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PROCEEDINGS BOOK

Editors:

Prof. Dr. Omer S.M. Jomah

Prof. Dr. Abdullah GÖKTAŞ



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13th INTERNATIONAL CONFERENCE ON SCIENTIFIC RESEARCH

July 2-7, 2025 / Sharm El Sheik, Egypt



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EDITOR

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adapted by Mariam Rasulan

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CONGRESS TITLE

EL RUHA 13th INTERNATIONAL CONFERENCE ON SCIENTIFIC RESEARCH

DATE and PLACE

July 2-7, 2025 / Sharm El Sheik, Egypt

ORGANIZATION

IKSAD-Institute of Economic Development and Social Research, Türkiye

CONGRESS COORDINATOR

Samira KHADHRAOUI ONTUNC

IKSAD-Institute of Economic Development and Social Research, Türkiye

NUMBER of ACCEPTED PAPERS-221 (*Türkiye- 102, Other Countries- 11S*)

NUMBER of REJECTED PAPERS-23

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Oral C Poster presentation

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MEASURING THE EFFICIENCY OF COMPANIES IN BIST 30 PARTICIPATION INDEX BY DATA ENVELOPMENT ANALYSIS

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ABSTRACT

In today's competitive business environment, measuring and improving efficiency is critical for companies seeking long-term sustainability and market success. Firms must evaluate whether they utilize their financial resources effectively to generate optimal outputs. Companies must take corrective measures to address their weaknesses if inefficiencies are identified. Efficiency enhances productivity and competitive advantage by achieving the highest possible output with the least input. This study assesses the financial efficiency of 14 companies listed in the BIST Participation 30 index between 2019 and 2023. These companies operate in various sectors, including chemicals, petroleum rubber and plastic products, transportation and storage, basic metals, and defense industries. The BIST Participation index includes companies that comply with Islamic finance principles. This study employs Data Envelopment Analysis (DEA), a widely recognized non-parametric methodology designed to evaluate the relative efficiency of decision-making units (DMUs) by considering multiple input and output variables. Three financial indicators were selected as input variables: Total equity, total assets, and total liabilities. The output variables included net profit, return on assets (ROA), and return on equity (ROE). The data for the analysis were obtained from the companies' official financial statements and the Public Disclosure Platform (KAP), a platform managed by the Capital Markets Board of Turkiye (SPK), where companies listed on the Borsa Istanbul (BIST) are required to disclose their financial reports and other relevant information. The results show that five companies were efficient in 2022 and 2023, six were efficient in 2021, only one achieved efficiency in 2020, and five were efficient in 2019. The five most efficient companies were identified as GESAN, ASELS, MAVI, BIMAS, and SASA based on the average efficiency scores over the five years. This analysis provides a comprehensive understanding of firm-level efficiency under Islamic financial principles. It offers investors, managers, and policymakers valuable insights to enhance strategic financial decision-making and competitiveness in the Islamic capital market.

Keywords: BIST Participation, Data Envelopment Analysis, Efficiency, Stock Market, Financial Analysis

INTRODUCTION

Today, with the increasingly competitive environment, the issue of measuring the performance and efficiency of firms has gained importance. The existing competitive environment pushes firms to use their resources optimally. To achieve this, firms need to evaluate their performance within the sector in which they compete and identify the firms that they should take as reference to exist at the efficiency frontier. In performance evaluation studies, it should be determined which units are effective and what actions should be taken by ineffective units to become effective. This task is challenging in systems with many inputs and outputs. Therefore, firms need to conduct comprehensive performance measurements frequently. In addition to many different methods, Data Envelopment Analysis (DEA) is a widely used method for evaluating the performance of companies.

An Islamic Index is an index composed of the stocks of companies operating by Islamic principles. Islamic Indices are selected from the companies listed on the stock exchange that pass the qualitative and quantitative filtering stage and are a subset of the main company table. The purpose of Islamic Indices is to enable Muslim investors to invest in stock markets peacefully and earn interest-free earnings that do not contradict their beliefs.

The companies included in the Participation Index go through a two-stage filtering process similar to other Islamic indices. In the first stage, companies are screened based on their core business activities. Companies whose core business activities include interest-based finance, trade, services, brokerage (including banking, insurance, leasing, factoring and other interest-based activities), alcoholic beverages, gambling and games of chance, pork and similar food, press, broadcasting and advertising, tourism, entertainment, tobacco products,

weapons, gold, silver and foreign currency futures trading are excluded from the list. The remaining companies are filtered according to their financial ratios in the second stage. The financial criteria are as follows:

$$\text{Total Interest-Bearing Loans} / \text{Market Capitalization} < 30$$

$$\text{Interest Bearing Cash and Securities} / \text{Market Capitalization} < 30$$

$$\text{Revenues from Ineligible Sectors Identified in the First Phase} / \text{Total Revenues} < 5$$

In Türkiye, five-year data of fourteen firms in the Participation 30 index, which includes firms that comply with the above-mentioned Islamic principles, will be evaluated by Data Envelopment Analysis (DEA) method.

MATERIALS AND METHODS

In performance evaluation studies, it should be determined which units are effective and what actions should be taken by ineffective units to become effective. This task is challenging in systems with many inputs and outputs. Therefore, firms need to conduct comprehensive performance measurements frequently. Among various performance evaluation methods, Data Envelopment Analysis (DEA), developed by Charnes, Cooper, and Rhodes in 1978, is one of the most widely used approaches for assessing the efficiency of companies (Cooper, Seiford, & Tone, 2006)

This study aims to determine the efficiencies of 14 different companies, from chemicals, petroleum rubber and plastic products, transportation and storage, basic metals, and defense sectors, etc., in the BIST Participation 30 index between 2019 and 2023 with Data Envelopment Analysis (DEA) by using Excel Solver. In this study, the efficiency of companies was evaluated using three input and three output variables, which were selected with reference to previous applications of Data Envelopment Analysis (DEA) in the literature. Specifically, the study by Gürbüz and Dumlu (2018), which analyzed the performance of firms listed in the BIST Sustainability Index, served as a basis for variable selection. The input variables used in the analysis are total equity, total assets, and total liabilities. On the other hand, the output variables are net profit, return on assets (ROA), and return on equity (ROE). This structure allows for a comprehensive assessment of financial performance through the DEA framework. Data were collected from the public disclosure platform (KAP) and the company's financial reports.

Table 1: Variables of Inputs and Outputs

Inputs	Outputs
I1: Total Equity	O1: Net Profit
I2: Total Liabilities	O2: Return On Assets (ROA) (Net Profit / Total Assets)
I3: Total Assets	O3: Return On Equity (ROE) (Net Profit/ Total Liabilities)

The number of decision-making units (DMUs) is two times the sum of inputs and outputs (number of DMUs $\geq 2 \times$ (number of inputs + number of outputs) or at least one more than the sum of inputs and outputs (number of DMUs $\geq$ number of inputs + number of outputs +1) (Charnes, Cooper, & Rhodes, 1978)

FINDINGS AND DISCUSSION

Table 2 summarizes the descriptive statistics of the financial indicators used as inputs and outputs in the analysis of 14 companies listed in the BIST 30 Participation Index. Total Equity, Total Liabilities, and Total Assets are considered as input variables, while Net Profit, Return on Assets (ROA), and Return on Equity (ROE) are used as output variables. The data reveal a high level of variability among the companies, with substantial differences in financial size and performance. For instance, while the average total equity is

approximately 35.55 billion, it ranges from 3.89 billion to 162.22 billion. Similarly, net profit varies significantly, with some firms reporting losses and others achieving profits as high as 47.10 billion. The average ROA and ROE are 0.078 and 0.208, respectively, indicating overall moderate profitability, though values range from negative to relatively high. These variations highlight the diverse financial structures and efficiency levels across the sample, providing a valuable basis for further analysis using methods such as Data Envelopment Analysis (DEA).

Table 2: Summary Descriptive Results of Inputs and Outputs (Average of 2019-2023)

	Total Equity	Total Liabilities	Total Assets	Net Profit	Return On Assets	Return On Equity
Average (Total)	35.549.776	44.572.638	87.583.582	7.960.184	0,078	0,208
Standard deviation	44.945.326	54.465.711	116.725.213	13.231.226	0,060	0,167
Minimum	3.885.032	6.021.800	9.923.117	-1.056.283	-0,009	-0,048
Maximum	162.221.115	217.030.400	463.328.600	47.101.165	0,193	0,483
DMUs	14	14	14	14	14	14

Table 3 presents the annual efficiency scores and overall rankings of 14 companies listed in the BIST 30 Participation Index for 2019–2023, based on Data Envelopment Analysis (DEA). The efficiency scores, expressed as percentages, reflect the relative financial efficiency of each company in utilizing its inputs to generate outputs. The results reveal notable fluctuations in efficiency over the years for many firms. For example, BIMAS demonstrated consistently high efficiency, averaging 75.94% over the five years and ranking fourth overall. GESAN achieved the highest overall efficiency score (92.30%) and ranked first, maintaining full efficiency in the first three years. In contrast, TKFEN had the lowest average efficiency (26.47%) and ranked last (14th), indicating room for significant performance improvement. These findings underscore the differences in operational and financial efficiency among the analyzed firms and highlight the usefulness of DEA in benchmarking company performance over time.

Table 3: Efficiency Score and Ranking of the Companies (2019-2023)

Company	2019	2020	2021	2022	2023	Efficiency (%)	Rank
BIMAS	100,00%	56,88%	88,00%	81,37%	81,37%	75,94%	4
TUPRS.E	67,79%	25,77%	44,00%	100,00%	100,00%	67,51%	8
EREGL	100,00%	46,82%	100,00%	9,52%	9,52%	67,62%	7
SASA.E	44,52%	72,75%	40,00%	100,00%	100,00%	70,87%	5
PETKM	55,41%	22,19%	100,00%	54,27%	54,27%	56,64%	10
MAVI.E	97,91%	2,36%	100,00%	100,00%	100,00%	80,05%	3
ENERJISA	52,79%	23,81%	57,00%	22,69%	22,69%	51,26%	11
TKFEN	57,02%	0,00%	25,00%	0,00%	0,00%	26,47%	14
ASELS.A	100,00%	83,23%	100,00%	33,65%	33,65%	80,07%	2
VESTEL	33,14%	42,23%	48,00%	100,00%	100,00%	47,23%	12
GESAN	100,00%	100,00%	100,00%	61,48%	61,48%	92,30%	1
KARDEMIR	8,56%	2,43%	100,00%	18,62%	18,62%	33,98%	13
PGSUS.E	100,00%	0,00%	0,00%	100,00%	100,00%	60,00%	9
THYAO.E	100,00%	0,00%	47,63%	100,00%	100,00%	69,53%	6

In 2019, six companies—BIMAS, EREGL, ASELS, GESAN, PGSUS, and THYAO—achieved full efficiency. However, in 2020, GESAN was the only firm to maintain full efficiency, which may be attributed to the adverse economic impacts of the COVID-19 pandemic. In 2021, six companies—EREGL, PETKM, MAVI, ASELS, GESAN, and KARDEMIR—were identified as fully efficient. The year 2022 saw another group of six companies—TUPRS, SASA, MAVI, VESTEL, PGSUS, and THYAO—reach full efficiency. A similar pattern was observed in 2023, with the same six companies maintaining their efficient status. Notably, MAVI, PGSUS, and THYAO distinguished themselves by achieving full efficiency in three of the five years analyzed, indicating relatively consistent performance over the period. These findings underscore both the temporal dynamics of firm-level efficiency and the value of longitudinal efficiency assessment in identifying sustained operational excellence.

CONCLUSION

This study investigates the financial efficiency of 14 companies listed in the BIST 30 Participation Index over the 2019–2023 period, employing the Data Envelopment Analysis (DEA) methodology. The DEA approach, recognized for its ability to evaluate the relative efficiency of decision-making units with multiple inputs and outputs, provided a robust framework for assessing firm-level performance under Islamic financial principles.

The findings reveal significant variations in efficiency across companies and years, reflecting both sectoral dynamics and broader economic conditions. For instance, the year 2020 exhibited a notable decline in efficiency for most firms, likely due to the economic disruptions caused by the COVID-19 pandemic. Only GESAN maintained full efficiency during this period, underscoring its resilience. Across the five-year span,

GESAN emerged as the most efficient company overall, followed by ASELS and MAVI, while TKFEN consistently lagged, indicating areas for strategic improvement.

The results also highlight that certain firms, particularly MAVI, PGSUS, and THYAO, demonstrated consistent efficiency across multiple years, achieving full efficiency in three of the five analyzed years. This consistency suggests strong internal management practices and effective resource utilization, making these companies potential benchmarks for others operating in similar sectors.

The broader implication of the study is the importance of integrating Islamic finance criteria with modern performance evaluation techniques such as DEA. This integration offers a comprehensive framework for investors, managers, and policymakers to assess and enhance financial efficiency while remaining compliant with ethical and religious standards. As the Islamic capital market continues to grow, such evaluations will become increasingly vital in fostering transparency, accountability, and strategic competitiveness among participating firms.

Although many studies measure the efficiency of companies listed in other BIST indices using Data Envelopment Analysis (DEA), no previous study has evaluated the efficiency of the companies listed in the BIST Participation Index using the DEA method. Therefore, this study is an original contribution to the field. Future research could expand the analysis by incorporating additional financial and non-financial variables, exploring cross-country comparisons, or utilizing alternative efficiency measurement techniques. Nevertheless, the current study contributes meaningfully to understanding firm-level efficiency within the scope of Islamic finance and provides actionable insights for stakeholders in the Turkish financial market.

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