

EVALUATION OF FINANCIAL PERFORMANCE OF SOME TECHNOLOGY COMPANIES TRADED IN BORSA ISTANBUL BY TOPSIS METHOD

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ABSTRACT

Financial performance measurement is critical in corporations' and investors' financial decisions. When analyzing a company's financial performance, a variety of methods can be used. Multi-criteria decision making (MCDM) is one of these methods. In terms of usability of use, evaluation of objective and subjective data together, and convenience of analysis of the results, the TOPSIS technique, which is one of the MCDM methods, is also often used in financial performance assessment.

The objective of this research is to use the TOPSIS method to evaluate financial performance of Technology Turkish enterprises traded on the Istanbul Stock Exchange (BIST), and to see if there is a correlation among overall financial performance and stock market capitalisation.

According to the study's findings, it was found that Technology Sector companies operating in BIST were affected by national and international developments, and performance scores varying according to years showed fluctuations in both market value change, score, and rank. This study, considering market value change and TOPSIS rank, the implemented method has shown that there is not a stable correlation between market value change and TOPSIS rank of the companies.

Keywords: TOPSIS, Financial Decision Making, MCDM, Performance Analysis, Financial Ratios

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Borsa İstanbul'da İşlem Gören Bazı Teknoloji Şirketlerinin Finansal Performanslarının TOPSIS Yöntemi ile Değerlendirilmesi

ÖZET

Finansal performans ölçümü şirketler ve yatırımcıların yatırım kararlarında önemli bir yer tutmaktadır. Şirketlerin finansal performansları ölçülürken farklı yöntemler kullanılabilir. Bu yöntemlerden bir tanesi de çok kriterli karar verme yöntemleridir. Çok kriterli karar verme yöntemlerinden biri olan TOPSIS yöntemi de kullanım kolaylığı, nesnel ve öznel verileri bir arada değerlendirebilmesi ve sonuçlarının değerlendirilme kolaylığı açısından finansal performans ölçümünde sıklıkla kullanılmaktadır.

Bu çalışmanın amacı, Borsa İstanbul'da (BİST) işlem gören Teknoloji Sektör'ü işletmelerinin finansal verileri ile hazırlanan kriterler çerçevesinde TOPSIS yöntemi ile performanslarının belirlenmesi ve performans skorları ile borsa kapitalizasyonları arasında bir ilişkinin olup olmadığının tespit edilmesidir.

Çalışma sonucunda BİST'te faaliyet gösteren Teknoloji Sektörü şirketlerinin ulusal ve uluslararası gelişmelerden etkilendiği görülmüştür. Teknoloji sektörü şirketlerinin performans puanlarının ise yıllara göre hem skor bazında hem de sıralamada dalgalanmalar gösterdiği ve bu şirketlerin piyasa değerlerinin değiştiği belirlenmiştir. Teknoloji sektörü şirketlerinin piyasa değerlerinin yıllara göre yüzdesel değişimi ile TOPSIS sıralamalarını dikkate alarak gerçekleştirilen bu çalışmanın sonucunda, firmaların piyasa değerlerinin yüzdesel değişimi ile TOPSIS sıralamaları arasında anlamlı bir ilişki olmadığı tespit edilmiştir.

Anahtar Kelimeler: TOPSIS, Finansal Karar Alma, ÇKKV, Performans Analizi, Finansal Oranlar

INTRODUCTION

Financial failure and its reasons and the ways to avoid them have been an important issue for a long time. With the liberalization of the developing technology and the post-globalization markets in the global world, where financial limits are almost erased, businesses, investors, customers, and competitors across the globe are encountering. This situation leads businesses into a great uncertainty. In environments where financial uncertainty is high, determining the most accurate financial instrument becomes increasingly difficult and estimating financial risk becomes increasingly important. Preliminary determination of possible financial failure and intervention in this situation as early as possible can minimize the negative effects of financial failure on both the businesses and the investors.

In the globalizing world, financial performance measurement has a great importance for businesses and investors who want to succeed in the increasingly competitive environment. The financial statements and the financial ratios derived from them are the primary instruments used in financial performance measurement methodologies. The purpose of financial performance measurement is to provide decision-makers with information about the financial status of the company. Financial analysis helps decision-makers to make decisions on a forward-looking basis, as well as informing investors about companies. In addition, it also facilitates credit institutions' credit decisions regarding the business (Yükçü, 2010: 28-35).

There are many decision making methods for performance measurement. MCDM techniques can be employed among the techniques that are used to evaluate the financial performance, according to Wang (2009) and they are divided into three groups: basic methods (weighted addition and multiplication methods), ranking methods according to superiority (PROMETHEE, ELECTRE) and one value integrated criterion methods (TOPSIS, AHP, gray correlation method, fuzzy MCDM method).

TOPSIS (Technique For Order Preference Similarity To An Ideal Solution) is one of these techniques that is commonly used in the literature due to its practicality, ability to combine subjective and objective data, convenience of sorting, and understanding of the findings.

The objective of this research is to use the TOPSIS method to evaluate the financial performance of Technology Turkish enterprises traded on the Istanbul Stock Exchange (BIST), and to see if there is a correlation between overall financial performance and stock market capitalization.

In this study, 19 companies that are traded in the Technology Sector of BIST between 2019-2021 years were examined. The study consists of 6 chapters. In the first part, a literature study including the main works written in the field was made. In the second part, information about the TOPSIS method used in the research was given. In the third and fourth parts, the data about the research were mentioned and used, and in the last two sections, the findings of the research have been examined and recommendations have been made for future research by the researchers.

1. LITERATURE REVIEW

In the literature, it is observed that the topsis method is used in the solution of many problems. The TOPSIS method has been used in the literature to solve problems including supplier selection (Haldar et.al., 2014; Mohammed et.al., 2019; Koç, 2020), solid waste storage location selection (Kharat et.al., 2016), risk analysis studies (Fanghua&Guanchun, 2010; Jozi et.al., 2015; Haghshenas et.al, 2016; Orojloo et.al., 2018; Bid&Siddique et.al, 2019; Ranganath et.al., 2020), and disaster and emergency management studies (Jun et. al., 2013; Lee et.al., 2015; Kim et.al., 2019; An et.al., 2020). Furthermore, financial performance analysis studies commonly apply the TOPSIS method.

In the analysis of financial performance, MCDM techniques are frequently used. Yurdakul and Ic (2003) used the TOPSIS approach to measure the performance of automobile firms and compared the findings to stock value. According to the results, it was determined that the results obtained with TOPSIS method were similar to the stock values. The financial performance of cement factories was analyzed by Ertugrul and Karakaşolu (2009). Seçme, Bayrakdarolu, and Kahraman (2009) employed MCDM techniques to assess the Turkish banking sector's financial performance. Dumanoglu and Ergul (2010) studied the financial performance of technology companies from 2006 to 2009 and concluded that there were no significant changes in financial performance data over time. According to Demireli

(2010), public banks, which are operating nationally, are affected by local and global financial crises, performance scores show constant fluctuations based on foreign data, and the banking system shows no significant progress. Soba and Eren (2011) examined the financial performances of intercity bus companies between 2007-2010 and found that they fluctuated according to years. Bulgurcu (2012) compared the performance of technology companies between 2009 and 2011 according to MCDM methods and found that there were no serious fluctuations in the technology sector in these years. Stankevičienė ve Mencaitė (2012) evaluated the performances of the banks in Lithuania in terms of financial, customer and qualitative; Ömürbek and Kınay (2013) evaluated the financial performance of aviation companies; Shaverdi et al. (2014) reported the financial performance of oil companies in Iran, Wang (2014) evaluated the financial performance of container shipping companies in Taiwan; İşseveroğlu and Sezer (2015) evaluated the financial performances of pension companies operating in Turkey between 2008-2012 and found that performance values did not change significantly in the years examined. Cam, Cam, Ulutas and Sayın (2015) examined the financial performances of textile companies traded in BIST between 2010-2013 and determined that their performance values changed according to years. Akgün and Temür (2016) examined the financial performance of the two companies operating in the aviation sector between 2010-2015 and found that the performance values of both companies varied according to years. Demirci (2017) used the comparative analysis of the sportive, financial and financial fair play performances of football clubs traded on the BIST. Ünlü et al. (2017) examined 22 corporations in the BIST 30 index using data from the 2014 year's performance metrics, and found no differences in financial performance or shareholder value generation between BIST 30 firms that are and are not in the Borsa Istanbul Corporate Governance Index. Üçüncü et al. (2018) ranked the paper industry companies traded at BIST by using the TOPSIS technique to evaluate financial performance of companies in the paper industry. Ozcelik and Kucukcakal (2019) used the TOPSIS technique and financial ratios to examine the financial performance of financial leasing and factoring corporations traded on BIST from 2009 to 2016. Using MCDM techniques, Ozkan (2020) studied and ranked the financial performance of cement firms in the BIST Stone and Soil Based Sector for the year 2019 year.

When the literature is evaluated, it is seen that MCDM methods are deployed in many fields of both public and private sectors in both national and international studies. The financial ratios of BIST technology businesses were evaluated in this study between the years 2019 and 2021, and a comparison was conducted according to the years. In the literature, there are studies covering different date ranges and examining different indices with MCDM. However, the COVID-19 process has had very serious effects on both a local and global scale. Specific to BIST technology companies, a study examining the financial performances of companies and their market capitalization together could not be reached as a result of our literature search. It is thought that this study will contribute to the literature as a study that examines the financial performance of technology companies and the market capitalization of these companies in the COVID-19 process.

2. TOPSIS METHOD

The TOPSIS method was developed by Hwang Yoon in 1981. TOPSIS, which is the most frequently used method of MCDM methods, is applied by comparing the maximum and minimum values that alternatives within a set of criteria can take.

This method's main objective is to find the positive and negative ideal solution values. The TOPSIS method is based on sorting alternatives based on the best solution. It is sorted from far alternative solution to relatively close alternative solution. Alternatives are ranked according to this order (Cheng-Min and Wang, 2001:465).

The implementation of the TOPSIS method is conducted in the following order (Ustasüleyman, 2003:37; Akkaya, 2004:25; Opricovic and Tzeng, 2004:448; Eleren and Karagül, 2008:7; Gökdalay, 2009:162):

The decision matrix is created in the first step of the method. Each criterion of alternatives and alternatives in the decision matrix are listed as a table such as table 1.

Table:1 The Decision Matrix

Alternatives	Criterias				
a ₁	y ₁₁	y ₁₂	y ₁₃	y ₁₄	y _{1k}
a ₂	y ₂₁	y ₂₂	y ₂₃	y ₂₄	y _{2k}
a _n	y ₃₁	y ₃₂	y ₃₃	y ₃₄	y _{3k}

The matrix is normalized in the second step of the method by taking the square root of the sum of the squares of points or features in the given decision matrix.

$$z_{ij} = \frac{y_{ij}}{\sqrt{\sum (y_{ij})^2}} \quad (1)$$

The normalized decision matrix data is weighted with respect to each criterion to which it is subjectively attributed in the third step of the method. An example of weighted scale distribution is shown in table 2.

Table:2 Example of a 5 Weighted Scale

Criterion Evaluation	Weighted Scale
Very Insignificant	1
Less Insignificant	2
Unimportant	3
Less Important	4
Very Important	5

$$X_{ij} = w_i \cdot z_{ij} \quad (w_j: \text{as each } j. \text{ the weight of the criterion})$$

In the fourth step, m* and m- ideal points are defined. For each column, the weighted matrix's maximum and minimum values are determined.

$$m^* = (x_1^*, x_2^* \dots x_k^*) \text{ maximum values}$$

$$m^- = (x_1^-, x_2^- \dots x_k^-) \text{ minimum values}$$

After defining the ideal points, the distance between the maximum and minimum ideal points is calculated in the fifth step using the formula below:

$$S_i^* = \sqrt{\sum_{j=1}^k (x_{ij} - x_j^*)^2} \quad \text{for maximum ideal point} \quad (2)$$

$$S_i^- = \sqrt{\sum_{j=1}^k (x_{ij} - x_j^-)^2} \text{ for minimum ideal point} \quad (3)$$

In the last stage, the order and score of each alternative is found with the help of the following formula:

$$C_i^* = \frac{S_i^-}{S_i^- - S_i^+} \quad (0 \leq C_i^* \leq 1 \text{ ve } i=1,2,\dots,n) \quad (4)$$

According to the proximity values discovered, each alternative is sorted from small to large.

3. PURPOSE AND SCOPE OF THE STUDY

The main objective of this study is to analyze the financial performances according to the TOPSIS method using the financial data of companies in Technology Sector traded in Borsa Istanbul A.S. (BIST).

The reason for selecting the companies listed on the BIST is that they are both more transparent and robust than companies unlisted on the BIST because they comply with both the Turkish Commercial Code and the Capital Markets Law and they are under strict supervision by the relevant institutions. Therefore, quantitative explanations are more likely to be attributed to random effects. Furthermore selected companies are subject to certain legislation will also contribute to the homogeneity of the datas.

The scope of the work constitutes the enterprises that are traded in the technology sector in the BIST. The analysis is made with the financial ratios of 19 companies operating in Technology Sector between 2019-2021 years. The financial ratios of the companies are taken from the official website of the Public Disclosure Platform (KAP).

4. DATA AND VARIABLES USED IN RESEARCH

The study's scope is limited to companies in the technology sector that operate in the BIST. The financial ratios of the 19 Technology Sector companies that operate in BIST are calculated in this context using 12-month balance sheet and income statement data from 2019 to 2021. The companies subject to the work and the codes they have processed in BIST are listed in the Table 3.

Table:3 Firms Subject to Analysis

Name of the Company	Company Code in BIST
ALCATEL LUCENT	ALCTL
ARD GRUP BİLİSİM	ARDYZ
ARENA BİLGİSAYAR	ARENA
ARMADA BİLGİSAYAR	ARMDA
ASELSAN	ASELS
DATAGATE BİLGİSAYAR	DGATE
DESPEC BİLGİSAYAR	DESPC
ESCORT TEKNOLOJİ	ESCOM
FONET BİLGİ	FONET
İNDEKS BİLGİSAYAR	INDES
KAFEİN YAZILIM	KFEIN
KAREL ELEKTRONİK	KAREL
KRON	KRONT
LİNK BİLGİSAYAR	LINK
LOGO YAZILIM	LOGO
NETAS TELEKOM	NETAS
PAPİLON SAVUNMA	PAPIL
PLASTİKKART	PKART
SMARTİKS YAZILIM	SMART

Since the company names are long, the transaction codes in BIST are used. 19 companies are given in Table 3. 10 financial ratios of these companies are given in Table 4.

Table:4 Financial Ratios

X₁	Current Ratio
X₂	Quick Ratio
X₃	Total Debt / Total Assets
X₄	Profitability of Equity (Earnings Before Taxes / Equity)
X₅	Assets Profitability (EBIT/ Total Assets)
X₆	Net Profit Margin
X₇	Equity / Total Assets
X₈	Total Debt / Equity
X₉	Net Profit / Total Assets
X₁₀	Current Asset Turnover Rate

The 10 financial ratios calculated by using the balance sheets and income statements datas of the companies mentioned in Table 4 are listed above.

5. RESEARCH FINDINGS

In the research, 19 companies operating in the BIST Technology Sector were dealt with. The financial statements of these companies covering the years 2019-2021 were examined and 10 financial ratios, which are frequently used in previous studies, were calculated. Calculated ratios have been included in the analysis. Only the calculations and tables for the 2019 year are given below in order to show how it is done. Table 5 includes the financial ratios of the selected firms which are specified in Table 4.

Since the company names are long, the transaction codes in BIST are used. 19 companies and 10 financial ratios of these companies are given in Table 3 and Table 4.

Table:5 Decision Matrix of Criterias for 2019

Company	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀
ALCTL	2,08	1,72	0,63	0,00	0,02	-0,04	0,37	1,72	0,04	1,15
ARDYZ	3,86	3,83	0,16	0,36	0,33	0,47	0,84	0,19	0,31	1,55
ARENA	1,59	1,22	0,63	0,08	0,06	0,01	0,37	1,68	0,03	3,03
ARMDA	1,50	1,36	0,75	0,09	0,04	0,01	0,25	3,05	0,01	2,10
ASELS	1,80	1,23	0,47	0,24	0,12	0,26	0,53	0,89	0,13	1,02
DGATE	1,87	1,42	0,53	0,23	0,10	0,03	0,47	1,11	0,08	4,34
DESPC	2,06	1,48	0,48	0,20	0,13	0,04	0,52	0,94	0,08	2,12
ESCOM	8,76	8,76	0,04	0,24	0,26	-14,32	0,96	0,04	0,24	0,07
FONET	1,32	1,26	0,16	0,24	0,21	0,30	0,84	0,19	0,18	3,54
İNDES	1,27	0,98	0,76	0,26	0,07	0,02	0,24	3,25	0,05	2,94
KFEIN	4,08	4,02	0,17	0,17	0,14	0,18	0,83	0,21	0,14	1,86
KAREL	1,57	1,10	0,66	0,35	0,15	0,14	0,34	1,94	0,10	1,02
KRONT	1,90	1,87	0,33	0,19	0,14	0,20	0,67	0,49	0,14	1,50
LINK	9,14	9,14	0,14	0,24	0,14	0,48	0,86	0,16	0,18	0,57
LOGO	1,55	1,55	0,49	0,23	0,13	0,20	0,51	0,97	0,11	1,40
NETAS	1,26	1,16	0,73	0,33	0,03	-0,11	0,27	2,74	0,07	0,93
PAPIL	10,33	9,33	0,11	0,11	0,02	0,48	0,89	0,12	0,09	0,23
PKART	2,02	1,69	0,43	0,19	0,11	0,04	0,57	0,76	0,08	2,73
SMART	2,84	2,71	0,16	0,13	0,12	0,29	0,84	0,19	0,11	1,51

In the next step, the matrices of the criterion decisions shown in the Table 5 should be normalized. For this purpose, the criterion must be divided by the square root of the sum of the squares of each value. As a result of this operation normalized decision matrices are obtained as shown in Table 6.

Table:6 Normalized Decision Matrix

Company	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀
ALCTL	0,11	0,10	0,30	0,00	0,02	0,00	0,13	0,27	-0,06	0,13
ARDYZ	0,21	0,22	0,08	0,37	0,52	0,03	0,30	0,03	0,52	0,17
ARENA	0,09	0,07	0,30	0,08	0,09	0,00	0,13	0,26	0,04	0,33
ARMDA	0,08	0,08	0,36	0,09	0,06	0,00	0,09	0,47	0,02	0,23
ASELS	0,10	0,07	0,23	0,25	0,20	0,02	0,19	0,14	0,22	0,11
DGATE	0,10	0,08	0,25	0,23	0,15	0,00	0,17	0,17	0,14	0,48
DESPC	0,11	0,08	0,23	0,21	0,20	0,00	0,19	0,15	0,14	0,23
ESCOM	0,47	0,50	0,02	-0,25	-0,41	-1,00	0,35	0,01	-0,40	0,01
FONET	0,07	0,07	0,08	0,25	0,33	0,02	0,31	0,03	0,31	0,39
INDES	0,07	0,06	0,37	0,26	0,12	0,00	0,09	0,50	0,08	0,32
KFEIN	0,22	0,23	0,08	0,18	0,22	0,01	0,30	0,03	0,24	0,20
KAREL	0,08	0,06	0,32	0,36	0,24	0,01	0,12	0,30	0,17	0,11
KRONT	0,10	0,11	0,16	0,19	0,22	0,01	0,24	0,08	0,24	0,17
LINK	0,49	0,52	0,07	0,25	0,22	0,03	0,31	0,03	0,31	0,06
LOGO	0,08	0,09	0,24	0,24	0,20	0,01	0,18	0,15	0,19	0,15
NETAS	0,07	0,07	0,35	-0,34	-0,05	-0,01	0,10	0,42	-0,13	0,10
PAPIL	0,56	0,53	0,05	0,12	0,03	0,03	0,32	0,02	0,15	0,03
PKART	0,11	0,10	0,21	0,19	0,17	0,00	0,21	0,12	0,14	0,30
SMART	0,15	0,15	0,08	0,13	0,20	0,02	0,30	0,03	0,18	0,17

Thereafter, each criterion is assigned a weight value that is subjectively to the significance level. In some of the previous studies (Demireli, 2010), it was seen that equal weight values were assigned to financial ratios. This method is preferred in our study. Accordingly, the weighted values given to the criteria are as shown in Table 7.

Table:7 Weighted Values of Criterias

Criterias	Weight Ratings
Current Ratio (X ₁)	0.1
Quick Ratio (X ₂)	0.1
Total Debt / Total Assets (X ₃)	0.1
Profitability of Equity (Earnings Before Taxes / Equity) (X ₄)	0.1
Assets Profitability (EBIT/ Total Assets) (X ₅)	0.1
Net Profit Margin (X ₆)	0.1
Equity / Total Assets (X ₇)	0.1
Total Debt / Equity (X ₈)	0.1
Net Profit / Total Assets (X ₉)	0.1
Current Asset Turnover Rate (X ₁₀)	0.1
Total	1

In the next step, weighted matrices are obtained by multiplying the weighted values given to the criterias and the normalized matrix values. The weighted matrix table for 2019 is shown in Table 8.

In the next step, the ideal maximum (m*) and ideal minimum (m-) values of the weighted matrices are found as indicated in Table 9. Then the maximum values for each column are taken into account for the ideal solution values of each decision criterion while the minimum values for each column are taken into account for the negative ideal solution values.

The ideal maximum (Si*) and ideal minimum (Si-) values of companies are based on the maximum (m*) and minimum (m-) values of the weighted criteria which is written in Table 10.

Table:8 Weighted Matrix Table

Company	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀
ALCTL	0,01	0,01	0,03	0,00	0,00	0,00	0,01	0,03	-0,01	0,01
ARDYZ	0,02	0,02	0,01	0,04	0,05	0,00	0,03	0,00	0,05	0,02
ARENA	0,01	0,01	0,03	0,01	0,01	0,00	0,01	0,03	0,00	0,03
ARMDA	0,01	0,01	0,04	0,01	0,01	0,00	0,01	0,05	0,00	0,02
ASELS	0,01	0,01	0,02	0,02	0,02	0,00	0,02	0,01	0,02	0,01
DGATE	0,01	0,01	0,03	0,02	0,02	0,00	0,02	0,02	0,01	0,05
DESPC	0,01	0,01	0,02	0,02	0,02	0,00	0,02	0,01	0,01	0,02
ESCOM	0,05	0,05	0,00	-0,02	-0,04	-0,10	0,03	0,00	-0,04	0,00
FONET	0,01	0,01	0,01	0,02	0,03	0,00	0,03	0,00	0,03	0,04
INDES	0,01	0,01	0,04	0,03	0,01	0,00	0,01	0,05	0,01	0,03
KFEIN	0,02	0,02	0,01	0,02	0,02	0,00	0,03	0,00	0,02	0,02
KAREL	0,01	0,01	0,03	0,04	0,02	0,00	0,01	0,03	0,02	0,01
KRONT	0,01	0,01	0,02	0,02	0,02	0,00	0,02	0,01	0,02	0,02
LINK	0,05	0,05	0,01	0,02	0,02	0,00	0,03	0,00	0,03	0,01
LOGO	0,01	0,01	0,02	0,02	0,02	0,00	0,02	0,01	0,02	0,02
NETAS	0,01	0,01	0,04	-0,03	0,00	0,00	0,01	0,04	-0,01	0,01
PAPIL	0,06	0,05	0,01	0,01	0,00	0,00	0,03	0,00	0,02	0,00
PKART	0,01	0,01	0,02	0,02	0,02	0,00	0,02	0,01	0,01	0,03
SMART	0,02	0,02	0,01	0,01	0,02	0,00	0,03	0,00	0,02	0,02

Table:9 Ideal Maximum and Minimum Values

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10
m*	0,06	0,05	0,00	0,04	0,05	0,00	0,03	0,00	0,05	0,05
m-	0,01	0,01	0,04	-0,03	-0,04	-0,10	0,01	0,05	-0,04	0,00

Table:10 Ideal Maximum (Si*) and Minimum Values (Si-)

Company	Ideal Maximum Value (Si*)	Ideal Minimum Value (Si-)
ALCTL	0,0311	0,0024
ARDYZ	0,0195	0,0148
ARENA	0,0292	0,0044
ARMDA	0,0334	0,0014
ASELS	0,0277	0,0051
DGATE	0,0283	0,0054
DESPC	0,0283	0,0049
ESCOM	0,0132	0,0239
FONET	0,0224	0,0119
INDES	0,0333	0,0036
KFEIN	0,0275	0,0059
KAREL	0,0292	0,0039
KRONT	0,0273	0,0054
LINK	0,0163	0,0125
LOGO	0,0280	0,0047
NETAS	0,0363	0,0007
PAPIL	0,0164	0,0206
PKART	0,0264	0,0065
SMART	0,0288	0,0053

Finally, a relatively ranking is done by using each alternative maximum and minimum ideal values which are written in Table 11.

Table:11 Performance Score

Company	Performance Score (Ci)
ALCTL	0,515
ARDYZ	0,921
ARENA	0,614
ARMDA	0,535
ASELS	0,733
DGATE	0,739
DESPC	0,728
ESCOM	0,191
FONET	0,844
INDES	0,606
KFEIN	0,839
KAREL	0,700
KRONT	0,771
LINK	0,905
LOGO	0,728
NETAS	0,356
PAPIL	0,804
PKART	0,738
SMART	0,776

According to the results obtained in Table 11, ARD Grup Bilişim (ARDYZ) has the highest performance score in 2019. ARD Grup Bilişim's performance score of 0,921 is clearly ahead of other companies. While, Link Bilgisayar (LINK) was the company with the highest performance score respectively.

Escort Teknoloji (ESCOM) and Netaş Telekom (NETAŞ) were the companies with the lowest performance scores in the same period respectively.

The performance scores of the companies surveyed between the years 2019-2021 are compared in Table 12.

Table:12 Performance Scores for the Years 2019-2021

Company	2019	2020	2021
ALCTL	0,515	0,071	0,501
ARDYZ	0,921	0,431	0,717
ARENA	0,614	0,132	0,448
ARMDA	0,535	0,040	0,442
ASELS	0,733	0,155	0,519
DESPC	0,728	0,148	0,503
DGATE	0,739	0,160	0,510
ESCOM	0,191	0,645	0,857
FONET	0,844	0,346	0,575
INDES	0,606	0,098	0,462
KAREL	0,700	0,117	0,470
KFEIN	0,839	0,178	0,488
KRONT	0,771	0,166	0,550
LINK	0,905	0,434	0,669
LOGO	0,728	0,145	0,498
NETAS	0,356	0,019	0,002
PAPIL	0,804	0,557	0,671
PKART	0,738	0,199	0,551
SMART	0,776	0,156	0,488

Looking at the performance scores of the companies in the BIST Technology Sector covering the years 2019 and 2021, as seen from Table 13 at the companies generally fluctuated in order.

In 2019, three companies with the best performance scores, ARD Grup Bilişim (ARDYZ), Link Bilgisayar (LINK), and Fonet Bilgi Teknolojileri (FONET), fell into recession in 2020 and 2021, while companies with performance scores above the average in the next two years as shown in Table 13.

Table:13 Performance Rankings for the Years 2019-2021

Company	2019 Rank	2020 Rank	2021 Rank
ALCTL	17	17	11
ARDYZ	1	4	2
ARENA	14	14	17
ARMDA	16	18	18
ASELS	10	11	8
DESPC	11	12	10
DGATE	8	9	9
ESCOM	19	1	1
FONET	3	5	5
INDES	15	16	16
KAREL	13	15	15
KFEIN	4	7	14
KRONT	7	8	7
LINK	2	3	4
LOGO	12	13	12
NETAS	18	19	19
PAPIL	5	2	3
PKART	9	6	6
SMART	6	10	13

Escort Teknoloji (ESCOM), Netaş Telekomünikasyon (NETAS), Alcatel Lucent Teletaş (ALCTL), and Armada Bilgisayar (ARMDA) are the worst performing companies in 2019, and they are in the last place in 2020 as well except for Escort Teknoloji (ESCOM). Escort Teknoloji (ESCOM) has made a big breakthrough after 2020 and have risen to the first rank.

Table:14 Market Value Change (%) for the Years 2019-2021

Company	Market Value Change (%)		
	2019	2020	2021
ALCTL	109,03	146,34	-20,07
ARDYZ		700,79	639,15
ARENA	71,11	371,86	19,01
ARMDA	76,43	199,45	22,05
ASELS	75,28	75,87	17,05
DESPC	55,31	208,02	-31,97
DGATE	82,48	106,27	-28,68
ESCOM	82,89	372,66	-6,97
FONET	399,35	69,44	-5,11
INDES	74,05	103,95	44,33
KAREL	247,54	58,49	79,45
KFEIN	61,75	92,59	-10,01
KRONT	46,21	189,62	-6,03
LINK	118,09	254,26	-12,99
LOGO	124,22	106,36	27,69
NETAS	102,18	115,01	-39,93
PAPIL		195,32	-38,33
PKART	243,61	55,79	36,33
SMART		-9,68	-35,89

According the Table 14, in 2019, highest market value change performance according to the previous year's market value belongs to Fonet Bilgi Teknolojileri (FONET). The companies with the second and third best market value change performance scores belongs to Plastikart (PKART) and Karel Elektronik (KAREL).

In 2020 and 2021, ARD Grup Bilisim (ARDYZ) has the highest market value change scores while other companies' scores decrease significantly in 2021. Link Bilgisayar (LINK) and Fonet Bilgi Teknolojileri (FONET), fell into recession in 2020 and 2021, while companies with performance scores above the average in the next two years.

Smartiks Yazılım (SMART) is the worst-performing company in 2020 and 2021, and SMART's market value change performance score dropped steadily in 2020 and 2021. Table 15 shows Market Value Change (%) and Performance Rankings for the Years 2019-2021.

Table 15. Market Value Change (%) and Performance Rankings for the Years 2019-2021

Company	2019		2020		2021	
	Market Value Change (%)	TOPSIS Rank	Market Value Change (%)	TOPSIS Rank	Market Value Change (%)	TOPSIS Rank
ALCTL	109,03	17	146,34	17	-20,07	11
ARDYZ		1	700,79	4	639,15	2
ARENA	71,11	14	371,86	14	19,01	17
ARMDA	76,43	16	199,45	18	22,05	18
ASELS	75,28	10	75,87	11	17,05	8
DESPC	55,31	11	208,02	12	-31,97	10
DGATE	82,48	8	106,27	9	-28,68	9
ESCOM	82,89	19	372,66	1	-6,97	1
FONET	399,35	3	69,44	5	-5,11	5
INDES	74,05	15	103,95	16	44,33	16
KAREL	247,54	13	58,49	15	79,45	15
KFEIN	61,75	4	92,59	7	-10,01	14
KRONT	46,21	7	189,62	8	-6,03	7
LINK	118,09	2	254,26	3	-12,99	4
LOGO	124,22	12	106,36	13	27,69	12
NETAS	102,18	18	115,01	19	-39,93	19
PAPIL		5	195,32	2	-38,33	3
PKART	243,61	9	55,79	6	36,33	6
SMART		6	-9,68	10	-35,89	13

According to Table 15, there are fluctuations in both the market value changes, scores and rankings of the Technology Sector firms operating in the BIST according to years.

Demireli (2010) on the banking sector, Soba and Eren (2011) intercity bus companies, Cam et al. (2015) in the textile sector, Akgün and Temür (2016) in the aviation sector, Üçüncü et al. (2018) on paper sector, Özçelik and Küçükçakal (2019) intercity leasing and factoring companies, Özkan (2020) on the stone and soil based sector, have determined that the financial performance of the companies has fluctuated over the years in their studies. These findings coincide with the findings of our study. İşseveroğlu and Sezer's (2015) study on pension companies and Ünlü et al.'s (2017) BIST-30 companies found that there was no significant fluctuation in the financial performance of the companies in comparison with the results obtained in our study. The reason for this differentiation is that the sectors have different characteristics and are influenced by different factors.

Dumanoğlu and Ergül (2010) evaluated the financial performance of the companies operating in the technology sector from 2006 to 2009 and found that there was no significant fluctuation in the financial performance of the companies in the technology sector. Bulgurcu (2012) compared the financial performance of technology companies between the years 2009-2011 according to MCDM methods and found that there were no serious fluctuations in the financial performance of companies in the technology sector in a similar way with Dumanoğlu and Ergül (2010). However, in our study covering the years 2019-2021, unlike Dumanoğlu and Ergül (2010) and Bulgurcu's (2012) studies, there are serious fluctuations in the financial performance of the companies operating in the technology sector. The changes in local and international market conditions and the financial ratios included in the review may be the reason for this change.

CONCLUSION

In this study, it was aimed to compare the performances of Technology Sector companies operating in BIST using financial data covering the years 2019 and 2021 comparatively. The relatively evaluation of the performances of these publicly traded companies has great importance in terms of money and capital market participants in where intense competition has occurred.

In this context, the 10 most widely used financial ratios were determined in the literature and the performance scores of the companies were calculated by weighting the importance ranks equally among the 10 criteria evaluated by the TOPSIS method. In this way, a model has been achieved in which both investors and decision-makers in the business can objectively express their interpretation-based success ratings.

The market value of the companies also implies the position of the companies in the stock market. Therefore, the market value of the companies is widely used for financial evaluation and comparison of companies. Depending on this, the market value change of a company gives information about the performance of the company. The market value change and TOPSIS ranking results can help to see the relationship between the financial performance results of companies and their reflection in the real economy.

As a result of the study, it was determined that Technology Sector companies operating in BIST were influenced by national and international developments, and performance scores varying according to years showed fluctuations in both market value change, score, and rank. In this study, considering market value change and TOPSIS rank, the implemented method has shown that there is an unstable correlation between market value change and TOPSIS rank of the companies.

This study for Technology Sector companies can help in rating and comparing the performances of companies in other sectors. Researchers can make additional contributions to the literature by considering different companies in different sectors in the future, by using different financial ratios, by changing the weightings assigned to financial ratios, by updating them according to changing conditions, and by changing the performance scores and comparison criteria of companies.

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