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# A data envelopment analysis of Sharia stock listed companies on the Jakarta Islamic Index

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## Abstract

**Purpose** – This study analyzes the efficiency of companies listed on the Jakarta Islamic Index (JII) during the 2020–2023 period.

**Method** – This study applies data envelopment analysis (DEA) using total assets, equity, and operational expenses as input variables, with market capitalization and earnings per share (EPS) as output variables. Market capitalization is employed to capture a firm's ability to convert internal resources into market-recognized value as shaped by investor perception.

**Findings** – The results indicate that most JII companies operate inefficiently, with efficiency scores below 0.2. Several benchmark firms form the efficiency frontier: Adaro Energy Indonesia (2022), Indo Tambangraya Megah (2022), Bumi Resources Minerals (2021), Unilever Indonesia (2021), and Aspirasi Hidup Indonesia (2021). The sector-wise analysis indicates that the financial sector exhibits the highest and most consistent scale efficiency. In contrast, from an industrial perspective, the transportation and energy sectors demonstrate the most optimal efficiency performance. Regarding ownership structure, state-owned enterprises consistently achieve higher scale efficiency than privately owned companies. Further analysis suggests that efficiency improvements are primarily driven by output performance, particularly market capitalization, highlighting the relevance of an output-oriented approach to long-term efficiency strategies.

**Implications** – This perspective suggests that efficiency in Sharia Stock Listed Companies depends not only on internal management performance, but also on external market perceptions that determine their market value.

**Originality** – This study offers originality by employing DEA approach to assess the efficiency of Sharia stock-listed companies in the JII, integrating sectoral, industrial, and ownership perspectives that have received limited attention in prior research.

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## Introduction

Indonesia's Islamic finance industry has exhibited a positive growth trajectory. According to the ICD-LESG Islamic Finance Development Report (2023), Indonesia ranks third globally as one of the most advanced countries in Islamic finance. This achievement reflects the successful implementation of an integrated Islamic financial system in the country. Based on data released by the Financial Services Authority (Otoritas Jasa Keuangan/OJK), as of August 2024, the Islamic

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finance industry has recorded a solid performance with total assets amounting to IDR 2,742.28 trillion. Of this total, the Islamic capital market sector contributed the largest share with assets valued at IDR 1,676.42 trillion, followed by the Islamic banking sector with IDR 902.39 trillion, and the Islamic non-bank financial industry with IDR 163.47 trillion (Otoritas Jasa Keuangan, 2024). These figures underscore the dominant role of the Islamic capital market in supporting the overall growth of Indonesia's Islamic finance industry.

In 2023, the performance of Indonesia's Islamic capital market demonstrated positive growth, as reflected in the increasing volume and value of Islamic financial instruments, including Sharia stock-listed companies, corporate sukuk, and sovereign sukuk. One key indicator of this progress is the market capitalization of the Indonesia Sharia Stock Index (ISSI), which recorded a significant increase of 28.41%, rising from IDR 4,786.02 trillion to IDR 6,145.96 trillion. This growth outpaced the increase in the overall market capitalization of the Indonesia Composite Index (IHSG) during the same period, signifying rising interest in Islamic investments among market participants. In addition to market capitalization, the number of stocks listed on (DES) also experienced consistent growth. By 2023, the number of DES-listed stocks reached 637, marking a year-on-year (yoy) increase of 15.40%. In terms of volume, Sharia stocks accounted for 67.41% of the total listed stocks on the Indonesia Stock Exchange, while in terms of capitalization, ISSI stocks represented 52.68% of the total market capitalization (Otoritas Jasa Keuangan, 2023).

This significant growth indicates that Sharia stock-listed companies have become an essential component of Indonesia's capital market ecosystem. However, to support sustainable development, greater attention must be given to the efficiency of companies listed in the Sharia Securities List (Daftar Efek Syariah/DES). Efficiency serves as a key performance indicator in evaluating company performance, and provides valuable insights for both investors and regulators in assessing the extent to which companies can optimize their resource utilization (Jalaludin & Sari, 2024). The Covid-19 pandemic in 2020 emphasized the importance of industry resilience and operational efficiency for business continuity (Mumin et al., 2024). Companies must survive and generate profits by effectively managing their resources. Efficiency can be considered optimal when it reduces the required input for a given level of output or maximizes the output using the same level of input (Jalaludin & Sari, 2024).

In terms of competitiveness, efficiency also plays a crucial role in improving product and service quality (Badan Pusat Statistik, 2019). According to the International Institute for Management Development (2024), Indonesia ranks 14th globally in business efficiency, an improvement of six positions from the previous year. This achievement underscores the importance of systematically measuring efficiency at the firm level, particularly in the sharia equity sector, to ensure that their contribution to the national economy aligns with the principles of productivity and sustainability. Among the various methods of measuring efficiency, this study employs the data envelopment analysis (DEA) approach. DEA is a mathematical programming method used to measure the relative efficiency of decision-making units (DMUs) (Jalaludin & Sari, 2024). As a non-parametric approach, DEA utilizes linear programming techniques that focus on identifying inefficiency sources in DMUs and assumes the absence of random errors (Dwijayantie & Mulyadi, 2022).

Numerous prior studies have examined efficiency across various industrial sectors, although research specifically focusing on Sharia stock-listed companies remains relatively limited. Sohail and Anjum (2016) analyzed the efficiency and productivity of Initial Public Offering (IPO) companies listed on the Karachi Stock Exchange (KSE). Rusydiana and Firmansyah (2022) investigated the efficiency of companies listed on the Jakarta Islamic Index (JII) and explored optimization strategies through digitalization by employing DEA super-efficiency and interpretative structural modeling. Zhao et al. (2022) utilized a three-stage DEA method and stochastic frontier analysis (SFA) regression to assess the efficiency of 23 thermal power generation firms in China in 2019. Jalaludin and Sari (2024) used the DEA method to measure the efficiency of seven publicly listed financing companies in Indonesia from 2020 to 2022. Mumin et al. (2024) explored the impact of key success factors (CSFs), industry resilience, and efficiency on the

transformation of the tourism sector relative to nine other sectors listed on the Indonesia Stock Exchange (IDX) during the 2018-2022 period using DEA.

The post-pandemic period (2020-2023) marked a structural shift in Indonesia's Islamic capital market, where sustainability, digitalization, and market resilience became critical determinants of competitiveness (Arifin et al., 2024; Shear & Ashraf, 2022). Despite strong asset growth, empirical evidence on how efficiently listed firms allocate resources remains scarce. Unlike previous studies, which primarily focused on efficiency in conventional industries or single-sector Islamic institutions (Hibatullah & Nurcahyani, 2022; Rusydiana & Firmansyah, 2022), this study integrates sectoral, industrial, and ownership perspectives within the Jakarta Islamic Index. Such multidimensional analyses have rarely been conducted in recent years (Aparicio & Santín, 2025; Mumin et al., 2024). However, existing studies have not examined how ownership structure and sectoral differences jointly influence the efficiency performance of Sharia stock-listed companies. This gap limits our understanding of how Islamic capital market participants can improve their competitiveness. Given this gap, the present study contributes by assessing the efficiency of Jakarta Islamic Index firms through a DEA model that incorporates both sectoral and ownership dimensions to capture the heterogeneity of firm performance.

This study measures how efficiently companies utilize their internal resources to create market value and attract investor interest. This study not only focuses on operational efficiency in utilizing internal resources but also evaluates the extent to which firms are able to transform their financial performance into market value recognized by investors. Accordingly, this study emphasizes the measurement of market-oriented efficiency, namely market-based efficiency, which reflects a firm's ability to optimally manage assets and capital to enhance market capitalization and strengthen investor confidence. This objective is particularly relevant in the context of Islamic capital markets, where efficiency and competitiveness are key benchmarks. By analyzing the efficiency levels of Sharia stock-listed companies over the 2020-2023 period, this study captures a critical window characterized by heightened market volatility and contagion effects on asset returns. The outbreak of Covid-19 in early 2020 triggered unprecedented disruptions and risk spillovers across global equity markets (Al-Awadhi et al., 2020; Rizvi et al., 2020). Bossman et al. (2022) confirmed that Islamic capital markets are not immune to these shocks and experience significant volatility transmission and recovery dynamics. Therefore, focusing on the 2020-2023 period enables this study to evaluate how Sharia stock listed companies in Indonesia managed efficiency and value creation amidst global uncertainty and post-pandemic normalization. These findings offer valuable insights for investors, regulators, and other stakeholders in making data-driven decisions and formulating policies to foster a more efficient and sustainable Islamic equity market. Furthermore, this research is crucial for encouraging Sharia stock-listed companies to integrate efficiency principles into their operations, thereby contributing to the long-term stability and sustainability of Indonesia's Islamic stock market.

## Literature Review

### Sharia stock

Sharia-compliant stocks are equity securities that adhere to Islamic principles in the capital market (Tanin et al., 2023). The concept of Sharia-compliant stocks aligns with the general definition of equity as regulated by the prevailing laws and regulations issued by the OJK (IDX Islamic, 2019). In the Indonesian capital market, two categories of Sharia stocks are officially recognized. The first includes shares issued by Sharia-based issuers or public companies in accordance with OJK Regulation No. 17/POJK.04/2015 concerning the Issuance and Requirements of Sharia Securities in the Form of Shares by Sharia Issuers or Sharia Public Companies. The second category comprises shares that are declared compliant based on the screening criteria outlined in OJK Regulation No. 35/POJK.04/2017 on the Criteria and Issuance of the Sharia Securities List (Daftar Efek Syariah/DES). All sharia-compliant stocks, regardless of whether they are listed on the Indonesia Stock Exchange (IDX), are included in the DES, which is semiannually updated by the OJK in May and November.

The Sharia screening criteria set by the OJK prohibit issuers from engaging in activities that are contrary to Islamic principles. These include operations involving gambling or games of chance, speculative trading without the actual delivery of goods or services, and fraudulent bidding or pricing (Tanin et al., 2023). Issuers are also barred from offering interest-based financial services such as conventional banking or interest-based financing, and from engaging in transactions involving uncertainty (*gharar*) or gambling (*maisir*) such as conventional insurance. Moreover, companies must not produce, distribute, or trade goods and services that are forbidden in Islam, either by their nature (*haram li-dzatihi*) or by their context or production method (*haram lighairihi*), including products that are morally harmful, detrimental to public welfare, or linked to corrupt practices (*risywah*) (Azmi et al., 2017; Rizaldy & Ahmed, 2019). From a financial perspective, issuers must also meet specific ratios, such as maintaining total interest-based debt below 45% of total assets and ensuring that interest income and other non-halal revenues do not exceed 10% of total income ( DSN MUI No. 135/DSN-MUI/V/2020).

To support Islam-based investment, Indonesia maintains five Sharia stock indices. The first is the Indonesia Sharia Stock Index (ISSI), which includes all the sharia-compliant stocks listed on the main and development boards of the IDX. The second is the Jakarta Islamic Index (JII), which is composed of 30 large-cap, highly liquid Sharia stocks. The third, JII70, comprises 70 large-cap, liquid Sharia stocks. Fourth, IDX-MES BUMN 17 includes 17 Sharia stocks owned by state-owned enterprises (SOEs) and their affiliates that demonstrate strong fundamentals. Lastly, the IDX Sharia Growth Index tracks the price performance of 30 Sharia stock-listed companies with notable net income and revenue growth trends, combined with sound liquidity and financial performance.

**Previous Studies**

Previous research has applied data envelopment analysis (DEA) across multiple sectors to assess how firms convert their operational resources into financial and market outcomes. Most studies employ assets, equity, and operating expenses as key input variables representing firm resources and capital utilization (Jalaludin & Sari, 2024; Rusydiana & Firmansyah, 2022; Sohail & Anjum, 2016). These inputs reflect a company's ability to transform its internal financial capacity into productive activities. Empirical evidence generally indicates that larger asset bases do not always result in higher efficiency because resource underutilization or overinvestment can create diminishing returns (Zhao et al., 2022).

On the other hand, market capitalization, earnings per share (EPS), and net income are commonly used output variables that reflect firm performance and investor perception (Jalaludin & Sari, 2024; Sohail & Anjum, 2016). EPS reflects profitability from an operational perspective, whereas market capitalization measures how efficiently firms convert their financial performance into market value. These two output dimensions correspond to the dual perspectives of profitability and marketability proposed by Seiford and Zhu (1999). The two-stage DEA framework conceptually separates these performance dimensions, where the first stage measures operational efficiency (transformation of inputs into profits) and the second stage captures market efficiency (conversion of profitability into market value).

Empirical evidence from both Islamic and conventional contexts support the relevance of this dual-stage interpretation. For example, Bitar et al. (2018) find that Islamic financial institutions demonstrate a distinct two-phase efficiency path, where operational soundness precedes market valuation, reflecting investors' responses to the underlying resource management quality. Similarly, studies such as Zhao et al. (2022) and Jalaludin and Sari (2024) emphasize that most firms operate under variable returns to scale (VRS), meaning that efficiency improvements in operational inputs do not always proportionally increase market outputs, further supporting the two-stage framework.

From an industry perspective, efficiency is also influenced by the structural cost composition and sectoral conditions. Mumin et al (2024) identified financial costs and fixed assets as the main inefficiency drivers across industries, whereas more manageable expenditures such as overhead and COGS tend to exhibit higher optimization. In Islamic equity markets, consistent listing on indices such as the Jakarta Islamic Index (JII) is associated with sustained operational efficiency and investor trust (Rusydiana & Firmansyah, 2022).

Several previous studies have also shown that efficiency is not necessarily limited to the dimensions of productivity or profitability but can be extended to market-oriented efficiency, in which managerial performance is reflected through investors' valuation of firm value (Bitar et al., 2018; Seiford & Zhu, 1999; Sohail & Anjum, 2016). This concept is particularly relevant in the context of the Islamic capital market, where firm value is influenced not only by internal financial performance but also by market perceptions of Sharia compliance and the stability of Sharia-compliant issuers.

Overall, the reviewed studies justify the selection of assets, equity, and operational costs as inputs representing the profitability stage and EPS and market capitalization as outputs representing the marketability stage. This conceptual alignment with the two-stage DEA model (Seiford & Zhu, 1999) allows the current study to capture both the operational and market dimensions of firm efficiency, thereby providing a comprehensive understanding of performance behavior among listed companies.

## Method

This study adopts a non-parametric quantitative approach using data envelopment analysis (DEA) with an asset-based orientation. In this context, assets are considered key resources utilized by firms to achieve both operational and financial objectives. Efficiency is evaluated based on the extent to which companies can optimize the use of their assets to generate output (Hibatullah & Nurcahyani 2022). Within the DEA framework, the entities being assessed are referred to as decision making units (DMUs), which in this study consist of all companies listed in the Jakarta Islamic Index (JII). JII includes firms from a variety of industries, such as mining, energy, manufacturing, and telecommunications, each with distinct asset compositions and production technologies. To address this structural diversity, this study applies the DEA model under the variable returns to scale (VRS) assumption, which allows efficiency to be evaluated relative to firms operating at similar scales rather than imposing a uniform proportional relationship across all decision-making units. The VRS specification helps mitigate scale-related distortions by constructing a flexible efficiency frontier that adjusts for differences in production capacity and asset intensity among sectors (Cooper et al., 2011). The data used were secondary in nature, collected from the financial statements of each company under analysis. This approach enables the measurement of relative efficiency among DMUs, offering insights into optimal asset management in the Islamic equity sector and evaluating how effectively firms leverage internal resources to generate market value and attract investor interest.

Data envelopment analysis (DEA) is a non-parametric method that employs linear programming models to calculate the ratio between outputs and inputs across all decision making units (DMUs) under evaluation. One of the main advantages of DEA is that it does not require an explicit functional form specification and relies on minimal structural assumptions to construct an efficiency frontier (Rusydiana & Firmansyah, 2022). The DEA methodology was first introduced by Charnes et al. (1978), and subsequently extended by Banker et al. (1984). The foundation of efficiency measurement, as outlined by Farrell (1957) consists of two primary components: Technical efficiency (TE) and allocative efficiency. Technical efficiency reflects a firm's ability to produce maximum output from a given set of inputs, whereas allocative efficiency indicates the extent to which a firm utilizes its inputs in optimal proportions, given their respective prices. Within DEA, two widely used models for efficiency assessment are the constant returns to scale (CRS) and variable returns to scale (VRS) models. The CRS model assumes a proportional relationship between input and output; that is, an x percent increase in input results in an x percent increase in output. This model is typically used when an organization is believed to operate at an optimal scale. In contrast, the VRS model allows for non-proportional changes between inputs and outputs, and an x percent increase in input may lead to a more or less than x percent increase in output. Therefore, the VRS model is more suitable when evaluating institutions that may not yet be operating at optimal capacity (Rusydiana & Firmansyah, 2022).

This study adopts both input and output orientations to simultaneously optimize firm inputs and outputs. The selected input variables include equity (Jalaludin & Sari, 2024; Sohail &

Anjum, 2016), total assets (Jalaludin & Sari, 2024; Rusydiana & Firmansyah, 2022; Sohail & Anjum, 2016; Zhao et al., 2022), and operational expenses (Jalaludin & Sari, 2024; Mumin et al., 2024; Rusydiana & Firmansyah, 2022). The output variables are market capitalization (Sohail & Anjum, 2016), and earnings per share (EPS) (Sohail & Anjum, 2016). Market capitalization as an output variable is intended to capture the external dimension of efficiency, that is, a firm's ability to enhance its market value as a result of efficient management of assets and equity. Therefore, this study adopts a market-based efficiency approach that assesses the extent to which firms can convert internal resources into market value through stock market capitalization. Unlike operational efficiency, which measures internal productivity, market-oriented efficiency reflects how financial and managerial performance translate into investor confidence. Efficiency analysis was conducted using the MaxDEA Basic version 8 software.

This study employs the Banker, Charnes, and Cooper (BCC) model, which assumes Variable Returns to Scale (VRS). This assumption implies that increasing inputs does not necessarily lead to a proportional increase in the output. The VRS model is appropriate when the DMUs operate at varying scales; thus, changes in scale need to be considered (Banker et al., 1984). Mathematically, the DEA model can be expressed by the following equation:

$$Efficiency = \frac{\sum_{i=1}^{m} UiYis}{\sum_{i=1}^{m} vjXjs} \leq 1, Ui\ and\ Vj\ \geq 0 \quad (1)$$

where **m** represents the number of outputs, **i** represents the number of inputs, **Ui** is an (s × 1) vector of weighted outputs, **Vj** is an (s × 1) vector of weighted inputs, **Yis** denotes the total quantity of output *i* produced, and **Xjs** denotes the total quantity of input *j* used.

A company is deemed efficient if its performance metric reaches 100%, indicating optimal utilization of inputs to produce outputs. Conversely, an efficiency score below 100% suggests that the company is not operating at its full potential, which results in inefficiency.

## Result

The sample consists of 25 Sharia stock listed companies that are part of the Jakarta Islamic Index (JII) out of a total of 30 listed Sharia stock companies. The selection was based on the availability of the data required for analysis. Some companies were excluded from the sample because of incomplete data on specific variables in their financial reports during the observation period. Additionally, companies that were newly listed or established in 2021 were excluded because of insufficient historical data to meet the minimum observation period criteria set in this study, which spans from 2020 to 2023. Thus, reducing the sample size is necessary to maintain the consistency and validity of the efficiency analysis results.

**Table 1.** Descriptive statistic (in million IDR, except for EPS)

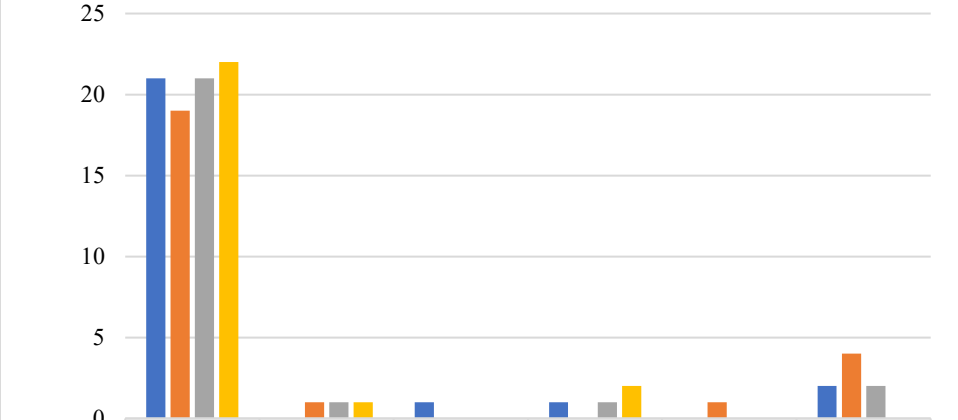
| Indicator | Input | | | Output | |
|---|---|---|---|---|---|
| | Total asset | Total equity | Operational cost | Market capitalization | Earning per share (EPS) |
| Mean | 81.548 | 40.767 | 8.702 | 3,469,511 | 592 |
| Min | 7.19 | 4.321 | 88 | 12 | 0.06 |
| Max | 353.624 | 156.562 | 104.3 | 125,370,070 | 17.661 |
| St.Dev | 77.014 | 33.594 | 18.818 | 17,402,914 | 2.006 |

Source: Processed by author (2025)

Table 1 presents the descriptive statistics of the five indicators used in this study, consisting of three input and two output variables. For the input variables, the company's total assets have a mean value of IDR 81.5 trillion, with a minimum value of IDR 7.1 trillion and a maximum of IDR 353.6 trillion. Total equity shows a mean value of IDR 40.8 trillion, with a minimum of IDR 4.3 trillion and a maximum of IDR 156.6 trillion. Meanwhile, operational expenses average IDR 8.7 trillion, ranging from IDR 88.1 billion to IDR 104.3 trillion. High standard deviation values,

particularly for total assets and operational expenses, indicate significant variations among companies in terms of capacity and operational scale.

For the output variables, market capitalization shows a very large mean value of IDR 3,469 trillion, with a minimum value of IDR 12.3 billion and a maximum of IDR 125,370 trillion, indicating extreme differences in market value among companies in the sample. Earnings per share (EPS) has a mean of 592, with a minimum value of only 0.06 and a maximum of 17,661, showing high disparities in profitability per share among the analyzed companies. The large standard deviation value of EPS (2,006) further confirms the gap in financial performance among the Sharia-compliant companies listed in the Sharia securities list during the observation period.




| | < 0.2 | 0.2-0.4 | 0.4-0.6 | 0.6-0.8 | 0.8-1 | 1 |
|---|---|---|---|---|---|---|
| 2020 | 21 | 0 | 1 | 1 | 0 | 2 |
| 2021 | 19 | 1 | 0 | 0 | 1 | 4 |
| 2022 | 21 | 1 | 0 | 1 | 0 | 2 |
| 2023 | 22 | 1 | 0 | 2 | 0 | 0 |

**Figure 1.** Efficiency distribution of Jakarta Islamic Index (JII) Sharia Stock listed companies for the period of 2020-2023
Source: MaxDea 8, processed by author (2025)

Figure 1 reveals the inefficiency trend among most companies, with a significant proportion scoring below 0.2 in efficiency. The years 2020 and 2022 saw 84% of companies (21) fall into this category, with 2023 witnessing an even higher percentage of 88% (22 companies). By contrast, 2021 stood out as a year of relative efficiency, with four companies achieving perfect scores and a more balanced distribution of efficiency levels across the board. This finding suggests that some companies have made notable improvements in managerial efficiency and scale by 2021.

Based on the Benchmark (Lambda) column from the MaxDEA output (Table 2), the firms that most frequently serve as references (peers/benchmarks) for other companies include Adaro Energy Indonesia (2022), PT Indo Tambangraya Megah Tbk (2022), PT Bumi Resources Minerals Tbk (2021), PT Unilever Indonesia Tbk (2021), and PT Aspirasi Hidup Indonesia Tbk (2021). These five firms achieve an efficiency score of 1.000 and therefore act as an efficient frontier, forming the efficiency boundary in the DEA model. Other firms with efficiency scores below one are evaluated as linear combinations based on the assigned weights (λ) relative to these benchmarks. The dominance of Adaro Energy and Indo Tambangraya Megah helps explain why the majority of other DMUs exhibit efficiency scores below 0.20 (Figure 1), as the efficiency frontier is shaped by firms with extreme market values, creating relative distortions for the remaining companies.

**Table 2.** Benchmark firms (Efficient frontier)

| DMU | Score | Benchmark (Lambda) |
|---|---|---|
| Adaro Energy Indonesia_2023 | 0,704466 | Adaro Energy Indonesia_2022 (0,913720); PT Bumi Resources Minerals Tbk_2021 (0,084463); PT. Indo Tambangraya Megah Tbk_2022 (0,001817) |

| DMU | Score | Benchmark (Lambda) |
|---|---|---|
| Indofood CBP Sukses Makmur Tbk_2023 | 0,034815 | Adaro Energy Indonesia_2022 (0,027912); PT. Indo Tambangraya Megah Tbk_2022 (0,972088) |
| Kalbe Farma_2023 | 0,011112 | Adaro Energy Indonesia_2022 (0,053240); PT Aspirasi Hidup Indonesia Tbk_2021 (0,647446); PT. Indo Tambangraya Megah Tbk_2022 (0,299314) |
| PT AKR Corporindo Tbk_2023 | 0,031918 | PT Aspirasi Hidup Indonesia Tbk_2021 (0,011105); PT Bumi Resources Minerals Tbk_2020 (0,738979); PT. Indo Tambangraya Megah Tbk_2022 (0,249916) |
| PT ANTAM Tbk_2023 | 0,008903 | Adaro Energy Indonesia_2022 (0,036392); PT Aspirasi Hidup Indonesia Tbk_2021 (0,152208); PT. Indo Tambangraya Megah Tbk_2022 (0,811400) |
| PT Aspirasi Hidup Indonesia Tbk_2023 | 0,160067 | Adaro Energy Indonesia_2022 (0,000438); PT Aspirasi Hidup Indonesia Tbk_2021 (0,986107); PT. Indo Tambangraya Megah Tbk_2022 (0,013455) |
| PT Bank Syariah Indonesia Tbk_2023 | 0,007592 | Adaro Energy Indonesia_2022 (0,084006); PT. Indo Tambangraya Megah Tbk_2022 (0,915994) |
| PT Bukit Asam Tbk_2023 | 0,052942 | Adaro Energy Indonesia_2022 (0,003973); PT Aspirasi Hidup Indonesia Tbk_2021 (0,232466); PT Bumi Resources Minerals Tbk_2020 (0,195431); PT. Indo Tambangraya Megah Tbk_2022 (0,568129) |
| PT Bumi Resources Minerals Tbk_2023 | 0,019630 | Adaro Energy Indonesia_2021 (0,016368); PT Bumi Resources Minerals Tbk_2021 (0,983632) |
| PT Chandra Asri Pacific Tbk_2023 | 0,013082 | Adaro Energy Indonesia_2022 (0,276965); PT Bumi Resources Minerals Tbk_2021 (0,707892); PT. Indo Tambangraya Megah Tbk_2022 (0,015144) |
| PT Charoen Pokphand Indonesia Tbk_2023 | 0,012764 | Adaro Energy Indonesia_2022 (0,051092); PT Aspirasi Hidup Indonesia Tbk_2020 (0,227274); PT Unilever Indonesia Tbk_2021 (0,101379); PT. Indo Tambangraya Megah Tbk_2022 (0,620256) |
| PT Elang Mahkota Teknologi_2023 | 0,007363 | Adaro Energy Indonesia_2022 (0,038913); PT Bumi Resources Minerals Tbk_2021 (0,276595); PT. Indo Tambangraya Megah Tbk_2022 (0,684492) |
| PT Indah Kiat Pulp and Paper Tbk_2023 | 0,070594 | Adaro Energy Indonesia_2022 (0,004796); PT. Indo Tambangraya Megah Tbk_2022 (0,995204) |
| PT Indocement Tunggal Prakarsa Tbk_2023 | 0,056343 | Adaro Energy Indonesia_2022 (0,004216); PT Aspirasi Hidup Indonesia Tbk_2020 (0,381102); PT Unilever Indonesia Tbk_2021 (0,045095); PT. Indo Tambangraya Megah Tbk_2022 (0,569587) |
| PT Indofood Sukses Makmur Tbk_2023 | 0,052945 | Adaro Energy Indonesia_2022 (0,008183); PT. Indo Tambangraya Megah Tbk_2022 (0,991817) |
| PT Merdeka Copper Gold Tbk_2023 | 0,008143 | Adaro Energy Indonesia_2022 (0,063620); PT Bumi Resources Minerals Tbk_2021 (0,837812); PT. Indo Tambangraya Megah Tbk_2022 (0,098568) |
| PT Mitra Adiperkasa Tbk_2023 | 0,024337 | Adaro Energy Indonesia_2022 (0,008731); PT Unilever Indonesia Tbk_2021 (0,732961); PT. Indo Tambangraya Megah Tbk_2022 (0,258307) |
| PT Perusahaan Gas Negara Tbk_2023 | 0,010944 | Adaro Energy Indonesia_2022 (0,019334); PT. Indo Tambangraya Megah Tbk_2022 (0,980666) |
| PT Unilever Indonesia Tbk_2023 | 0,045714 | Adaro Energy Indonesia_2022 (0,023300); PT Aspirasi Hidup Indonesia Tbk_2021 (0,824289); PT. Indo Tambangraya Megah Tbk_2022 (0,152411) |
| PT Vale Indonesia Tbk_2023 | 0,134655 | Adaro Energy Indonesia_2022 (0,002364); PT Bumi Resources Minerals Tbk_2021 (0,806284); PT. Indo Tambangraya Megah Tbk_2022 (0,191352) |
| PT XL Axiata Tbk_2023 | 0,007946 | Adaro Energy Indonesia_2022 (0,025945); PT Aspirasi Hidup Indonesia Tbk_2020 (0,180655); PT Unilever Indonesia Tbk_2021 (0,098319); PT. Indo Tambangraya Megah Tbk_2022 (0,695081) |
| PT. Indo Tambangraya Megah Tbk_2023 | 0,644206 | Adaro Energy Indonesia_2022 (0,000087); PT Bumi Resources Minerals Tbk_2021 (0,361606); PT. Indo Tambangraya Megah Tbk_2022 (0,638307) |
| PT. Semen Indonesia (Persero) Tbk_2023 | 0,018488 | Adaro Energy Indonesia_2022 (0,018297); PT. Indo Tambangraya Megah Tbk_2022 (0,981703) |

| DMU | Score | Benchmark (Lambda) |
|---|---|---|
| Telkom Indonesia_2023 | 0,016923 | Adaro Energy Indonesia_2022 (0,184149); PT. Indo Tambangraya Megah Tbk_2022 (0,815851) |
| United Tractors Tbk_2023 | 0,000935 | Adaro Energy Indonesia_2022(0,701150); PT Unilever Indonesia Tbk_2021 (0,007098); PT. Indo Tambangraya Megah Tbk_2022 (0,291752) |

Source: MaxDea 8, processed by author (2025)

**Table 3.** Sector-wise analysis

| Category | 2020 | | | 2021 | | | 2022 | | | 2023 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CRS | VRS | SE | CRS | VRS | SE | CRS | VRS | SE | CRS | VRS | SE |
| Sector (Panel A) | | | | | | | | | | | | |
| Financial sector | 0.005 | 0.006 | 0.918 | 0.008 | 0.008 | 0.931 | 0.007 | 0.007 | 0.985 | 0.008 | 0.008 | 0.992 |
| Manufacturing sector | 0.033 | 0.179 | 0.642 | 0.032 | 0.230 | 0.610 | 0.025 | 0.094 | 0.645 | 0.022 | 0.048 | 0.659 |
| Other sectors | 0.070 | 0.154 | 0.638 | 0.147 | 0.238 | 0.727 | 0.159 | 0.184 | 0.803 | 0.115 | 0.120 | 0.855 |
| Industry (Panel B) | | | | | | | | | | | | |
| Banks | 0.005 | 0.006 | 0.918 | 0.008 | 0.008 | 0.931 | 0.007 | 0.007 | 0.985 | 0.008 | 0.008 | 0.992 |
| Chemicals | 0.011 | 0.017 | 0.725 | 0.017 | 0.022 | 0.787 | 0.016 | 0.021 | 0.831 | 0.021 | 0.023 | 0.931 |
| Construction and materials | 0.036 | 0.040 | 0.912 | 0.032 | 0.038 | 0.853 | 0.034 | 0.042 | 0.783 | 0.032 | 0.037 | 0.800 |
| Fixed line telecommunication | 0.005 | 0.010 | 0.610 | 0.009 | 0.016 | 0.597 | 0.006 | 0.012 | 0.631 | 0.006 | 0.012 | 0.622 |
| General industrials | 0.033 | 0.051 | 0.643 | 0.052 | 0.090 | 0.575 | 0.069 | 0.147 | 0.469 | 0.044 | 0.071 | 0.617 |
| Industrial metals and mining | 0.132 | 0.293 | 0.624 | 0.285 | 0.462 | 0.731 | 0.306 | 0.351 | 0.809 | 0.219 | 0.225 | 0.868 |
| Industrial transportation | 0.001 | 0.001 | 0.969 | 0.001 | 0.001 | 0.981 | 0.001 | 0.001 | 1.000 | 0.001 | 0.001 | 1.000 |
| Media | 0.011 | 0.019 | 0.554 | 0.011 | 0.013 | 0.884 | 0.007 | 0.007 | 0.991 | 0.007 | 0.007 | 0.991 |
| Oil and gas producers | 0.011 | 0.011 | 0.999 | 0.013 | 0.013 | 0.999 | 0.013 | 0.013 | 0.993 | 0.011 | 0.011 | 0.995 |
| Personal goods | 0.032 | 0.240 | 0.474 | 0.027 | 0.305 | 0.465 | 0.018 | 0.105 | 0.584 | 0.018 | 0.049 | 0.596 |
| Ownership (Panel C) | | | | | | | | | | | | |
| Private | 0.065 | 0.203 | 0.605 | 0.120 | 0.291 | 0.649 | 0.128 | 0.181 | 0.730 | 0.092 | 0.107 | 0.775 |
| State owned | 0.013 | 0.016 | 0.793 | 0.017 | 0.020 | 0.813 | 0.009 | 0.012 | 0.800 | 0.015 | 0.019 | 0.804 |

Source: MaxDea 8, processed by author (2025)

The efficiency analysis results presented in Table 3 reveal distinct trends across the sectors. The financial sector stands out for its consistently high efficiency levels, with scale efficiency (SE) scores improving from 0.918 in 2020 to 0.992 in 2023, underscoring its near-optimal technical and scale efficiency. In contrast, the manufacturing sector exhibits lower and stagnant efficiency levels, with SE scores ranging from 0.610 to 0.659 and a notable decline in managerial efficiency, as indicated by the drop in variable return to scale (VRS) scores. Conversely, other sectors demonstrated a steady improvement in efficiency, with SE scores increasing from 0.638 to 0.855, reflecting enhancements in both managerial and scale efficiency.

The industry-level efficiency analysis in Panel B highlights notable performance differences. Industrial transportation and oil and gas producers stand out for their exceptional efficiency, with industrial transportation achieving perfect scale efficiency (SE) scores in the last two years and oil and gas producers maintaining near-perfect scores throughout the period. Conversely, the general industrial and personal goods industries struggle with low efficiency levels, with general industries experiencing a significant dip in SE scores by 2022. However, the chemical industry demonstrated a marked improvement in efficiency, with SE scores rising from 0.725 to 0.931 over the period, indicating enhanced technical and scale efficiency.

The analysis of efficiency by ownership type in Panel C reveals distinct patterns. State-owned enterprises (SOEs) consistently exhibit higher scale efficiency than private companies, with SE values ranging from 0.793 to 0.813. Nevertheless, private companies demonstrate a more pronounced upward trend in efficiency, with SE values rising from 0.605 to 0.775. This suggests

that private companies are more agile in adapting to changing circumstances and improving their operational efficiency.

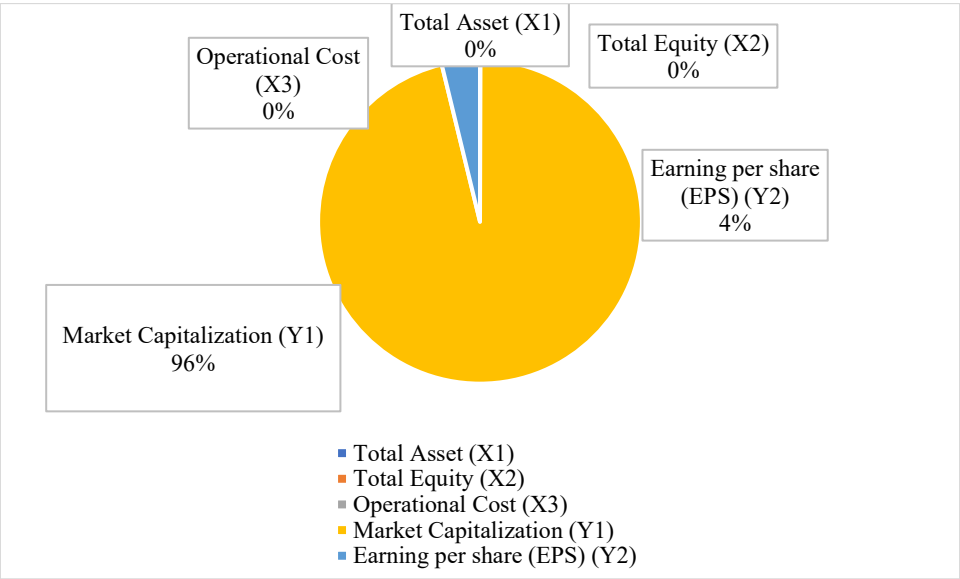



**Figure 2.** Improvement projection analysis
Source: MaxDea 8, processed by author (2025)

Figure 2 shows the results of the projection analysis, which highlights the contribution of each input and output variable to a company's performance efficiency. From the pie chart visualization, it is evident that the market capitalization (Y1) variable makes the largest contribution to achieving efficiency, accounting for 96%. This dominant contribution suggests that the DEA model's efficiency scores are largely driven by stock market valuation rather than internal financial fundamentals, such as assets or equity. In this sense, the observed inefficiency may be better interpreted as a form of market undervaluation rather than a purely operational failure.

## Discussion

The results show that the majority of companies fall into the inefficient category each year. Industry sector characteristics can influence efficiency levels. For example, sectors such as infrastructure, energy, and mining often have large capital structures but require a long time to provide commensurate returns. When market performance declines or becomes volatile, such as during the Covid-19 pandemic, the efficiency of companies in these sectors can drop drastically (Jalaludin & Sari, 2024). This finding confirms that external macroeconomic shocks and sectoral capital intensity are key determinants of short-term efficiency variations, especially when measured using market-based indicators, such as capitalization (Seiford & Zhu, 1999). 2021 stands out as the year with the highest efficiency, which can be explained by the context of post-pandemic economic recovery. After the shock in 2020, many companies have made strategic adjustments, cost efficiency, and operational digitalization (Mumin et al., 2024). The fiscal and monetary stimuli provided by the government during that year also accelerated the recovery of certain sectors (Elgin et al., 2020). As a result, some companies were able to streamline operational costs and maximize profits, as reflected in the increased number of companies achieving perfect efficiency scores (=1) in that year. This pattern indicates that external recovery policies and digital adaptation play an important mediating role in shaping corporate efficiency trajectories in the post-crisis period (Bitar et al., 2018). However, this trend did not continue in the following years, likely due to global volatility, rising interest rates, geopolitical tensions, and inflationary pressures, which put pressure on market performance and increased operational costs. Such cyclical dynamics underscore the interdependence between managerial performance and investor confidence, two elements that are central to market-oriented efficiency in Islamic equity markets. These factors pose challenges to maintaining efficiency in the Indonesian Sharia capital market.

Furthermore, the DEA results indicate that the efficiency frontier is shaped by several firms with perfect efficiency scores (1.000), which function as benchmark firms or efficient frontiers for other companies. The low average efficiency scores observed during the 2020-2023 period do not solely reflect managerial inefficiency, but are also influenced by frontier distortions arising from the large market capitalization of these firms. The dominant benchmark firms identified were Adaro Energy Indonesia (2022), PT Indo Tambangraya Megah Tbk (2022), PT Bumi Resources Minerals Tbk (2021), PT Unilever Indonesia Tbk (2021), and PT Aspirasi Hidup Indonesia Tbk (2021), demonstrating that the efficient frontier is heavily defined by companies with superior valuation and investor recognition. In addition, the significant decline in market capitalization experienced by most companies in the early years of this study can be linked to negative investor sentiment and panic selling during the Covid-19 pandemic. This finding is consistent with Al-Awadhi et al. (2020), who argued that stock price fluctuations during the pandemic were driven more by market panic and uncertainty than by changes in firm fundamentals. Therefore, the observed inefficiency should be interpreted as reflecting market-oriented dynamics, where valuation shocks temporarily distort the efficiency scores within the DEA framework.

The findings in Panel A reveal that the financial sector exhibits higher and more consistent efficiency levels than the manufacturing sector and other sectors. This can be attributed to several structural and operational factors that distinguish the financial sector from other sectors. The financial sector, particularly banking, tends to have lower fixed costs and digital business models that enable higher operational efficiency (Amanda & Sudrajad, 2023). Additionally, this sector is quicker to adopt information and communication technology, which contributes to increased productivity and efficiency (Yusgiantoro et al., 2018). By contrast, the manufacturing sector in Indonesia faces challenges in operational efficiency, suboptimal assets, and equity utilization (Dwijayantie & Mulyadi, 2022). Many manufacturing industries rely on conventional technology and face obstacles in adopting new technologies that impact productivity and efficiency (BPS, 2019). Despite initiatives such as "Making Indonesia 4.0" to promote digital transformation in the manufacturing sector, its implementation faces various obstacles, including infrastructure limitations and skilled human resource constraints (Kementerian Perindustrian, 2018). Thus, differences in technology adoption rates, cost structures, and business models between the financial and manufacturing sectors contribute to the observed disparities in the efficiency levels in the analysis.

The results in Panel B show that all industry categories tend to have high Scale Efficiency (SE) values, approaching perfect scores, especially compared with the much lower CRS and VRS values. This indicates that these companies have operated at an optimal production scale, but still face technical and managerial inefficiencies (Aparicio & Santín, 2025). In the context of companies listed on the Jakarta Islamic Index (JII), high scale efficiency can be linked to the characteristics of companies with large capitalization, strong financial performance, and strict Sharia compliance (Fitrah et al., 2022; IDX Islamic, 2019). Companies in JII are generally at a business maturity stage and operate on a minimum economic scale, enabling high scale efficiency (Rusydiana & Firmansyah, 2022). In this study, the transportation and energy sectors exhibited the optimal efficiency performance. In the transportation sector, high efficiency is driven by massive infrastructure development such as toll roads, ports, and airports, which significantly reduces logistics costs and accelerates the flow of goods and public mobility (Kementerian Perhubungan RI, 2024). Additionally, initiatives for vehicle electrification, with targets for millions of electric vehicles by 2030, provide incentives for energy efficiency in this sector (Kementerian ESDM, 2024). On the other hand, the energy sector also experiences increased efficiency through diversification of the energy mix by incorporating renewable energy sources such as bioenergy and bioethanol, as well as developing the energy service company (ESCO) ecosystem in building efficiency projects (Ditjen EBTKE, 2023). These sectoral results emphasize that efficiency in the Islamic equity market is influenced not only by firm-specific productivity, but also by national industrial policies and sustainability transitions that affect sector-wide cost structures.

Panel C presents an analysis of efficiency based on company ownership, which shows that state-owned enterprises (SOEs) consistently have higher scale efficiency levels than private

companies throughout the research period. This finding is in line with the study by Sohail and Anjum (2016), which indicates that SOEs' efficiency is superior to that of private companies, particularly after an Initial Public Offering (IPO) process. One of the main factors supporting the high efficiency of SOEs is their broader access to resources, especially in the form of operational financing and direct subsidies from the government, which are generally unavailable to private companies (Le et al., 2019). SOEs also have advantages in facing government regulations and often receive guarantees of state support, which provides additional stability in business management (Le et al., 2023). Furthermore, the efficiency advantage of SOEs can be explained by their operational scale. As noted by the Organisation for Economic Co-operation and Development (2016) SOEs tend to operate on a large scale, which enables them to achieve scale efficiency through reduced costs per unit as production volume increases. The stability and operational efficiency of SOEs are further strengthened by their strategic role in vital sectors, such as banking, energy, transportation, and utilities. The International Monetary Fund (2020) confirms that the involvement of SOEs in these strategic sectors provides a more secure and efficient position in facing national and global economic dynamics.

The area of improvement focuses on output performance, particularly in terms of increasing market capitalization. In other words, efficiency improvement is driven by strategies to increase a company's market value (output-oriented). Market capitalization is now widely accepted as an indicator of a company's valuation (Fitrah et al., 2022). Generally, investors seek stocks with large market capitalization for long-term investment because of their potential for company growth, dividend distribution, and relatively low risk (Wahyuni, 2024). However, the dominance of market capitalization in determining efficiency, contributing up to 96%, indicates that the DEA results are heavily influenced by stock price movements and investor sentiment, rather than purely managerial or operational performance. This aligns with the perspective of behavioral finance, which suggests that market efficiency is often shaped by psychological factors, such as overreaction, herding behavior, and risk perception (Al-Awadhi et al., 2020). In this context, a company's efficiency score may reflect market undervaluation or investor pessimism, rather than actual inefficiency. Accordingly, improvements in output performance should be interpreted as part of a broader strategy of strategic value creation and investor relations, aimed at aligning market perceptions with firms' intrinsic values.

In this context, company management must focus on efforts to increase market value through innovation, market share expansion, strengthening corporate governance, and transparency as part of a long-term strategy. Such initiatives not only enhance financial fundamentals but also help build investor trust and market confidence, which are essential components of market efficiency. For Sharia stock listed companies, value creation strategies must also consider adherence to Sharia principles, which can directly or indirectly affect a company's room to maneuver in optimizing market value. Therefore, efficiency improvement in JII companies should ideally be directed through synergy between value-based business strategies, continuous innovation, and adherence to ethical principles in Sharia.

## Conclussion

This study analyzes the performance of Sharia stock listed companies in the Jakarta Islamic Index (JII) to measure how efficiently companies utilize their internal resources to create market value and attract investor interest. This study concludes that the efficiency level of companies listed in JII is generally low during the period 2020-2023, especially in 2023, which recorded the highest percentage of inefficient companies. The analysis also identifies Adaro Energy Indonesia (2022), PT Indo Tambangraya Megah Tbk (2022), PT Bumi Resources Minerals Tbk (2021), PT Unilever Indonesia Tbk (2021), and PT Aspirasi Hidup Indonesia Tbk (2021) as benchmark firms that form an efficient frontier and represent the best-performing companies in the Islamic capital market. The financial sector has consistently emerged as the most efficient sector compared to others, supported by its low-cost structure and advanced technology adoption. At the industry level, the transportation, industrial, and energy sectors show the most stable and high efficiency, whereas the manufacturing and consumer goods sectors lag behind. In terms of ownership, state-owned

enterprises (SOEs) consistently have higher scale efficiency levels than private companies. Scale efficiency is generally high; however, technical and managerial efficiency pose major challenges. The projection analysis for improvement shows that increasing market capitalization is the dominant contributor to efficiency, indicating the need for market value enhancement strategies as a top priority for achieving company efficiency. The use of market-based outputs, such as market capitalization and earnings per share, indicates that the efficiency assessed in this study reflects a company's ability to convert internal resources into investor-recognized market value. In this sense, efficiency in the JII context represents market-driven performance, in which valuation and investor perception play a decisive role alongside operational capability.

The research objectives were achieved based on these findings. The study successfully measures and explains the extent to which Sharia stock listed companies in Indonesia utilize their resources to generate market value while also highlighting structural inefficiencies across sectors and ownership types. The results not only provide practical insights for improving company-level efficiency but also contribute to the theoretical understanding of market-oriented efficiency within the Islamic capital market context.

These findings have important implications for company management to focus more on output-oriented efficiency improvements through strategic value creation and stronger investor relations supported by solid financial fundamentals, effective managerial practices, and adherence to Sharia principles. This study recognizes that using market capitalization as an output variable may make DEA results more sensitive to changes in market sentiment and investor perception. As a result, companies with inflated stock values might appear efficient, whereas those with strong fundamentals but undervalued shares may seem inefficient. To address this limitation, future research could combine market-based and financial performance indicators, such as profitability ratios, Tobin's Q, or shareholder returns, to provide a more balanced view of efficiency. It would also be valuable to apply a panel or two-stage DEA approach so that external market influences can be separated from internal managerial performance, offering a clearer picture of efficiency in the Islamic capital market. Future studies should also apply a meta-frontier DEA model to better capture the structural diversity and sectoral differences among Islamic equity firms in the Jakarta Islamic Index. The results of this study provide a basis for promoting policies that support the efficiency of sharia stock-listed companies, including digitalization incentives and strengthened information transparency. Meanwhile, for investors, the efficiency results can serve as a consideration when selecting Sharia stock-listed companies with higher growth prospects and optimal operations.

**Author contribution**

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Writing – original draft: Syahdatul Maulida
Writing – review & editing: Wiku Suryomurti, Miftakhus Surur, Nashr Akbar

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