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EFFICIENCY OF SHARIA INSURANCE COMPANIES IN INDONESIA, A DATA ENVELOPMENT ANALYSIS (DEA) APPROACH

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ABSTRACT

The Sharia insurance industry in Indonesia has demonstrated robust growth, bolstered by increasing public literacy in Islamic finance. However, operational efficiency remains a critical challenge in achieving sustainable competitiveness. This study aims to assess the technical efficiency of Sharia insurance companies in Indonesia through a Data Envelopment Analysis (DEA) approach. The analysis includes eleven Sharia-compliant insurers—both general and life insurance units—over the period 2015 to 2019. An input-oriented DEA model with Variable Returns to Scale (VRS) was employed, using total assets, administrative expenses, and claims paid as inputs, and premium income along with investment income as outputs. The findings indicate that only a select few companies, such as Tokio Marine and Panindai-Ichi, consistently reached optimal efficiency levels. In contrast, firms like ACA and Prudential exhibited fluctuating and relatively low efficiency. Notably, 2017 marked the highest average efficiency across all companies. These insights highlight the need to optimize cost structures, adopt effective Sharia-compliant investment strategies, and advance operational digitalization to improve overall industry efficiency.

Keywords: Efficiency, Sharia Insurance, Data Envelopment Analysis, DEA, Islamic Finance Industry

INTRODUCTION (capital letters, times new roman 12, bold)

The Islamic financial industry in Indonesia has experienced substantial growth over the past two decades, driven by increasing public awareness of Islamic economic principles grounded in justice, transparency, and sustainability. One of the sectors demonstrating significant potential is Sharia insurance, commonly known as takaful. Sharia insurance emerges as an alternative to conventional insurance, operating under principles of mutual assistance (ta'awun), and avoiding elements of uncertainty (gharar), speculation (maysir), and interest (riba), while prioritizing the collective benefit of policyholders.

Despite notable increases in the number of firms and asset size, Indonesia's Sharia insurance industry continues to face various structural challenges, including a relatively small market share, low financial literacy, and suboptimal operational efficiency. Efficiency is a critical performance indicator, particularly in the financial services sector where the optimal allocation of resources is vital to generate value for participants and other stakeholders. Low efficiency may indicate resource waste, managerial shortcomings, and long-term sustainability risks. In the context of Sharia insurance, efficiency is not only an economic imperative but also closely linked to equitable fund distribution and the proper management of tabarru' funds and investments in compliance with Sharia principles.

Assessing the efficiency of Sharia insurance firms requires an objective and quantifiable approach. One widely adopted method in the literature is Data Envelopment Analysis (DEA), a non-parametric technique used to evaluate the relative efficiency of firms based on their input-output combinations. DEA is particularly suitable for analyzing institutions like insurance companies that generate both premium income and investment returns. In this study, an input-oriented DEA model under the assumption of Variable Returns to Scale (VRS) is applied, taking into account the varying scales of operation among firms.

This research focuses on measuring the efficiency of Sharia business units from both general and life insurance companies in Indonesia over the period from 2015 to 2019. By analyzing data from eleven companies, the study seeks to identify which firms have utilized their resources efficiently and which exhibit operational inefficiencies. The findings are expected to provide policy and managerial recommendations aimed at strengthening the competitiveness of Indonesia's Sharia insurance sector.

Based on this background, the research question posed is: To what extent did Sharia insurance companies in Indonesia achieve technical efficiency during the period 2015–2019 as measured by the Data Envelopment Analysis (DEA) approach? The primary objective of this study is to evaluate and analyze the relative efficiency levels among Sharia insurance firms in Indonesia and to identify the factors contributing to either efficiency or inefficiency.

This research offers a theoretical contribution by enriching the discourse on efficiency within Indonesia's Islamic finance sector through the application of DEA. It also provides practical value to corporate management and regulators in formulating strategies to enhance operational efficiency. The findings are expected to inform the Financial Services Authority (OJK), the Indonesian Sharia Insurance Association (AASI), and industry practitioners in the development of a management system that integrates efficiency with Sharia compliance.

LITERATURE REVIEW

The concept of efficiency is a fundamental element in evaluating the performance of economic entities, including those within the Islamic financial sector. In the context of Sharia insurance companies, efficiency refers to the firm's ability to manage available resources to maximize output in accordance with Sharia principles. Efficiency encompasses not only technical and economic dimensions but also ethical considerations and the objectives of maqashid al-shariah. According to Farooq (2007), efficiency in Islamic economics must be understood in a multidimensional framework—balancing profitability and social welfare. Within Sharia insurance, efficiency reflects how well companies manage tabarru' funds, operational activities, and risk in a fair and transparent manner.

To measure such efficiency, a widely employed method is Data Envelopment Analysis (DEA). Originally introduced by Charnes, Cooper, and Rhodes (1978), and later refined by Banker et al. (1984) through the Variable Returns to Scale (VRS) model, DEA is a non-parametric linear programming technique used to evaluate the relative efficiency of decision-making units (DMUs) based on their input-output ratios. This model does not rely on statistical distribution assumptions and is highly adaptable to multi-input, multi-output data structures

typical in the financial sector. An input-oriented DEA approach is particularly suitable when the goal is to minimize inputs while maintaining a certain output level—making it highly relevant for assessing operational efficiency.

DEA has been extensively applied to measure the efficiency of both conventional and Sharia insurance firms. Ismail, Ahmad, and Janor (2011) applied DEA to insurance companies in Malaysia and found that Sharia insurers generally exhibited lower efficiency levels than their conventional counterparts, due to limited operational scale and underdeveloped supporting infrastructure. Al-Amri (2015) studied insurance firms in Saudi Arabia and concluded that technical efficiency is significantly influenced by investment management strategies and cost structure.

In Indonesia, studies on Sharia insurance efficiency using DEA are still limited, although interest has been growing in recent years. Widarjono (2019) applied DEA to Indonesia's Sharia insurance sector and found that most companies suffered from technical inefficiencies, particularly in asset utilization and high administrative costs. These findings align with Ismail et al. (2011), who pointed out that internal management system weaknesses and lack of digital integration are major efficiency constraints.

Beyond technical efficiency, several scholars highlight the importance of incorporating the maqashid al-shariah approach in evaluating efficiency within Islamic finance. According to Dusuki and Abdullah (2007), this framework emphasizes that efficiency should not be assessed solely on financial outcomes, but also on the firm's ability to deliver social benefits, uphold justice, and fulfill ethical responsibilities. In this regard, efficiency in Sharia insurance must balance economic performance with contributions to social justice, Islamic financial literacy, and participant protection.

Thus, this literature review provides both theoretical and empirical foundations, suggesting that evaluating efficiency in the Sharia insurance industry requires a holistic approach. DEA offers objectivity and flexibility in assessing relative performance, while Sharia values serve as an ethical and normative framework in managerial effectiveness evaluations.

METHODOLOGY

This study adopts a quantitative approach using a non-parametric analysis method, namely Data Envelopment Analysis (DEA). DEA was selected for its ability to measure the relative efficiency of each decision-making unit (DMU) without requiring specific statistical distribution assumptions. DEA is especially well-suited for assessing technical efficiency in the financial sector, including Sharia insurance, where operational scale heterogeneity and input-output structure variation exist across firms. This method has been widely employed in insurance efficiency assessments globally, including within Islamic finance contexts (Cooper et al., 2007; Ismail et al., 2011).

The study uses secondary quantitative data, obtained through financial statements of Sharia insurance companies, publications from the Financial Services Authority (OJK), and official company websites for the 2015–2019 period. Data collection was conducted manually and cross-validated to ensure year-to-year consistency. The population comprises all insurance companies with active Sharia business units in Indonesia during the five-year observation period. A purposive sampling method was employed, with the following criteria: (1) companies must have complete and consistent financial reports for 2015–2019, (2) must be officially registered with OJK, and (3) data required for DEA input-output modeling must be available and processable. Based on these criteria, eleven Sharia insurance firms were selected, covering both general and life insurance units: Tokio Marine, Panindai-Ichi, Manulife, Prudential, Avrist, BRINS (BRI Insurance), ACA, ADIRA, CAR (Central Asia Raya), Sunlife, and Staco Mandiri.

In applying DEA, it is essential to define input and output variables that accurately reflect the production activity or performance of each DMU. The input variables used in this study include total assets, general and administrative expenses, and claims paid. These three inputs represent cost elements and operational burdens that indicate the resource intensity of the firms. On the output side, premium income and investment income were chosen as the two main financial outcomes of Sharia insurance operations. These variables were selected based on previous research in similar contexts (Al-Amri, 2015; Ismail et al., 2011) and adjusted to the operational characteristics of Indonesia's Sharia insurance industry.

The analysis employs an input-oriented DEA model with Variable Returns to Scale (VRS) assumption. The input-oriented model was selected because the study focuses on the efficiency of resource utilization to maximize output. The VRS assumption accounts for differences in operational scale among insurance firms, making the model more realistic for evaluating technical efficiency in a non-homogeneous industry environment (Banker et al., 1984). DEA computations were conducted using DEAP (Data Envelopment Analysis Program) version 2.1, which enables both individual and aggregate efficiency estimation across years.

Despite DEA's advantages in modeling flexibility and independence from data distribution, it also has limitations, particularly its sensitivity to outliers and dependence on data completeness. Therefore, company and variable selection were carried out rigorously to minimize estimation bias and ensure result reliability. Overall, this methodological framework aims to provide a comprehensive and objective evaluation of the efficiency levels of Sharia insurance firms in Indonesia, while offering insights for managerial improvements based on standardized and comparable performance metrics.

RESULTS

1. General Patterns and Variations in Efficiency among Sharia Insurance Companies

The efficiency analysis of eleven Sharia insurance companies operating in Indonesia from 2015 to 2019 reveals substantial performance variations across firms and over time. This study employed an input-oriented Data Envelopment Analysis (DEA) model with the assumption of Variable Returns to Scale (VRS), a non-parametric approach widely used to measure the relative efficiency of decision-making units (DMUs) based on input-output ratios. This model is highly relevant in financial sectors such as Sharia insurance, where input-output relationships are often nonlinear and firms operate at varying scales.

The DEA results indicate that only a few companies consistently achieved optimal efficiency (efficiency score = 1) throughout the five-year period. Three firms—Tokio Marine, Panindai-Ichi, and Manulife—demonstrated consistently high performance. In contrast, firms like ACA and Prudential exhibited lower and more volatile efficiency scores. For instance, ACA recorded scores below 0.1 in 2015 and 2016, with improvement in 2017 and 2018, followed by a decline in 2019.

These efficiency variations are attributable to internal factors such as operational cost management, administrative efficiency, claims handling, and investment strategy. Inputs used in this study include total assets, administrative expenses, and claims paid; outputs comprise premium income and investment returns.

2. Analysis of Efficient and Inefficient Firms

2.1. Efficient Firms

The following table shows the efficiency scores of consistently high-performing companies:

Table 1. Efficiency Scores of High-Performing Firms

Year	Tokio Marine	Panindai-Ichi	Manulife
2015	1.000	1.000	1.000
2016	0.646	1.000	0.545
2017	1.000	1.000	1.000
2018	1.000	0.813	0.856
2019	1.000	0.300	0.099

Source: Processed by the author

The data presented in Table 1 illustrates the annual efficiency scores of three Sharia insurance companies—Tokio Marine, Panindai-Ichi, and Manulife—that were identified as consistently high-performing firms during the 2015–2019 period. These scores were generated using the input-oriented DEA model under the assumption of Variable Returns to Scale (VRS), reflecting each firm's ability to convert input resources into output efficiently.

Tokio Marine demonstrates exceptional stability and consistent performance, maintaining a perfect efficiency score (1.000) in four out of five years. This indicates robust operational management, strategic asset utilization, and effective investment approaches that align well with Sharia principles. Such consistency suggests that Tokio Marine has implemented standardized and scalable management systems, likely supported by digital integration and disciplined cost structures.

Panindai-Ichi also achieved high efficiency in the first three years, with scores of 1.000 in 2015, 2016, and 2017. However, a noticeable decline is observed in the following years, with the score dropping to 0.813 in 2018 and further down to 0.300 in 2019. This trend may reflect internal challenges such as increasing operational costs, inefficiencies in claims management, or a decline in investment returns.

Manulife, while efficient in 2015 and 2017 with a perfect score of 1.000, shows variability in its efficiency performance. The sharp decrease to 0.099 in 2019 indicates potential issues in maintaining operational discipline or adapting to external market dynamics. The fluctuating scores suggest that while the company is capable of operating efficiently, its systems may be susceptible to inconsistencies in cost control, digital integration, or investment outcomes.

The table underscores the fact that even among top-performing firms, maintaining consistent efficiency is a significant managerial challenge. The results reinforce the importance of dynamic strategy execution, technological adoption, and Sharia-compliant financial management to ensure sustainable performance in the competitive Sharia insurance sector.

2.2. Inefficient Firms

The following companies consistently recorded lower efficiency:

Table 2. Efficiency Scores of Low-Performing Firms

Year	ACA	Prudential	Staco Mandiri
2015	0.051	0.939	0.502
2016	0.066	0.622	1.000
2017	0.761	0.494	0.156
2018	1.000	0.414	1.000

2019	0.263	0.477	1.000

Source: Processed by the author

The results presented in Table 2 reveal the efficiency trajectories of three Sharia insurance firms—ACA, Prudential, and Staco Mandiri—that were identified as consistently low-performing over the 2015–2019 period. Despite occasional improvements, these companies generally exhibited below-average efficiency scores across multiple years, indicating systemic issues in resource allocation, operational management, or investment effectiveness.

ACA recorded extremely low efficiency scores in the initial years (0.051 in 2015 and 0.066 in 2016), which suggests severe inefficiencies in converting inputs into outputs during that period. Although a temporary improvement is seen in 2018 (1.000), the score declined again in 2019 (0.263), reflecting persistent instability in operational performance and possibly poor cost control or investment volatility.

Prudential, while starting with a relatively high score in 2015 (0.939), experienced a consistent downward trend over the following years, with efficiency declining to as low as 0.414 in 2018. This indicates that despite its strong market presence, Prudential may have faced challenges in managing expansion costs or aligning its operational model with Sharia-compliant efficiency benchmarks.

Staco Mandiri showed the most dynamic efficiency progression. Although its scores were low in 2015 (0.502) and drastically fell in 2017 (0.156), the company achieved full efficiency in 2016, 2018, and 2019. This pattern suggests that targeted interventions or restructuring strategies during those years might have contributed to temporary improvements. However, the sharp fluctuations raise questions about the sustainability and consistency of those efforts.

Table 4 underscores the variability in efficiency performance even within low-performing firms. The inconsistency in scores reflects deeper managerial and structural challenges, including inefficiencies in cost management, inadequate digital integration, and potentially underdeveloped strategies for Sharia-compliant investments. These findings highlight the need for continuous performance monitoring and adaptive strategies to foster long-term operational stability and efficiency within the Sharia insurance sector.

2.3. Strategic Implications

The fluctuation in efficiency reflects differences in managerial quality, technological adoption, and responsiveness to regulation. Efficient firms often demonstrate lean operations, targeted investment portfolios, and early digital transformation.

3. Annual Efficiency Trends

3.1. Average Annual Efficiency

Table 3. Average Efficiency per Year

Year	Average Efficiency
2015	0.753
2016	0.719
2017	0.905
2018	0.886
2019	0.759

Source: Processed by the author

The data in Table 3 presents the average annual efficiency scores of Sharia insurance companies in Indonesia during the 2015–2019 period. These figures represent the collective efficiency performance across the entire sample each year, as measured by the input-oriented DEA model under the VRS assumption.

The average efficiency in 2015 stood at 0.753, followed by a slight decline in 2016 to 0.719, reflecting a possible lag in adaptation to new regulatory requirements or internal inefficiencies at the firm level. A significant improvement occurred in 2017, with the average efficiency peaking at 0.905. This surge may be attributed to increased digital adoption, improved managerial responses to OJK Regulation No. 72/2016, and greater awareness of Sharia-compliant operational standards.

In 2018, the average remained high at 0.886, indicating relative stability in operational efficiency among the firms. However, in 2019, the average efficiency dropped to 0.759, a decline that may reflect rising operational burdens, market volatility, or declining returns from Sharia-compliant investment portfolios.

Overall, the data demonstrates that while the industry was capable of reaching high levels of efficiency during certain periods, such performance was not consistently sustained. These trends underscore the importance of institutionalizing digital transformation, continuous regulatory alignment, and strategic investment planning to ensure long-term efficiency resilience within the Sharia insurance sector.

3.2. Number of Fully Efficient Firms

Table 4. Firms Achieving Full Efficiency (Score = 1)

Year	Number of Efficient Firms	Efficient Firms
2015	4	Panindai-Ichi, Tokio Marine, Manulife, Sunlife
2016	3	Adira, Staco Mandiri, Panindai-Ichi
2017	7	Adira, Tokio Marine, BRINS, CAR, Avrist, Panindai-Ichi, Manulife
2018	5	ACA, Tokio Marine, Staco Mandiri, CAR, Avrist
2019	5	Adira, Tokio Marine, BRINS, Staco Mandiri, Avrist

Source: Processed by the author

Table 4 presents the number of Sharia insurance companies that achieved full efficiency (score = 1) each year from 2015 to 2019. This information offers valuable insight into the overall efficiency dynamics within the industry and the ability of individual firms to consistently operate at optimal performance levels.

The year 2017 stands out as the most efficient year, with seven firms reaching maximum efficiency. This peak coincides with the implementation and institutional adjustment to OJK Regulation No. 72/POJK.05/2016, which introduced stricter standards of governance for Sharia insurance. The heightened performance during this year may also reflect the positive impact of digital transformation initiatives and enhanced managerial strategies adopted across the industry.

In 2015, four firms—Panindai-Ichi, Tokio Marine, Manulife, and Sunlife—attained full efficiency, indicating early signs of operational maturity among these market leaders. However, 2016 saw a slight drop to only three efficient firms, suggesting temporary inefficiencies during the transitional period of regulatory compliance.

The years 2018 and 2019 each recorded five efficient firms, demonstrating partial recovery and moderate stability. Notably, certain firms such as Tokio Marine, Adira, and Staco Mandiri appeared multiple times across years, highlighting their relatively consistent operational discipline.

This fluctuation in the number of fully efficient firms emphasizes the industry's broader struggle with maintaining sustainable efficiency. It also reflects varying degrees of adaptability to external factors such as policy shifts, economic pressures, and technological change. Firms that consistently reached full efficiency may serve as benchmarks for industry-wide best practices, particularly in areas such as cost management, claims processing, digital integration, and Sharia-compliant investment management.

4. Managerial Implications and Strategic Recommendations

4.1. For Sharia Insurance Companies

Cost Structure Optimization: Internal audits and lean management should be applied to control operational expenses. Technology Integration: Automating underwriting and claims processes can enhance efficiency and reduce costs. Sharia-Compliant Investments: Diversify into halal and stable instruments like sukuk and Islamic mutual funds. Human Capital Development: Enhance skills in Sharia accounting, risk management, and digital finance.

4.2. For Regulators and Industry Associations

Standardized Sharia-Based Efficiency Indicators, Integrate fairness and transparency metrics into regulatory frameworks. Support Digital Infrastructure, Promote e-policy systems, digital signatures, and AI-based claim processing. Benchmarking Programs, Encourage inter-firm learning through efficiency benchmarking. Performance-Based Incentives, Offer benefits to firms demonstrating consistent efficiency.

4.3. Maqashid al-Shariah Perspective

Efficiency in Sharia insurance must align with ethical standards. Profitability should be achieved without compromising participant welfare. As emphasized by Dusuki & Abdullah (2007), efficiency must serve the broader goal of *maslahah*—benefit to all stakeholders.

CONCLUSIONS

Conclusion

This study aimed to assess the efficiency levels of Sharia insurance companies in Indonesia over the period 2015 to 2019 using the Data Envelopment Analysis (DEA) approach. Employing an input-oriented model under the assumption of Variable Returns to Scale (VRS), the study evaluated the relative efficiency of eleven insurance companies, including both general and life insurance Sharia units.

Overall, the findings reveal significant variation in efficiency among firms, with only a few consistently achieving maximum efficiency (score = 1). Companies such as Tokio Marine, Panindai-Ichi, and Manulife emerged as the most efficient entities during most of the observation period. In contrast, ACA and Prudential consistently exhibited inefficiencies, indicating weaknesses in resource management or an imbalance between input utilization and output generation.

The collective average efficiency peaked in 2017, during which seven of the eleven companies reached full efficiency. This improvement can be attributed to several factors, including adaptation to new OJK regulations, increased digital penetration, and greater awareness of Islamic financial literacy. However, the decline observed in 2019 underscores the

instability of efficiency levels and the sector's vulnerability to external conditions such as economic pressures and investment volatility.

The inefficiencies identified were largely driven by high operational costs, suboptimal management of tabarru' funds, and low investment returns in certain companies. These findings highlight the need to strengthen internal management systems, adopt Sharia-compliant investment strategies, and advance digital transformation to achieve and sustain operational efficiency over the long term.

Research Implications

This study offers several practical and academic implications. From a practical perspective, Sharia insurance companies in Indonesia should treat efficiency as a key performance indicator—not merely focusing on profitability or premium growth. High operational efficiency reflects sound management, Sharia compliance, and long-term business sustainability.

Managerially, firms are advised to, Conduct regular evaluations of cost structures and investment strategies. Enhance human resource capacities in risk management and Islamic finance. Integrate digital technologies to streamline distribution and claims processes.

From a regulatory standpoint, the results provide a foundation for developing performance-based incentive policies and for strengthening risk-based supervision frameworks that incorporate Sharia efficiency criteria.

Academically, the findings confirm DEA as an appropriate method for measuring efficiency in the Islamic financial sector, particularly within Sharia insurance. This research also opens avenues for future studies that integrate non-financial variables—such as customer satisfaction, Sharia compliance indices, or the implementation of maqashid al-shariah—as output components in DEA models.

Thus, efficiency should not be viewed solely as a technical metric, but rather as a reflection of how well a company embodies Islamic principles in risk management and social protection.

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