	0,57	0,17	0,17
A22	0,50	0,27	0,71	0,34	1,00	0,50	0,20	0,26
A23	0,20	0,09	0,40	0,21	0,73	0,20	0,43	0,41
A24	0,00	0,00	0,00	0,00	0,86	0,00	1,00	1,00

The lowest value, A24 (Vestel Elektronik), stands out with a normalized value of "0.00" in most criteria. This is due to the normalization of high "cost-side" ratios (e.g. debt ratio) in the raw data. In MABAC, however, this is not treated negatively, but positively, usually associated with high equity and low debt (because minimum is better in that criterion). The highest value, A10 (Galata Wind), reached a normalized value of "1.00" in most criteria. This indicates that this company has maximum performance in some criteria

The weighted normalized decision matrix is elaborated upon in Table 5.

Table 5. Weighted Normalized Decision Matrix

	K1	K2	K3	K4	K5	K6	K7	K8
A1	0,23	0,21	0,24	0,20	0,25	0,23	0,15	0,17
A2	0,22	0,19	0,24	0,20	0,23	0,22	0,16	0,16
A3	0,21	0,18	0,23	0,20	0,19	0,21	0,18	0,17
A4	0,20	0,17	0,22	0,19	0,22	0,20	0,16	0,16
A5	0,16	0,14	0,19	0,18	0,17	0,16	0,20	0,18
A6	0,21	0,17	0,23	0,20	0,20	0,21	0,15	0,15
A7	0,16	0,14	0,18	0,18	0,15	0,16	0,22	0,19
A8	0,21	0,18	0,23	0,20	0,21	0,21	0,16	0,16
A9	0,22	0,19	0,23	0,23	0,13	0,22	0,20	0,18
A10	0,25	0,25	0,25	0,25	0,15	0,25	0,19	0,18
A11	0,21	0,18	0,23	0,20	0,21	0,21	0,16	0,16

Table 5. Continued

A12	0,20	0,17	0,23	0,19	0,23	0,20	0,16	0,16
A13	0,20	0,17	0,23	0,19	0,23	0,20	0,16	0,16
A14	0,20	0,17	0,23	0,19	0,23	0,20	0,16	0,16
A15	0,15	0,14	0,18	0,16	0,21	0,15	0,22	0,22
A16	0,22	0,19	0,24	0,24	0,13	0,22	0,20	0,18
A17	0,17	0,14	0,19	0,16	0,22	0,17	0,13	0,13
A18	0,16	0,14	0,19	0,19	0,13	0,16	0,22	0,18
A19	0,22	0,18	0,23	0,23	0,13	0,22	0,20	0,18
A20	0,18	0,16	0,21	0,17	0,24	0,18	0,15	0,15
A21	0,20	0,17	0,22	0,19	0,22	0,20	0,15	0,15
A22	0,19	0,16	0,21	0,17	0,25	0,19	0,15	0,16
A23	0,15	0,14	0,17	0,15	0,22	0,15	0,18	0,18
A24	0,13	0,13	0,13	0,13	0,23	0,13	0,25	0,25

Table 5 clearly shows the relative weighted achievement of each company in the financial criteria. These scores form the basis for the MABAC ranking. Firms such as A10, A24, A1 stand out prominently in this table. The boundary proximity area values obtained using Equation (6) are given in Table 6.

Table 6. Boundary Proximity Area Values

	K1	**K2**	**K3**	**K4**	**K5**	**K6**	**K7**	**K8**
g_i	0,19	0,17	0,21	0,19	0,19	0,19	0,17	0,17

The distance matrix for the options to the boundary proximity area is presented in Table 7.

Table 7. Distances to the Boundary Proximity Zone of Alternative

	K1	**K2**	**K3**	**K4**	**K5**	**K6**	**K7**	**K8**
A1	0,04	0,04	0,03	0,01	0,06	0,04	-0,02	0,00
A2	0,03	0,03	0,03	0,01	0,03	0,03	-0,02	-0,01
A3	0,02	0,01	0,02	0,02	-0,01	0,02	0,00	0,00
A4	0,01	0,00	0,01	0,00	0,02	0,01	-0,02	-0,01
A5	-0,03	-0,02	-0,02	-0,01	-0,02	-0,03	0,02	0,01
A6	0,02	0,01	0,02	0,01	0,01	0,02	-0,02	-0,02
A7	-0,03	-0,03	-0,03	-0,01	-0,05	-0,03	0,05	0,02
A8	0,02	0,01	0,02	0,01	0,02	0,02	-0,02	-0,01
A9	0,03	0,02	0,02	0,05	-0,07	0,03	0,03	0,01
A10	0,06	0,08	0,04	0,06	-0,04	0,06	0,02	0,01
A11	0,02	0,01	0,02	0,01	0,02	0,02	-0,02	-0,01
A12	0,01	0,01	0,02	0,00	0,03	0,01	-0,01	-0,01
A13	0,01	0,01	0,02	0,00	0,03	0,01	-0,01	-0,01
A14	0,01	0,01	0,02	0,00	0,03	0,01	-0,01	-0,01
A15	-0,04	-0,03	-0,03	-0,03	0,02	-0,04	0,05	0,04
A16	0,03	0,02	0,02	0,05	-0,07	0,03	0,03	0,01
A17	-0,02	-0,02	-0,02	-0,02	0,02	-0,02	-0,05	-0,05
A18	-0,03	-0,03	-0,02	0,00	-0,06	-0,03	0,04	0,01
A19	0,02	0,02	0,02	0,04	-0,06	0,02	0,03	0,01

Table 7. Continued

A20	-0,01	-0,01	0,00	-0,02	0,05	-0,01	-0,03	-0,02
A21	0,00	0,00	0,01	0,00	0,02	0,00	-0,03	-0,02
A22	0,00	-0,01	0,00	-0,02	0,06	0,00	-0,03	-0,01
A23	-0,04	-0,03	-0,04	-0,04	0,02	-0,04	0,00	0,01
A24	-0,07	-0,04	-0,09	-0,06	0,04	-0,07	0,08	0,08

Table 8 presents the criterion function values (S_i) for each choice together with the MABAC method rankings of the organizations.

Table 8. Results of the MABAC Method

Sort	Code	S_i	Sort	Code	S_i	Sort	Code	S_i	Sort	Code	S_i
1	A10	0,29	**7**	A3	0,07	**13**	A6	0,03	**19**	A5	-0,12
2	A1	0,19	**8**	A11	0,07	**14**	A4	0,01	**20**	A7	-0,12
3	A2	0,13	**9**	A12	0,07	**15**	A22	-0,01	**21**	A18	-0,13
4	A16	0,13	**10**	A14	0,07	**16**	A21	-0,02	**22**	A24	-0,15
5	A9	0,12	**11**	A13	0,07	**17**	A20	-0,05	**23**	A23	-0,18
6	A19	0,11	**12**	A8	0,06	**18**	A15	-0,06	**24**	A17	-0,12

Table 8 shows the financial structure performance rankings of the companies according to the MABAC method. A10 (Galata Wind) tops the list with the highest Si value. This means that the company's indebtedness ratios are low, its equity structure is strong and assets are financed effectively. At the same time, the fact that it is a sustainability-oriented company in the energy sector supports this result. A1 and A2 (Akçansa and Aksa Akrilik), despite being from traditional manufacturing sectors, maintained their sound financial structures and ranked high. These companies exhibit a stable structure in terms of debt/equity balance. A16 (Margün Enerji), as a renewable energy company, it is seen that indebtedness is kept at an optimal level and fixed assets are supported by solid capital. A9 (Esenboğa Elektrik) demonstrated a good financial structure with low short-term debt ratios and a strong fixed asset-equity balance.

4. Conclusion

Today, it is increasingly essential to assess corporate performance not just regarding profitability but also concerning adherence to sustainability principles and financial stability. For investors, stakeholders, and regulators, the long-term financial structure of organizations is intrinsically linked to their capacity for sustainable growth. This study evaluates the financial structure performance of businesses in the Borsa Istanbul Sustainability Participation Index using the Multi-Attributive Border Approximation Area Comparison method, a multi-criteria decision-making methodology. The primary aim of the study is to assess the financial soundness of 24 companies that have embraced sustainability and participatory finance concepts as of 2023 through a comparative analysis of their financial structures. The MABAC approach is a contemporary MCDM technique that assesses criterion values based on their proximity to the boundary region and displays the results in a consistent and interpretable format. The eight financial ratios employed in the

study illustrate the companies' equity-foreign equity equilibrium, short and long-term debt composition, and fixed asset-financing correlation. All criteria were assigned equal weights, and the analysis was conducted. The investigation indicates that Galata Wind (A10) has the most superior financial structure performance. Subsequent to this firm were Akçansa Çimento (A1), Aksa Akrilik (A2), Margün Enerji Üretim (A16), and Esenboğa Elektrik (A9). These companies demonstrated stronger financial structures due to their balanced capital compositions, relatively low debt ratios, and effective utilization of equity in financing long-term assets.

The use of Multi-Criteria Decision Making (MCDM) methods in financial performance analysis has become an important tool to increase the competitiveness of businesses and support strategic decision processes. While Chen and Chimerda (1981) state that financial ratios provide basic indicators for the analysis of accounting system and financial structure, Temizel and Bayçelebi (2016) state that the simultaneous evaluation of multiple criteria is only possible with MCDM methods. In this context, the MABAC method is an approach that is used especially in financial performance analysis but has limited number of applications in the literature. In Sonar and Kulkarni's (2021) study, the AHP-MABAC integrated model was used to determine the most suitable alternative among electric vehicles, while Say (2022a) analyzed bank performances by using the Entropy-TOPSIS method in an integrated manner. Similarly, Çilek (2022) conducted SD-MABAC analysis based on the financial ratios of firms in the BIST Real Estate Investment Trust index and determined the leverage ratio as the most critical criterion. Akyüz (2022) and Demir (2022) also tested the applicability of the MABAC method on firms in different sectors and conducted comparative analyses with methods such as TOPSIS and PSI. The findings of this study show that the MABAC method provides a meaningful and holistic assessment, especially in the financial structure analysis of companies that comply with the principles of sustainability and participation finance. According to the ranking obtained, Galata Wind Enerji A.Ş. (A10), Akçansa Cement (A1), Aksa Akrilik (A2), Margün Enerji (A16) and Esenboğa Elektrik (A9) are the companies with the highest performance. For example, in the study conducted by Yavuz and Sönmez (2023) on the BIST Corporate Governance Index, LOGO and PRKME companies were at the forefront, whereas LOGO (A15) ranked lower in this study, indicating that differences in index structure and criteria can significantly affect the ranking. In studies such as Kundakçı and Arman (2023), MABAC was integrated with different weighting methods in the analysis of REIT firms and the importance levels of the criteria were emphasized on a yearly basis. In this study, on the other hand, the simplicity and comparability of the method was preserved by analyzing all criteria with equal weights, whereas a structure without the use of different weighting models was preferred. Recent studies such as Bektaş (2023) and Yıldırım (2024) have shown that the MABAC method is a strong method in terms of consistency and performance sensitivity when compared to other CRM methods such as CoCoSo, MEREC and MAIRCA.

Similar MABAC-based studies in the literature have generally focused on bank performances, insurance firms or portfolio optimizations (Say, 2022b; Demir, 2022; Çilek, 2022). The difference of this study is that it focuses only on an index (XSRDK) determined according to the principles of sustainability and participation and analyzes the concept of

sustainable financial structure within the MCDM framework. In the literature, MABAC has often been integrated with objective weighting methods such as CRITIC, Entropy, AHP, PSI. In this study, a more direct approach is adopted by giving equal weight to all criteria. This methodological simplicity increases consistency in comparative analysis. In addition, the study is limited to data valid for a specific year (2023) and does not show temporal variation. Although this may seem like a shortcoming compared to some literature studies, it enables an in-depth analysis of the structure as of that year. While previous studies have mostly focused on profitability, portfolio choice, overall performance or corporate governance, this study focuses on "financial structure performance", focusing on debt/equity balance, short- and long-term liability structure and sources of financing for fixed assets. The study possesses certain limitations. Only data from the year 2023 has been utilized. This renders the observation of companies' performance changes over time unfeasible. Secondly, the analysis encompasses only those companies included in the BIST Sustainability Participation Index for whose financial data is accessible. Furthermore, banks and conglomerates are excluded from the analysis due to their distinct financial structural characteristics. While these limits impose certain constraints on general validity, they ensure methodological consistency on the structural integrity of the index. The findings of the study have several strategic implications for investors and managers. A strong financial structure not only minimizes short-term risks but also reflects companies' capacity for sustainable growth. In this context, a high level of equity and a balanced distribution of indebtedness should be among the primary evaluation criteria for sustainable investments. In addition, the fact that tangible fixed assets are backed by strong capital shows that companies secure their long-term assets. A few suggestions can be made for future studies. Incorporating multiple years into the analysis will facilitate the assessment of organizations' performance stability. Incorporating environmental, social, and governance (ESG) requirements alongside financial structure indicators would facilitate a more comprehensive approach to sustainability. Ultimately, performing analogous analyses on several indices (e.g., BIST 100, BIST Technology) or sectors will elucidate methodological comparisons and sectoral disparities more distinctly. This work offers significant contributions from both academic and practical viewpoints, illustrates the applicability of the MABAC technique in analyzing the financial structures of sustainability and participation-oriented enterprises, and establishes a foundation for future research on this topic.

Statement of Research and Publication Ethics

This study did not require ethics committee approval and/or any legal or special permission. The principles of research and publication ethics were fully complied with.

Declaration of Contribution of the Researchers

All content in the article has been prepared solely with the individual contribution of the author.

Researchers' Conflict of Interest Statement

There is no conflict of interest related to this study.

References

Akbulut, O.Y. (2020). Finansal performans ile pay senedi getirisi arasındaki ilişkinin bütünleşik CRITIC ve MABAC ÇKKV teknikleriyle ölçülmesi: Borsa İstanbul çimento sektörü firmalar üzerine ampirik bir uygulama. *Pamukkale Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 40, 471- 488.

Akyüz, G.Ç. (2022). Hayat dışı sigorta şirketlerinin finansal performans analizinde TOPSIS ve MABAC yöntemlerinin değerlendirilmesi. *İzmir İktisat Dergisi*, 37(4): 891-912.

Altın, H. (2021). Borsa İstanbul'da işlem gören şirketlerin finansal performansının MABAC yöntemiyle analizi. *Uluslararası Ekonomi İşletme ve Politika Dergisi,* 5(2): 211-234.

Chen, K.H. and Shimerda, T.A. (1981). An empirical analysis of useful financial ratios. *Financial Management,* 10(1): 51–60.

Çetin, Ö.O. ve Karataş, M. (2024). Bist'te işlem gören otomotiv şirketlerinin karlılıklarının LOPCOW ve MABAC yöntemleriyle analizi. *Nevşehir Hacı Bektaş Veli Üniversitesi SBE Dergisi,* 14(3): 1470-1496.

Çilek, A. (2022). SD temelli MABAC ÇKKV teknikleri ile portföy optimizasyonu: BİST GYO sektöründe ampirik bir uygulama. *Trends in Business and Economics*, 36(4), 374-386.

Demir, G. (2022). Hayat dışı sigorta sektöründe kurumsal performansın PSI-SD tabanlı MABAC metodu ile ölçülmesi: Anadolu Sigorta örneği. *Ekonomi Politika ve Finans Araştırmaları Dergisi*, 7(1): 112-136.

Devi, A.M. and Devaki, A. (2019). Applications of quantitative techniques in decision making of business organisation. *International Journal of Trend in Scientific Research and Development*, 3(3): 568-571.

Doğan, S. ve Kalaycı, E. (2023). Borsa İstanbul'da faaliyet gösteren teknoloji firmalarının finansal performansının TOPSİS, MABAC yöntemleri ile değerlendirilmesi. *Karamanoğlu Mehmetbey Üniversitesi Sosyal ve Ekonomik Araştırmalar Dergisi*, 25(45): 945-965.

Karaatlı, M., Ömürbek, N., Budak, İ. ve Dağ, O. (2015). Çok kriterli karar verme yöntemleri ile yaşanabilir illerin sıralanması. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi,* 33: 215-228.

Kundakcı, N. ve Arman, K. (2023). BİST kurumsal yönetim endeksinde işlem gören gayrimenkul yatırım ortaklıklarının bütünleşik çkkv yaklaşımı ile analizi. *Pamukkale Üniversitesi İşletme Araştırmaları Dergisi*, 10(1-Prof. Dr. Feyzullah EROĞLU Armağan Sayısı): 124-143.

Mercan, Y. ve Çetin, O. (2020). COPRAS ve VIKOR yöntemleri ile BIST elektrik endeksindeki firmalarının finansal performans analizi. *Uluslararası Afro-Avrasya Araştırmaları Dergisi*, 5(9): 123-139.

Ömürbek, N. ve Özcan, A. (2024). BİST'de işlem gören sigorta şirketlerinin MULTIMOORA yöntemiyle performans ölçümü. *Uluslararası İşletme, Ekonomi ve Yönetim Perspektifleri Dergisi*, 1(2): 64-75.

Public Disclosure Platform. (2025). *Sustainable Participation Index [Dataset]*. Retrieved from: https://www.kap.org.tr/tr/Endeksler

Pamučar, D., and Ćirović, G. (2015). The selection of transport and handling resources in logistics centers using multi-attributive border approximation area comparison (mabac). *Expert Systems with Applications,* 42(6): 3016-3028.

Phua, M.H. and Minowa, M. (2005). A GIS-based multi-criteria decision making approach to forest conservation planning at a landscape scale: A case study in the Kinabalu Area, Sabah, Malaysia. *Landscape and urban planning*, 71(2-4): 207-222.

Say, S. (2022a). Kamusal sermayeli mevduat bankalarının aktif kalitesinin entegre entropi-topsıs yöntemleri ile değerlendirilmesi, *Pamukkale Sosyal Bilimler Enstitüsü Dergisi,* 52: 351-361.

Say, S. (2022b). Aras ve copras yöntemleri ile BİST teknoloji endeksindeki şirketlerin finansal performans analizi. *Selçuk Üniversitesi Sosyal Bilimler Meslek Yüksekokulu Dergisi,* 25 (25. Yıl Özel Sayısı): 511-523.

Sonar, H.C. and Kulkarni, S.D. (2021). An integrated AHP-MABAC approach for electric vehicle selection. *Research in Transportation Business and Management*, 41, 100665.

Temizel, F. ve Bayçelebi, B.E. (2016). Finansal oranların TOPSIS sıralaması ile yıllık getiriler arasındaki ilişki: Tekstil imalatı sektörü üzerine bir uygulama. *Anadolu Üniversitesi Sosyal Bilimler Dergisi,* 16(2): 159-170.

Ulaş, A. (2017). Edas yöntemi kullanılarak bir tekstil atölyesi için dikiş makinesi seçimi. *İşletme Araştırmaları Dergisi,* 9(12): 169-183.

Yavuz, S. ve Sönmez, A. R. (2023). Critic-Mabac ve Entropi-Mabac yöntemleri ile finansal performans değerlendirmesi: BİST kurumsal yönetim endeksi üzerine bir araştırma. *EKEV Akademi Dergisi,* 94: 278-300.

Yıldırım, H. (2024). Factoring sector in Türkiye: General overview and evaluation of factoring companies' financial performance by multi-criteria decision-making techniques. *Politik Ekonomik Kuram,* 8(2): 277-302.