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EFFICIENCY PERFORMANCE ANALYSIS OF MINING COMPANIES LISTED IN SHARIA AND NON-SHARIA STOCK INDEX IN INDONESIA WITH DATA ENVELOPMENT ANALYSIS (DEA) METHOD

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ABSTRACT: Indonesia's mining sector experienced a decline in 2020 due to the COVID-19 pandemic, which caused a contraction in GDP growth of -2.07% (BPS, 2021). This study aims to analyze the efficiency performance of mining companies listed on the Indonesian Sharia Stock Index (ISSI) and the LQ45 Index, and to compare the efficiency of both. The data used are panel data from 4 ISSI mining companies and 4 LQ45 mining companies. The methods used are Data Envelopment Analysis (DEA), Kolmogorov-Smirnov normality test, and Mann Whitney Test to test for significant differences in efficiency. The results of the study show that the efficiency of mining companies in ISSI is 81% and LQ45 is 66%, both of which have not achieved perfect efficiency. The efficiency comparison shows a significant difference, with the average efficiency value of ISSI mining companies of 91.87 higher than LQ45 of 69.13.
Keyword: Mining Companies, Efficiency Performance, Data Envelopment Analysis (DEA), Indonesian Sharia Stock Index (ISSI), LQ45 Index

INTRODUCTION

In Indonesia, the mining sector is one of the industrial sectors that support economic development because Indonesia has the energy resources needed for national economic growth. Indonesia's mining sector plays an important role in the country's economy, contributing greatly to state revenue and job creation. However, the mining sector will face economic challenges such as commodity price fluctuations, strict

regulations, and environmental impacts.

The mining sector experienced a decline in 2020 due to the COVID-19 pandemic that hit almost the entire world and which also had an impact on Indonesia's GDP so that it contracted growth by minus 2.07% compared to the previous year (BPS, 2021). As one of the largest contributors to Gross Domestic Product (GDP) in Indonesia, the government must work together to continue to encourage the growth of the mining industry because of its potential contribution to the country's economy (Elza et al., 2023) . Mining is a sector that requires serious attention from the government, given that Indonesia has abundant natural resource potential. So, with the potential of many natural resources, efficient management is certainly needed (Satriawan, 2021) .

The price of one of the mining sectors, namely coal, has decreased, especially in 2019 due to the Covid-19 pandemic outbreak. Throughout 2019, PT Indo Tambang Raya Megah Tbk (ITMG) recorded a decrease in average selling price (ASP) of 20.1% (*yoy*), thus posting a decrease in total revenue of 14.5% (yoy). Indonesian coal mining issuers posted a decline in revenue in 2019 compared to the previous year (yoy). The decline in revenue experienced by the Indonesian coal sector was not accompanied by a decrease in production costs. This post swelled, resulting in the erosion of company margins (Citradi, 2020) . Mining and quarrying sector business activities in the fourth quarter of 2019 decreased compared to the previous quarter.

As a sector that contributes greatly to state revenue and job creation. The mining sector will be faced with challenges such as commodity price fluctuations, strict regulations, and environmental impacts, which require a thorough analysis of financial performance. Therefore, the company needs to make improvements in its business processes, one way to improve the company is to pay attention to its efficiency level. Efficiency measurement becomes very important because it encourages company growth to produce better performance so that it can increase market share (Khalimah & Gunanto, 2022) . A good level of company efficiency with appropriate operational costs has a big role in influencing the success of the company to achieve its goal of obtaining profit or profit (Sari & Rimawan, 2020) .

There are several mining companies listed on the Indonesia Sharia Stock Index (ISSI) that show fluctuating conditions in their company profits. Profit can show how the company manages existing funds to generate maximum profit, and is often used as a reference by investors before making an investment. The higher the profit generated, the better the assessment of the company's performance.

In addition to company profits, capital is also very influential on the growth and sustainability of the company. In the economy, capital is the most important asset in many companies and has a direct influence on company performance (Anam & Suhartini, 2020) . Capital plays an important role in carrying out the company's operational activities, if

there is no company capital, the company's operational activities will be hampered. Because capital is a fund used to finance the procurement of assets and company operational activities (Fitriyani & Munandar, 2020) .

In addition to profit and capital, total assets are also very influential on the growth and sustainability of the company. Companies must be able to run their operations efficiently and effectively, because companies that can manage their assets better will get greater profits. Asset management is very important to ensure sufficient liquidity, the company's growth potential, and to maintain the company's overall financial health. The financial performance of a company can be seen from the information in the financial statements. The information is used to see the company's financial performance in the past and predict its future performance (Achmad & Hidayat, 2015) .

In this study, the company's efficiency performance can be analyzed using the *Data Envelopment Analysis* (DEA) method. DEA is a type of non-parametric analysis used to evaluate the efficiency level of a work unit. The efficiency measured by DEA method has a different character from the concept of efficiency in general, which can find out the variables that cause the company's performance to be inefficient (Tuffahati et al., 2016) .

Efficiency research using the *Data Envelopment Analysis* (DEA) method, has been conducted by M. Mujiya Ulkhaq (2023) which measures the efficiency of large and medium manufacturing industries in West Java Province with the results showing that of the 23 DMUs studied, only five of them are considered the most efficient. Meanwhile, research conducted by Sholihah (2021) which measures the efficiency of the financial performance of the Indonesian banking sector during the covid-19 pandemic, shows the results that the average level of efficiency of the banking sector, both Conventional Commercial Banks and Islamic Commercial Banks, faces a substantial decline during the covid-19 pandemic.

This research refers to research conducted by Sa'diyah (2016) , with the title Efficiency Analysis Using the *Data Envelopment Analysis (DEA*) Method, research conducted by Permatasari & Setyawan (2019) , with the title Measurement of MSME Performance Efficiency Using *Data Envelopment Analysis* (DEA), research conducted by Yang & Li (2017) , with the title *Efficiency Evaluation of Industrial Waste Gas Control in China : A Study Based on Data Envelopment Analysis (*DEA*)*, and research conducted by Anam & Suhartini (2020) , with the research title *Efficiency of Palm Oil Companies in Indonesia: A DEA Approach*. The difference between this research and previous research lies in different research objects, namely mining companies listed on the Indonesian Sharia Stock Index (ISSI). So the authors are interested in conducting research on the extent of the efficiency performance of mining companies listed on the Indonesian Sharia Stock Index and the LQ45 Index using the *Data Envelopment Analysis* (DEA) method.

The problem formulations in this study are as follows: (1) How is the level of

efficiency of mining companies listed on the Indonesian Sharia Stock Index (ISSI) using the *Data Envelopment Analysis* (DEA) method? (2) How is the level of efficiency of non-sharia mining companies listed on the LQ45 Index using the *Data Envelopment Analysis* (DEA) method? (3) How is the level of efficiency difference between sharia and non-sharia mining companies using the *Data Envelopment Analysis* (DEA) method?

Furthermore, this research has the following objectives: (1) To analyze the efficiency level of mining companies listed on the Indonesian Sharia Stock Index (ISSI) using the *Data Envelopment Analysis* (DEA) method, (2) To analyze the efficiency level of non-sharia mining companies listed on the LQ45 Index using the *Data Envelopment Analysis* (DEA) method, (3) To determine the difference in the efficiency level of sharia and non-sharia mining companies using the *Data Envelopment Analysis* (DEA) method.

RESEARCH METHODS

This research uses quantitative research. The research conducted is a descriptive analysis using the non-parametric *Data Envelopment Analysis* (DEA) method using *Microsoft Access for Data Envelopment Analysis* (MaxDEA 8). This model is used as a tool to evaluate the performance of an activity in a *Decision Making Unit* (DMU) data organization which is the ratio between weighted *inputs* and weighted *outputs*. The resulting ratio is an efficiency value commonly referred to as the efficiency *score* (Abdullah et al., 2020) .

There are two models of efficiency measurement using DEA, namely the *Constant Return to Scale* (CRS) Model and the *Variable Return to Scale* (VRS) Model. This study uses a production approach with the latest assumption, namely *Variable Return to Scale* (VRS) with *output* orientation. *Output* orientation will measure the extent to which *output* can be increased without changing the number of *inputs*. Furthermore, a different test was conducted using the *Mann Whitney U-Test* test to determine the comparison of the efficiency level of mining companies listed on the ISSI and the LQ45 Index. The population in the study used mining companies listed on the Indonesian Sharia Stock Index (ISSI) and the LQ45 Index in the 2019-2023 period. The research sample was taken using *purposive sampling* technique, namely the sampling technique by considering the sample according to certain criteria (Sujarweni, 2019) . *Purposive sampling* results in 4 companies listed on ISSI (PT Aneka Tambang Tbk, PT Mitra Energi Persada Tbk, PT Bukit Asam Tbk, PT Golden Eagle Energy Tbk) and 4 companies listed on the LQ45 Index (PT AKR Corporindo Tbk, PT ESSA Industries Indonesia, PT Indika Energy Tbk, PT Medco Energi Internasional Tbk).

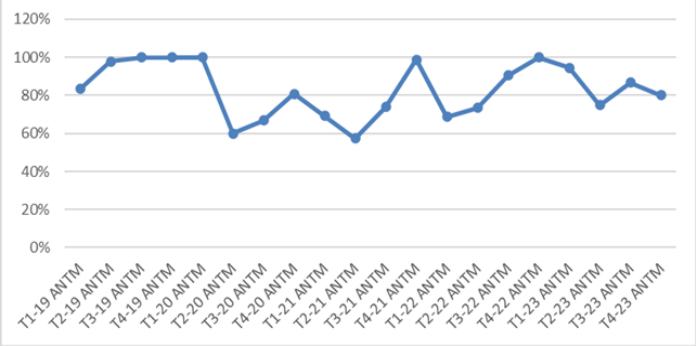
RESEARCH RESULTS AND DISCUSSION

Efficiency Performance of Mining Companies Listed in ISSI

Tests on several mining companies listed on the Indonesian Sharia Stock Index in the 2019-2023 period showed the companies' efficiency performance fluctuations. The average efficiency score of mining companies listed on ISSI using the *Data Envelopment Analysis* (DEA) method shows quite good results, namely with a percentage of 81%. This shows that the efficiency performance of mining companies listed in ISSI is quite good, but still has not achieved perfect efficiency performance because it has not reached 100%. The following are the efficiency results of mining companies listed on ISSI:

1) PT Aneka Tambang Tbk (ANTM)

Figure 1. Efficiency of PT Aneka Tambang Tbk (ANTAM)

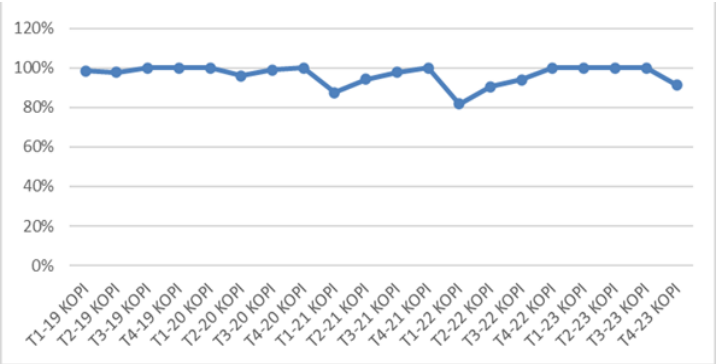


Source: Data processed, 2025

Based on the results of research using the *Data Envelopment Analysis* (DEA) analysis tool, PT Aneka Tambang Tbk shows the results of imperfect efficiency or inefficiency. Because the average efficiency result during the research period did not reach 100%, which was only 83%. The lowest efficiency result during the research period was at 57%.

2) PT Mitra Energi Persada Tbk (KOPI)

Figure 2. The efficiency of PT Mitra Energi Persada Tbk (KOPI)



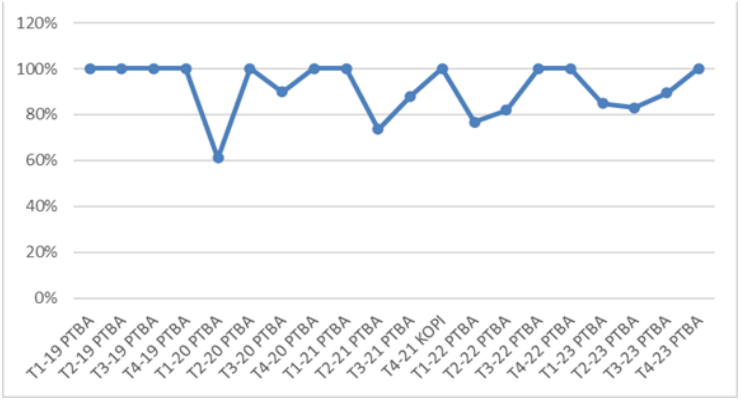
Source: Data processed, 2025

PT Mitra Energi Persada Tbk showed almost perfect efficiency results. Because the average efficiency result during the research period almost reached 100%, which was

96%. The lowest efficiency result shows 82% which is greater than PT Aneka Tambang Tbk.

3) PT Bukit Asam Tbk (PTBA)

Figure 3. Efficiency of PT Bukit Asam Tbk (PTBA)

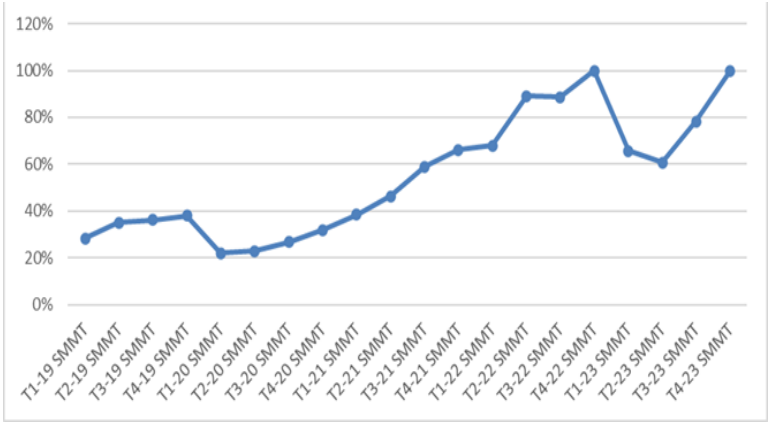


Source: Data processed, 2025

The research result of efficiency level at PT Bukit Asam Tbk showed an imperfect efficiency result, which was only 91%. The lowest efficiency result shows 61% higher than PT Aneka Tambang Tbk and lower than PT Mitra Energi Persada Tbk.

4) PT Golden Eagle Energy Tbk (SMMT)

Figure 4. The efficiency of PT Golden Eagle Energy Tbk (SMMT)



Source: Data processed, 2025

The result of the research on PT Golden Eagle Energy Tbk showed an imperfect efficiency result, with the average efficiency result during the research period not reaching 100%, which was only 55%. The lowest efficiency result shows 22% lower than the previous three companies.

Of the four mining companies listed in ISSI, PT Mitra Energi Persada Tbk showed the highest efficiency level of 96%. This is because the actual conditions of the six variables reach good targets, so the company is able to achieve an almost perfect level

of efficiency. Another case with PT Golden Eagle Energy Tbk which shows an average efficiency of 55%. This is because the actual conditions of the six variables have not reached a good target, so the company has not been able to achieve a perfect level of efficiency.

The occurrence of inefficiency in the four companies is due to the existence of research variables that have not reached the efficient target. Of the six variables used, the five variables showed an imperfect level of efficiency including capital, assets, debt, gross profit and net sales showed imperfect efficiency because the results did not reach perfect efficiency of 100%. This shows that there are targets that have not been achieved so that the company can be said to be efficient. The company can make improvements to the variables of capital, assets, debt, gross profit and net sales based on the results in the efficiency target table so that the company can achieve perfect efficiency.

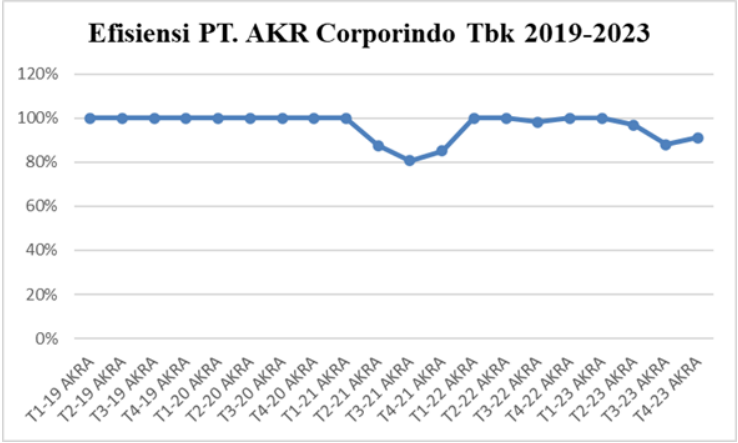
This is in line with research conducted by Alfath & Ambarwati (2024) , with the research title Efficiency Analysis of Food and Beverage Company Performance with the *Data Envelopment Analysis* (DEA) Approach which shows the results of the analysis that PT Indofood Sukses Makmur Tbk, PT Mayora Indah Tbk, PT Diamond Food Indonesia Tbk, and PT Sentra Food Indonesia Tbk have an efficiency score of 1 which indicates efficiency. Meanwhile, PT Bumi Teknokultura Unggul Tbk has a score that indicates inefficiency. The inefficiency was caused by the variables of asset, debt, gross profit, and net sales that could not reach the efficient target.

Efficiency Performance of Mining Companies Listed in LQ45 Index

Testing of several mining companies listed on the Indonesian Sharia Stock Index in the 2019-2023 period showed fluctuating conditions in the company's efficiency performance. The average efficiency score of mining companies listed in LQ45 with the *Data Envelopment Analysis* (DEA) method shows quite good results, namely with a percentage of 66%. This shows that the efficiency performance of mining companies listed in LQ45 is below that of mining companies listed in ISSI. This also shows that the efficiency performance of mining companies listed on the LQ45 Index is still not perfect. The following are the efficiency results of mining companies listed on the LQ45 index:

a. PT AKR Corporindo Tbk (AKRA)

Figure 5. Efficiency of PT AKR Corporindo Tbk (AKRA)

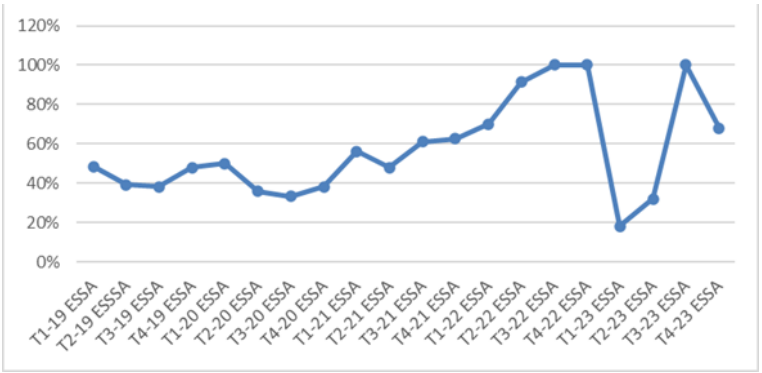


Source: Data processed, 2025

Based on the research result using *Data Envelopment Analysis* (DEA), PT AKR Coporindo Tbk showed almost perfect efficiency result. Because the average efficiency result during the research period almost reached 100% which was 96% and the lowest efficiency result showed 81%.

b. PT ESSA Industries Indonesia Tbk (ESSA)

Figure 6. The efficiency of PT ESSA Industries Indonesia Tbk (ESSA)

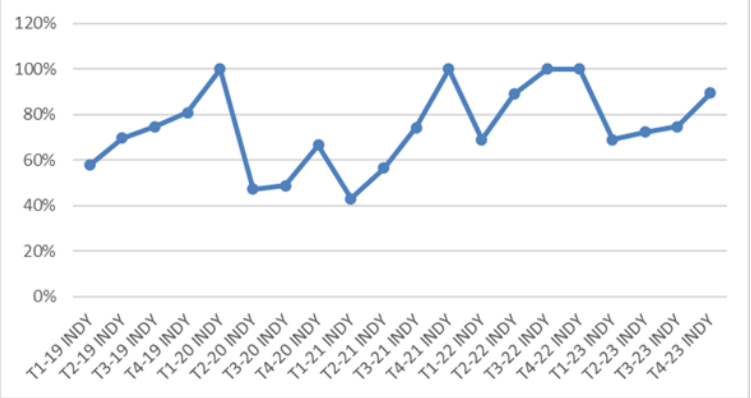


Source: Data processed, 2025

The results of the research at PT ESSA Industries Indonesia Tbk showed imperfect efficiency results. Because the average efficiency result during the research period was only 57%, with the lowest efficiency level showing 18% which was much lower than the previous company.

c. PT Indika Energy Tbk (INDY)

Figure 7. The efficiency of PT Indika Energy Tbk (INDY)

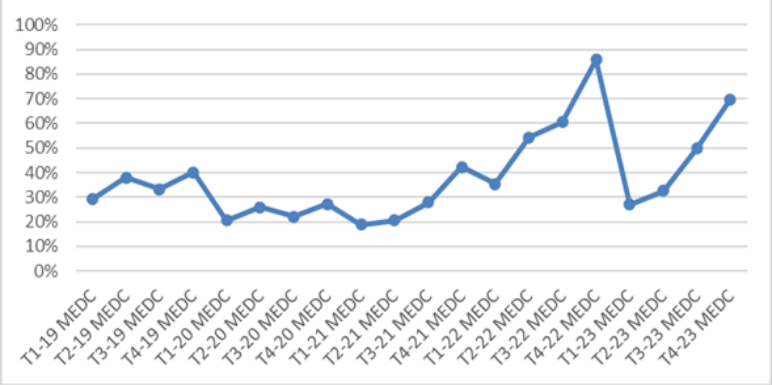


Source: Data processed, 2025

The results of the research on PT Indika Energy Tbk showed that the efficiency results were not perfect. Because the average efficiency result during the research period did not reach 100%, which was only 74%. The lowest efficiency result shows 43% lower than PT AKR Corporindo Tbk and higher than PT ESSA Industries Indonesia Tbk.

d. PT Medco Energi Internasional Tbk (MEDC)

Figure 8. Efficiency of PT Medco Energi Internasional Tbk (MEDC)



Source: Data processed, 2025

The results of the research on PT Medco Energi Internasional Tbk showed an average level of efficiency that was not perfect, namely 38% with the lowest efficiency level of 19%.

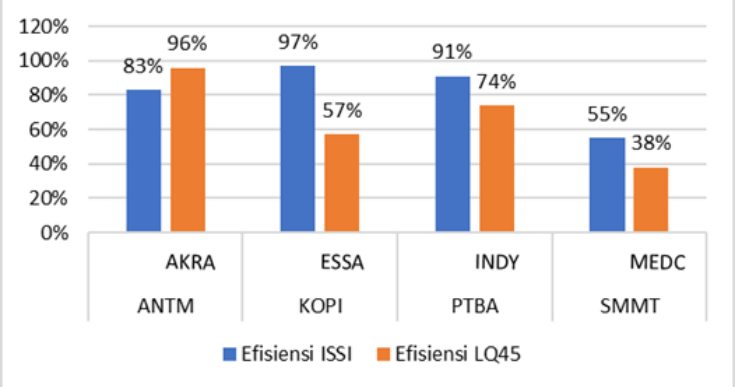
Of the four mining companies listed in LQ45, PT AKR Corporindo Tbk showed the highest efficiency level of 96%. This is because the actual conditions of the six variables reach a good target, so the company is able to achieve an almost perfect level of efficiency. Another case with PT Medco Energi Internasional Tbk which shows an average efficiency of 38%. This is because the actual conditions of the six variables have not reached a good target, so the company has not been able to achieve a perfect level of efficiency.

The occurrence of inefficiency in the four companies is due to the existence of research variables that have not reached the efficient target. Of the six variables used, the five variables showed an imperfect level of efficiency including capital, assets, debt, gross profit and net sales showed imperfect efficiency because the results did not reach perfect efficiency of 100%. This shows that there are targets that have not been achieved so that the company can be said to be efficient. The company can make improvements to the variables of capital, assets, debt, gross profit and net sales based on the results in the efficiency target table so that the company can achieve perfect efficiency.

This is in line with research conducted by Dwijayantie & Mulyadi (2022) , with the research title Efficiency of Manufacturing Companies with Data Envelopment Analysis, which shows the average results of 26 companies only 1 company that reaches the efficient level and the rest are inefficient with details, namely 3.85% of companies consistently have the highest efficiency value that reaches 100%, 7.69% of companies have relatively good efficiency values, while the remaining 88.46% are not efficient. The cause of inefficiency in the companies is mostly caused by the inappropriate management of total assets and capital, besides that it is also caused by wasteful selling expenses, administrative expenses, and other operational expenses which cause the inefficiency of the company in reaching the efficient level.

Comparison of Efficiency Performance of Mining Companies Listed in ISSI and LQ45

Figure 9. Efficiency of Mining Companies Listed in ISSI and LQ45 Period 2019-2023



Source: Data processed, 2025

Based on the results in graph 9, there is a significant difference between mining companies listed on the Indonesian Sharia Stock Index and the LQ45 index. The difference can also be seen in graph 4.10 based on the average results of the four companies listed on the Indonesian Sharia Stock Index which show better results than the four companies listed on the LQ45 Index. Companies listed on the Indonesian Sharia Stock Index, namely PT Aneka Tambang Tbk, showed an average efficiency of 83%, PT Mitra Energi Persada Tbk showed an average efficiency of 96%, PT Bukit Asam Tbk showed an average efficiency of 91%, and PT Golden Eagle Energy Tbk showed an average efficiency of 55%.

While in companies listed in the LQ45 Index, PT AKR Corporindo Tbk shows an average efficiency of 96%, PT ESSA Industries Indonesia Tbk shows an average efficiency of 57%, PT Indika Energy Tbk shows an average efficiency of 74%, and PT Medco Energi Internasional Tbk shows an average efficiency of 38%.

Then, the comparison of the efficiency performance of companies listed on the Sharia and Non-Sharia Index can be seen based on the fluctuation condition of the graph which shows that mining companies listed on the Indonesian Sharia Stock Index (ISSI) are better than mining companies listed on the LQ45 Index. Further differences can be seen based on the results of the *Mann Whitney U-Test* difference test in table 4.20 *mean rank* which shows the average value of the efficiency of mining companies in the Indonesian Sharia Stock Index (ISSI) which is 91.87 greater than the LQ45 Index mining companies with a value of 69.13.

This is in line with research conducted by Riani & Hendrawan (2020), with the research title *Data Envelopment Analysis* (DEA): Comparison of Efficiency of Islamic Banks and Conventional Banks for the 2014-2018 Period, with research results showing that by using the CRS production approach there is a significant difference in efficiency levels between Islamic banks and conventional banks as seen from the mean rank value of Islamic banks more efficient than conventional banks. In contrast to research conducted by Zahara & Saputra (2020) , with the title Comparative Analysis of the Efficiency of Conventional Life Insurance Companies and Islamic Life Insurance Companies in Indonesia with the *Data Envelopment Analysis* (DEA) Method, the results showed that the comparison of the average value of the efficiency of conventional life insurance companies was better than that of Islamic life insurance companies.

CONCLUSION

The results showed that the efficiency level of mining companies listed in ISSI showed an average efficiency value that was not perfect at 81%, while the efficiency level of mining companies listed in the LQ45 Index showed an average efficiency value that was not perfect and was below the mining companies listed in ISSI at 66%, and the comparison of the efficiency level of mining companies listed in ISSI and LQ45 Index based on the results of the *Mann Whitney U-Test* showed a significant difference. The difference in table 4.20 *mean rank* shows the average value of efficiency of ISSI mining companies which is 91.87 greater than LQ45 mining companies with a value of 69.13.

REFERENCES

Abdullah, D., Milyana, Kahar, M. S., Bunyamin, & Erliana, C. I. (2020). *Application of Data Envelopment Analysis Method for Performance Efficiency Measurement*.

Achmad, N., & Hidayat, L. (2015). The Effect of Asset Management on Corporate Financial

Performance. *Scientific Journal of Unity Management*,*1* (1), 23-38. https://doi.org/10.37641/jimkes.v1i1.252

Alfath, S., & Ambarwati, S. N. (2024). *Efficiency Analysis of Food and Beverage Company Performance with Data Envelopment Analysis (DEA) Approach*. *15*(2), 94–99.

Anam, M. K., & Suhartini. (2020). Efficiency of Palm Oil Companies in Indonesia: A DEA Approach. *HABITAT*,*31* (2), 55-63. https://doi.org/10.21776/ub.habitat.2020.031.2.7

Citradi, T. (2020). *Coal Issuers Battered in 2019, Is There Hope in 2020?* CNBC Indonesia. https://www.cnbcindonesia.com/market/20200402145601-17-149396/emiten-batu-bara-babak-belur-di-2019-adakah-harapan-di-2020

Dwijayantie, R., & Mulyadi, J. (2022). Efficiency of Manufacturing Companies with Data Envelopment Analysis. *Scientific Journal of Accounting Faculty of Economics*, *8*(2), 253–270.

Elza, Wahab, A., & Masse, R. A. (2023). Analysis of the Effect of Production Costs on Net Income at PT Aneka Tambang Tbk. *BALANCA: Journal of Economics and Islamic Business*,*5* (1), 55-62. https://doi.org/10.35905/balanca.v5i1.2869

Fitriyani, I., & Munandar, A. (2020). Analysis of the Cost of Capital on the Rate of Return on Investment at PT Mitra Adiperkasa, Tbk. *WIDYA Scientific Journal*, *7*(2), 45–51.

Khalimah, N., & Gunanto, E. Y. A. (2022). Efficiency and Productivity Analysis of Islamic Commercial Banks in Indonesia. *MALIA: Journal of Islamic Banking and Finance*, *6*(1), 1–71.

Permatasari, M. F., & Setyawan, A. A. (2019). *Measuring the Efficiency of MSME Performance Using the Data Envelopment Analysis (DEA) Method.*. 118–131.

Sa'diyah, N. H. (2016). Efficiency Analysis Using the Data Envelopment Analysis (Dea) Method (Case at PT. Indonesia Toray Sinthetic). *Journal of Management and Business*, *IX*(1), 101–119.

Sari, N., & Rimawan, M. (2020). *Operational Cost Efficiency to Increase Net Income*. *9*(2).

Satriawan, D. D. (2021). Management of Mineral and Coal Mining Business After the Enactment of Law Number 11 of 2020 concerning Job Creation. *Journal of Legal Essence*, *3*(2), 123–233.

Sholihah, E. (2021). Efficiency of the Financial Performance of the Indonesian Banking Sector during the Covid-19 Pandemic. *Indonesian Journal of Science Management Research*, *12*(2), 287–304.

Sujarweni, W. (2019). *Business and Economic Research Methodology Quantitative Approach*.

Tuffahati, H., Mardian, S., & Suprapto, E. (2016). *Measuring the Efficiency of Islamic Insurance with Data Envelopment Analysis (DEA)*. *4*(1), 1–24.

Ulkhaq, M. M. (2023). Analysis of Large and Medium Manufacturing Industry Efficiency in West Java Province. *Financial and Management Accounting Studies*, *2*(2), 113–120.

Yang, W., & Li, L. (2017). Efficiency evaluation of industrial waste gas control in China: A study based on data envelopment analysis (DEA) model. *Journal of Cleaner Production.* https://doi.org/10.1016/j.jclepro.2017.12.277

Zahara, N., & Saputra, M. (2020). Comparative Analysis of the Efficiency of Conventional Life Insurance Companies and Sharia Life Insurance Companies in Indonesia with the Data Envelopment Analysis (Dea) Method. *Scientific Journal of Accounting Economics Students*,*5* (2), 229-238. https://doi.org/10.24815/jimeka.v5i2.15558