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Efficiency and improvement potential of Sharia insurance: Implications of the financial sector strengthening law

Sunarmo Sunarmo, Sisca Debyola Widuhung, Aisyah Tiar Arsyad, Nasywaa Nasywaa

Department of Management, Faculty of Economics and Business, Universitas Al-Azhar Indonesia, Jakarta, Indonesia

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Corresponding author:
Sunarmo Sunarmo
sunarmo@uai.ac.id

Author's email:
sisca.debyola@uai.ac.id
aisyah.tiar@uai.ac.id
nasywaa05@gmail.com

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Abstract

Purpose – To compare efficiency conditions and potential improvements in the Sharia insurance company and examine its consistency with the law on strengthening and developing the financial sector.

Methodology – The research sample included 21 Sharia life and 20 general insurance companies. The secondary data used were sourced from the financial statements of Sharia insurance companies registered with the Financial Services Authority (OJK) and the Indonesian Sharia Insurance Association (AASI) for 2017–2023. The research method used a Data Envelopment Analysis (DEA) approach.

Findings – Sharia life insurance in Indonesia shows inefficient conditions, reflected in the low ratio of output to input due to the lack of business income, investment, and tabarru funds. In contrast, the general segment of Sharia was relatively more efficient, but burdened by high assets, liabilities, claims, and operational costs. The potential for improvement towards efficiency could be achieved by optimizing business income and Tabarru funds, as well as controlling inputs proportional to output. The Development and Strengthening of the Financial Sector Law (PPSK Law) policy played a strategic role in strengthening capital and implementing the Sharia unit spin-off obligations expected to form a more independent and competitive institutional structure.

Implications – The results have policy implications for regulators and industry players to strengthen the competitiveness of national Sharia insurance.

Originality – This research offers a major novelty, namely, comparing the efficiency performance of life insurance and general Sharia, as well as linking efficiency results and potential improvements with the implementation of the PPSK Law.

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Center for Islamic Economics Studies and Development, Faculty of Business and Economics, Universitas Islam Indonesia

Introduction

Economic growth is an indicator of community welfare. The central statistics agency (Badan Pusat Statistik, BPS) has stated that the economy has grown positively over the past five years. Quarterly economic growth data from 2021 to 2025 exhibit a distinct transition from post-pandemic volatility to medium-term stabilization. Growth initially reached approximately 7 percent in 2021 Q2 before declining sharply to around 3.5 percent in the subsequent quarter, reflecting the normalization of economic activity following an early rebound phase. By late 2021 and 2022, growth gradually stabilized near 5 to 6 percent, indicating a period of consolidation. Beginning in 2023, the growth

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trajectory settled to a more moderate and consistent range of approximately 5 percent, suggesting a shift toward sustained and stable expansion. A marginal increase observed in early 2025 indicates emerging positive momentum. Overall, the pattern demonstrates progressive stabilization of economic performance, providing a contextual foundation for examining the determinants of long-term growth dynamics.

The financial services and insurance sectors have experienced fluctuations. Table 1 shows that the growth of the sector was 4.17%, 6.61%, 3.25%, 1.56%, 1.93%, 4.77% and 4.74% in 2018, 2019, 2020, 2021, 2022, 2023, and 2024, respectively. Insurance and pension funds have shown a downward growth trend in the last seven years when viewed from a sub-sector perspective. These funds grew positively in 2018, 2019, and 2021, by 7.48%, 5.67%, 4.03%, and 0.21, respectively. Meanwhile, in the last three years, there has been a slowdown in growth, as shown by the negative growth.

Table 1. Growth rate of financial and insurance activities sector and sub-sector

Sector	Year						
	2018	2019	2020	2021	2022	2023	2024
Financial and Insurance Activities Sector	4,17	6,61	3,25	1,56	1,93	4,77	4,74
1. Financial Intermediary Services	2,39	6,14	3,98	2,71	2,44	7,01	6,8
2. Insurance and pension fund	7,48	5,67	4,03	0,71	-0,99	-0,5	-1,02
3. Other financial services	7,12	10,63	-0,57	-2,39	4,51	4,03	4,6
4. Financial Support Service	2,3	2,08	1,86	5,18	0,63	-1,53	-0,56

Source: Central Statistics Agency, 2025

The decline in the growth rate of the insurance and pension subsectors is supported by data from the Indonesian Life Insurance Association. In the first quarter of September 2024, life insurance penetration was only 6.6% of the total Indonesian population, or 0.8% of the Gross Domestic Product. Financial Services Authority (Otoritas Jasa Keuangan, OJK) survey showed that public understanding of Sharia insurance was only 6.9%, with a penetration rate of 0.14%. Therefore, Indonesia's life insurance penetration is the lowest compared with Malaysia, Thailand, Vietnam, Singapore, and South Korea (Otoritas Jasa Keuangan, 2019)

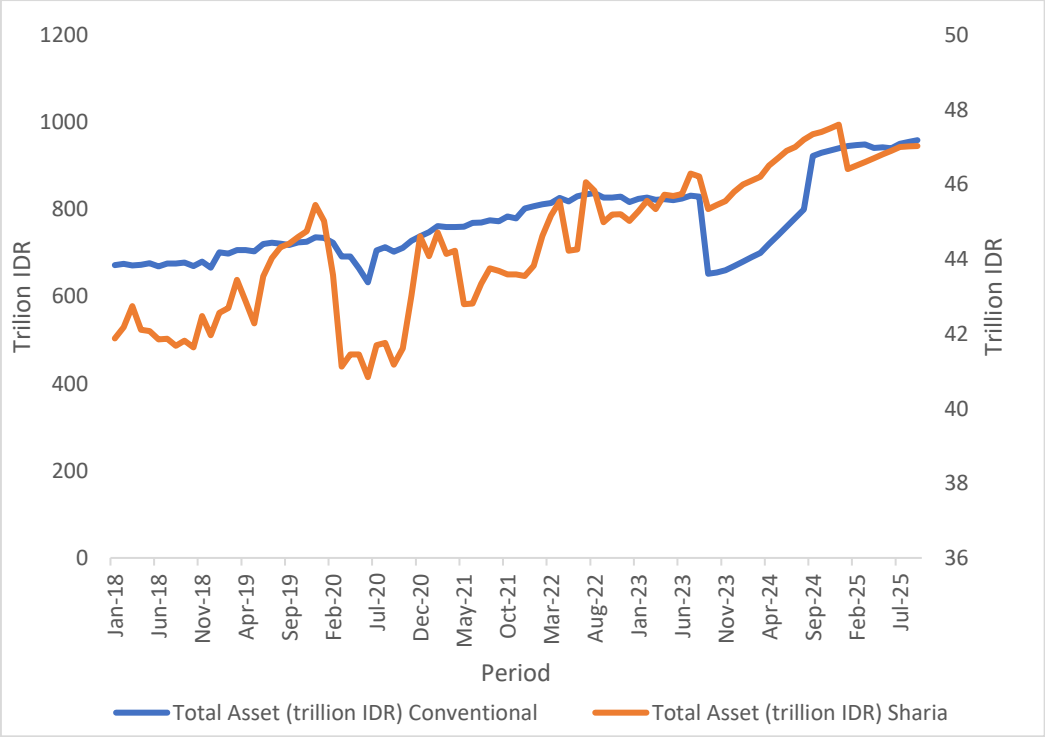


Figure 1. Comparison of conventional and Sharia insurance assets
Source: Financial Service Authority (2025)

According to the data in Figure 1, data on the development of conventional and Sharia insurance assets in Indonesia show different trends from January 2018 to September 2025. Conventional insurance assets experienced significant growth from IDR672.02 trillion in January 2018 to IDR958.54 trillion in September 2025, despite sharp fluctuations in 2020. The decline in assets in mid-2020, which reached IDR632.36 trillion, was mainly due to the impact of the Covid-19 pandemic. This virus triggered a weakening of the capital market, decline in investment value, and increase in customer withdrawals. After the crisis period, there was a consistent recovery starting in 2021, driven by economic rebounds, fiscal stimuli, and the digitization of insurance products. This increased the assets to IDR 940 trillion by the end of 2024. In contrast, Sharia insurance assets showed more stable and moderate growth, from IDR41.88 trillion in January 2018 to IDR 47.03 trillion in September 2025. This stability reflects the characteristics of more conservative Sharia portfolios with the dominance of sukuk instruments and deposits that are relatively resistant to market volatility. Empirical research shows that the differences in operational and regulatory frameworks between conventional and Sharia insurance affect financial performance and risk management(Azizi et al., 2025).

Low total assets, literacy, and penetration are contrary to data from the Ministry of Home Affairs, where the number of Muslims in Indonesia is 245,973,915 or 87.8% of the total population in the first quarter of 2024. This should be a potential market for the development of the Sharia insurance company since Indonesia is a Muslim-majority country (Otoritas Jasa Keuangan, 2019).

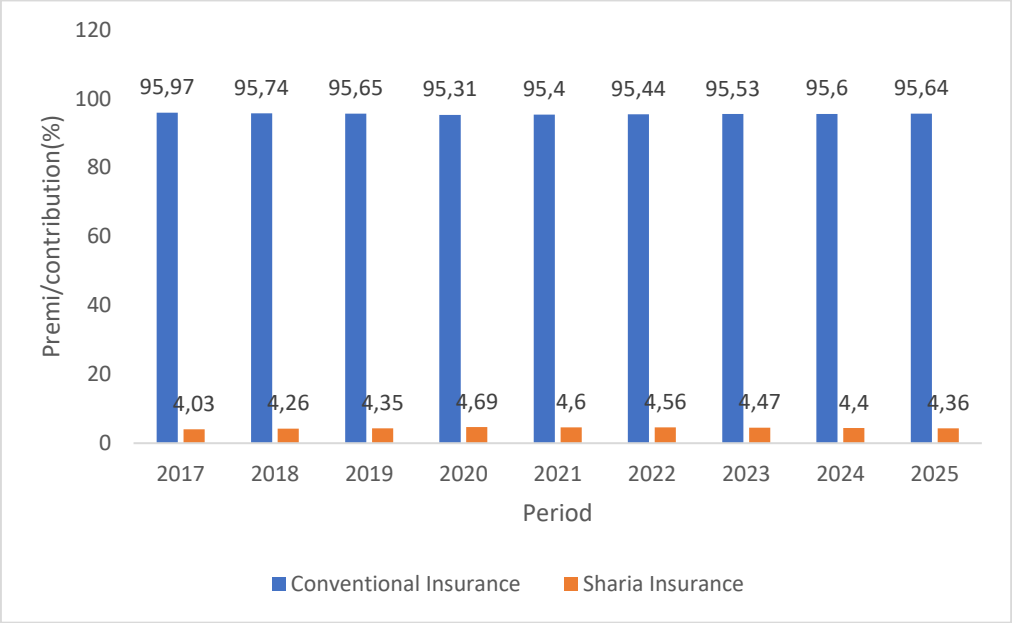


Figure 2. Comparison of premium market share and contribution of conventional insurance and Sharia
Source: Financial Service Authority (2025)

Figure 2 presents the market share distribution of conventional insurance premiums and contribution of Sharia insurance from 2017 to 2025. Conventional insurance dominates, with an average market share of 95.59%, while Sharia insurance is only 4.4%. The highest share of Sharia occurred in 2020 (4.69%), coinciding with a decrease in conventional premiums due to the impact of the COVID-19 pandemic, while Sharia contributions were relatively more stable.

The low literacy of Sharia finance causes the public's understanding of Sharia insurance products to be limited, leading to a low market penetration rate. Low penetration impacts the lack of contributions, which results in limited total assets. This condition affects a company's ability to achieve economies of scale, innovate, and optimize operational costs, leading to a decrease in efficiency. The Financial Sector Development and Strengthening Law (PPSK) is a regulatory instrument that requires the separation of Sharia business units (spin-offs) and strengthens

governance to improve long-term efficiency. However, the implementation of this regulation is highly dependent on increasing literacy and strengthening Islamic financial ecosystems.

an important method for measuring efficiency is DEA, with the ability of companies to maximize output and available inputs. The research conducted by Saputra et al. (2020) used DEA. Conventional life insurance companies have a higher level of efficiency than Sharia-based companies. DEA is a non-parametric method used to measure the relative efficiency of (DMUs) by considering the ratio between inputs and outputs. These results show that the dominance of the conventional insurance market share reflects strength and correlates with a company's ability to optimize the use of resources (Saputra et al., 2020). Fauziah et al. (2020) found that the level of efficiency of Sharia insurance companies differed based on the type of product offered. This study showed that Sharia General Insurance had a higher level of efficiency(Fauziah et al., 2020). Aryonindito et al. (2020) examined the influence of market share and company size on the efficiency of 11 Sharia and general insurance companies. The results show that market share positively affects efficiency.

The efficiency in this research was measured using DEA, with input variables in the form of total capital and operating expenses, as well as investment income and total tabarru funds from customers. In general, Sharia insurance companies have not operated optimally (Aryonindito et al., 2020). Sukmaningrum et al. (2023) examined the relationship between efficiency and productivity in the Sharia life insurance company using the Malmquist Productivity Index (MPI) method based on DEA. Total productivity is defined as the simultaneous relationship between inputs and outputs. The input variables include capital, total expenses, and total investment, whereas the output variables consist of total profit and total investment income. In 2014 and 2017, Sharia life insurance companies operated under inefficient conditions, which showed a decrease in productivity and non-optimization in resource utilization(Sukmaningrum et al., 2023). Arianty et al (2023) showed that life and general insurance in Sharia business units had a higher level of profit efficiency.

Other literature reviews have shown that the efficiency of Sharia insurance is lower than that of conventional insurance. Alam et al. (2022) emphasized that the DEA method with dominant CRS and VRS models was used to measure efficiency, with key factors such as market share and company size. Aouini dan Abdennadher (2022) found that conventional insurance was more efficient because of the scale of effort and better risk management. The trend of Takaful efficiency research is increasing, with a focus on productivity and the use of MPI to measure changes in efficiency over time. Rusydiana and Marlina (2025) emphasized that productivity declines are often caused by technological and managerial factors. This supports the result that Sharia insurance experiences inefficiencies in any given year. In addition, comparative research on Islamic financial institutions shows that DEA and MPI are effective in measuring efficiency and productivity, with significant influences from the scale of efforts and innovation.

Another study on the cost efficiency and profit of life insurance in India using the DEA method shows that cost efficiency is higher than profit efficiency, indicating the existence of a major problem of revenue inefficiency in the life insurance industry. State-owned life insurance companies have proven more efficient and profitable than private companies. Factors such as claims ratio, distribution ratio, and market share also have a positive influence on cost efficiency and profit (Siddiqui & Shaddady, 2023). Meanwhile, in China, although it is the main insurance market in Asia, research on operational efficiency remains limited. This study assessed the efficiency of 81 life insurance companies (2011–2020) using two-stage DEA and explored improvement factors through NCA and fsQCA. The results show increased efficiency, but are not optimal. SOEs excel in premium acquisition, but are less efficient in distribution than non-SOEs (Xie et al., 2025).

Inefficiencies also occur in the insurance industry in Iran, the results of research on 20 Iranian industries with the DEA model show that the input of the life insurance sector needs to be reduced by 9%, the input of the non-life sector is reduced by 50%, and the output of the investment sector is increased by 48%. All companies experience inefficiencies in the investment sector; therefore, increasing investment income is the key to improving technical efficiency. The key

findings confirm that scale efficiency and elasticity are highly dependent on the stage of production (Amirteimoori et al., 2024). Inefficiencies persist in Pakistan's Takaful industry. This study compares the operational efficiency of Takaful and conventional insurance companies from 2017 to 2023 using DEA, focusing on how effectively labor and assets are utilized. The findings indicate that conventional insurers generally operate more efficiently than Takaful firms. Efficiency is influenced by factors such as organizational size, asset base, workforce, and income diversification. These insights highlight key areas in which Takaful operators can enhance their performance and competitiveness (Iqbal et al., 2025).

This study contributes to the literature by comparing the efficiency of the life insurance and Sharia general insurance industries. It also examines the implications of these efficiency outcomes and their optimization potential within the framework of the PPSK Law, an area that remains largely underexplored in existing research. The structure of the research includes background, literature review, methodology, results, discussions, and conclusions.

Literature Review

Sharia insurance

Takaful or Sharia insurance is a protection system built on the principle of ta'āwun (help) and solidarity between participants, namely by collecting contributions to the tabarru' fund, which is used to help other participants who are affected by disasters. This system is designed to eliminate elements of usury, excessive gharar, and maysir, so takaful is present as an alternative to conventional insurance mechanisms. In contrast to conventional insurance, which uses a risk-transfer scheme, Takaful operates through risk sharing, meaning that the risk is shared collectively among the participants. Takaful companies do not own funds, but act as operators who manage funds in accordance with Sharia provisions and are supervised by the Sharia Supervisory Board. All these foundations affirm the main purpose of takaful as a protection instrument that is in line with Islamic financial ethics (Smetek et al., 2022).

Sharia insurance differs from conventional insurance, mainly in its principles and fund management. It is based on mutual assistance (*tabarru'*), with operations supervised by the Sharia Supervisory Board to ensure Islamic compliance (Nasir et al., 2020). The funds belong to the participants, and the company only manages them and may receive fees or profit-sharing. Claims are paid by Tabarru's fund. In contrast, conventional insurance uses a risk-transfer system in which premiums become the company's property and profits come from interest and investments. Sharia insurance products remain limited, focusing mostly on life, health, education, Hajj/Umrah, agriculture, and property (Cahyandari et al., 2023).

Takaful is implemented using several operational models that determine how funds are managed and how the operator is remunerated. The core structure of all models is *tabarru'*, where participants donate part of their contributions to a collective pool to support members who experience losses, reflecting the system's cooperative and solidarity-based nature (Ansari, 2022). The literature highlights two main models: the Wakalah model, in which the operator acts as an agent managing the fund in exchange for a transparent fee, and the Mudharabah model, in which investment profits from pooled contributions are shared between the operator and participants, consistent with the document's explanation that participants share in profits generated from Takaful investments. Modern practice also incorporates hybrid Wakalah–Mudharabah models, combining agency fees for underwriting with profit-sharing for investment management, a development noted in the text as part of efforts to enhance the efficiency and competitiveness of Takaful operations (Talib et al., 2025).

Efficiency and potential for improvement

The efficiency theory in industrial economics emphasizes optimizing resource allocation to increase productivity and competitive advantage. In this context, efficiency is the production of maximum output with minimal inputs using the DEA method. DEA is a non-parametric method based on linear programming that is used to measure the relative efficiency of DMUs with many inputs and

outputs. This method compares each DMU against the best-efficiency frontier to identify efficient and inefficient units. DEA theory has been applied in a variety of sectors, including finance, health, and education (Emrouznejad et al., 2025).

DEA has been widely used to evaluate the performance of entities such as hospitals, universities, courts, and businesses. Originally, the method was developed by Charnes et al. (1978) as a set of methods for measuring the relative efficiency of a DMU by combining input (resource) and output (outcome) variables with the equation model Er = yr/yR, where Er is the efficiency, yr is the maximum input, and yR is the result of the inputs. DEA is a non-parametric method for estimating technical efficiency (TE), which requires fewer assumptions than econometric models (Setiawan & Oude Lansink, 2018). The DEA model was created as a performance evaluation tool in a company or organizational entity, referred to as a DMU. The relative efficiency of a DMU was measured by predicting the ratio of the output weight to the input. The stages in the application are 1) Identifying the DMU or unit, 2) Observing the DMU formation from inputs and outputs, and 3) calculating the efficiency of each DMU. The purpose of the calculation is to determine the input and output targets required to optimize performance. The two methods used in DEA are input- and output-based approaches, and are written as follows:

Input = $\sum_{i=1}^{I} \mu_i x_i$, while output = $\sum_{i=1}^{I} \mu_i x_i \sum_{j=1}^{J} v_j y_i$ hence the efficiency formula:

$$\text{Efficiency} = \frac{\sum_{j=1}^{j} v_j y_j}{\sum_{i=1}^{I} \mu_i x_i}$$

where measuring efficiency in data envelopment analysis (DEA), **x** represents the input variables, and **y** represents the output variables. Here, **i** and **j** are indices denoting specific inputs and outputs, where **xi** is the ith input and **yj** is the jth output of a decision-making unit (DMU). Terms **j** and **J** refer to the total number of inputs and outputs considered, respectively, with both being greater than zero (**j, J > 0**). During the aggregation process, **μ_i** denotes the weight assigned to input **xi** and **v_j** denotes the weight assigned to output **yj**.

The general mathematical formula of DEA is directly connected to the efficiency measurement in Sharia insurance. The efficiency of a DMU, such as Sharia insurance, is calculated as:

$$\text{Efficiency} = \frac{\sum_{j=1}^{j} v_j y_j}{\sum_{i=1}^{I} \mu_i x_i}$$

In the analysis of Sharia insurance companies, **x** and **y** denote input and output variables, respectively. Here, **i** and **j** represent the indices for these inputs and outputs within a Sharia insurance company, respectively. Specifically, **xi** refers to the i-th input, and **yj** refers to the jth output of the company as a decision-making unit (DMU).

In DEA, Islamic insurance companies' efficiency is measured on a scale from 0 to 1. A score of 1.00 indicates that a company is efficient, meaning that it uses its inputs optimally to generate the maximum output. In contrast, a score below 1.00 reflects inefficiency, suggesting that the company either uses excessive inputs or produces insufficient output relative to best-performing firms that serve as benchmarks (Chong et al., 2024).

Another measure of efficiency is Stochastic Frontier Analysis (SFA), which estimates production or cost functions (Nguyen & Pham, 2020). The DEA method is often considered superior to Stochastic Frontier Analysis (SFA). This method has the advantage of being able to process the production process with various inputs without requiring the determination of parameters. In addition, DEA is widely used in research to measure the efficiency of insurance companies (Zhao et al., 2021).

The efficiency output can determine potential improvements to the unit. Recent research on potential improvements in DEA emphasizes the importance of setting realistic improvement targets achieved by inefficient units (Yang et al., 2024).

The relationship between the law on the strengthening and development of the financial sector (PPSK) and Sharia insurance

Law No. 4 of 2023 concerning the Development and Strengthening of the Financial Sector (PPSK Law) has major implications for the efficiency of Sharia insurance companies in Indonesia. This regulation requires the separation of Sharia business units (spin-offs) from conventional holding companies after meeting certain requirements to create a more focused and professional entity (Prijanto & Indrayani, 2023). This separation reduced the complexity of management between conventional and Sharia businesses, which were previously a source of operational inefficiencies. In addition, the PPSK Law regulates minimum equity increases and promotes consolidation, which allows Sharia insurers to achieve economies of scale and invest in technology and risk management (Takhsin & Azzahra, 2023). Research shows that the average TE of Sharia insurance is low and is influenced by company size, solvency, and profitability (Iskandar et al., 2020). The PPSK Law is expected to improve cost efficiency, capital structure, and product innovation by strengthening governance, OJK supervision, and integrating Sharia insurance products with financing (Darmawan & Putra, 2024).

Hypotheses

There are 29, 25, and four Sharia life insurance, general insurance, and reinsurance companies, respectively. However, this research only includes 21 and 20 general and life insurance companies, respectively, according to data availability. The market share and total assets of Sharia insurance are also lower, which has an impact on low efficiency and inefficiency (Aryonindito et al., 2020). To measure efficiency, the DEA method is used with input (total assets, claims, total costs, debt, and equity) and output (total income, tabarru funds, and net investment income) variables.

In academic discussions, DEA is widely recognized as a technique for evaluating relative efficiency rather than examining causal relationships or estimating statistical parameters. The method functions within a deterministic framework by employing linear programming to construct an efficiency frontier based on units that demonstrate the highest performance within the sample. As DEA is grounded in optimization rather than probabilistic reasoning, it does not involve the use of hypothesis testing, which is a common feature of conventional statistical approaches. (Fotova Čiković et al., 2024; Tavana et al., 2025).

Research Methods

Data types and sources

Secondary data from Sharia insurance companies from 2017 to 2023 are used. The selection of the 2017–2023 observation period was grounded in methodological and contextual considerations pertinent to the structural development of the Sharia insurance industry. This interval captures the critical phases of industry evolution, including asset expansion, accelerated digitalization, and intensifying market competition. It also coincides with major regulatory interventions introduced by the financial services authority, notably the mandated spin-off of Sharia units and strengthening of corporate governance requirements. These regulatory dynamics provide a relevant setting in which to examine industry responses to policy changes. Furthermore, the consistent availability of audited financial data throughout the period, combined with economic variations spanning the pre-pandemic era, the COVID-19 disruption, and the subsequent recovery phase, supports the robust construction of efficiency frontiers within the DEA framework. Accordingly, 2017–2023 is considered sufficiently representative for assessing the operational efficiency of Sharia insurance companies in Indonesia.

Table 2 displays that the data used are financial statements, including Sharia life insurance, general insurance sourced from the financial services authority, and financial statements published on the Sharia insurance company's website.

Table 2. List of Sharia insurance in Indonesia

No	Types of Sharia Insurance	
	Sharia Life Insurance	Sharia General Insurance
1	Alianz Life Syariah Indonesia	Askrida Syariah
2	Asuransi Syariah Keluarga Indonesia	Chubb Syariah Indonesia
3	Capital Life Syariah	Jasindo Syariah
4	Jiwa Syariah Al Amin	Sonwelis Takaful
5	Jiwa Syariah Bumiputera	Takaful Umum
6	Jiwa Syariah Jasa Mitra Abadi	Alianz Utama Indonesia
7	Asuransi Jiwa Syariah Kitabisa	Asuransi Central Asia
8	Takaful Keluarga	Asuransi Umum Mega
9	AIA Financial	BRI Asuransi Indonesia
10	Avrist Assurance	Bumiputeramuda 1967
11	AXA Mandiri Financial Services	Jasaraharja Putera
12	BNI Life Insurance	Mandiri AXA General Insurance
13	BRI Life	Maximus Graha Persada
14	Central Asia Raya	Ramayana Tbk
15	Chubb Life Insurance Indonesia	Reliance Indonesia
16	Manulife Indonesia	Sinar Mas
17	Panin Da-Ichi Life	Staco Mandiri
18	Prudential Sharia Life Assurance	Tri Pakarta
19	Simas Jiwa	Tugu Pratama Indonesia
20	Sinarmas MSIG	Wahana Tata
21	Sun Life Financial Indonesia	

Source: Financial services authority and the Indonesian Sharia insurance association, 2023

DEA Method Efficiency Model

DEA methods are used to estimate the efficiency and measure the relative performance of a company by comparing multiple inputs and outputs. The efficiency score was estimated as the ratio of the number of weighted outputs to the inputs(Alhassan et al., 2015).

The input variables include total assets, equity, debt, claim payments, and total costs and expenses (see Table 3). The outputs used are income, Tabarru funds, and net investment income(Aryonindito et al., 2020; Eling & Jia, 2018; Jamil & Setiawan, 2023; Lee et al., 2019).

Table 3. Description of input and output variables

No	Variables	Symbol	Information	Unit
			Input variables	
1	Total assets	TA	Deducted from total assets	Rupiah
2	Equity	EK	Obtained from the sum of paid-up capital, other comprehensive income balances and profit balances	Rupiah
3	Liabilities	UT	Deducted from total liability	
4	Claim payment	PK	Deducted from the claim burden on the underwriting statement of the tabarru fund	Rupiah
5	Total biaya – biaya	TB	Deducted from total operating expenses	Rupiah
			Output variables	
1	Income	PN	Fraction of total operating income	Rupiah
2	Tabarru Fund	DT	Deduction from tabarru funds in the participant fund component	Rupiah
3	Net investment income	PIB	Derived from business investment income	Rupiah

Source: Processed by author

The DEA model assumes n DMU, with m inputs and s outputs. The relative efficiency score of the tested DMU p was obtained as follows:

$$\max h0 = \sum_{r=1}^{g} \mu_r y_{r0}$$
$$\text{subject to} = \sum_{i=1}^{s} v_i x_{i0}$$
$$\sum_{i=1}^{s} \mu_r y_{rj} - \sum_{i=1}^{s} v_i x_{ij} \leq 0,\ j = 1,2,\ldots n$$

$$\mu_r, v_i \geq 0 \; r = 1,2,\ldots\ldots si = 1,2\ldots..m$$

where x_{ij} is the amount of input i used by Sharia Insurance j, y_{rj} is the sum of the outputs r produced by Sharia Insurance j, and u_r and v_i refer to the weights selected for the r output and input, respectively.

$$\begin{gathered} \text{minh}0 = \theta \\ \text{maka } \theta_0 x_{i0} - \sum_{j=1}^{n} \alpha_j x_{ij} \geq 0 \\ \sum_{j=1}^{n} \alpha_{jr} x_{rj} \geq y_{r0} \\ \alpha_j > 0 \end{gathered}$$

An input-oriented model minimizes the cost of achieving the desired output production level. The modeled linear programming assumes a constant yield scale, as per Charnes et al. (1978), in which each DMU operates at the optimal scale (Alhassan et al., 2015).

Results and Discussion

Efficiency of sharia life insurance

The efficiency of Sharia Life Insurance in Indonesia was measured using the DEA method for each year and investigated using a common frontlier. Table 4. shows the average TE, PTE, and Scale Efficiency (SE) of Sharia Life Insurance in Indonesia for 2017 (Panel A), 2018 (Panel B), 2019 (Panel C), 2020 (Panel D), 2021 (Panel E), 2022 (Panel F), 2023 (Panel G), and the entire year (Panel H).

Table 4. Sharia Life Insurance Efficiency Panel

Years/Type of Efficiency	Mean	Min	Max	St.Dev
Panel A (2017)				
TE	0,637	0,280	1,000	0,203
PTE	0,747	0,281	1,000	0,231
SE	0,872	0,488	1,000	0,136
Panel B (2018)				
TE	0,651	0,162	1,000	0,269
PTE	0,722	0,197	1,000	0,272
SE	0,900	0,600	1,000	0,106
Panel C (2019)				
TE	0,659	0,335	1,000	0,232
PTE	0,716	0,351	1,000	0,237
SE	0,927	0,604	1,000	0,118
Panel D (2020)				
TE	0,654	0,137	1,000	0,272
PTE	0,699	0,137	1,000	0,284
SE	0,945	0,684	1,000	0,095
Panel E (2021)				
TE	0,627	0,141	1,000	0,292
PTE	0,676	0,141	1,000	0,283
SE	0,927	0,473	1,000	0,127
Panel F (2022)				
TE	0,566	0,044	1,000	0,286
PTE	0,603	0,044	1,000	0,295
SE	0,947	0,580	1,000	0,096
Panel G (2023)				
TE	0,613	0,209	1,000	0,303
PTE	0,654	0,210	1,000	0,296
SE	0,937	0,440	1,000	0,121
Panel H (All Years)				
TE	0,630	0,044	1,000	0,269
PTE	0,688	0,044	1,000	0,276
SE	0,922	0,440	1,000	0,118

Information: TE= Technical Efficiency, PTE = Pure Technical Efficiency, SE = Scale of Efficiency
Source: Processed data 2024

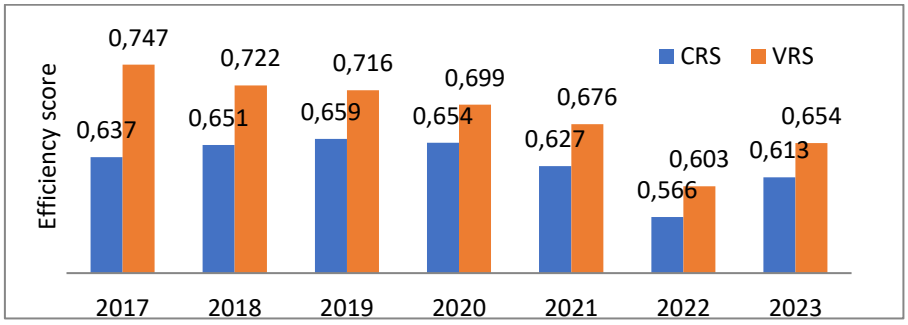
The efficiency of Sharia Life Insurance in Indonesia fluctuates from year to year. Based on the average TE, PTE, and SE scores for Sharia Life Insurance in Indonesia, the lowest and highest TE scores were in 2022 and 2019, with values of 0.566 and 0.659, respectively. For the average PTE score, the lowest and highest values were 2022 and 2017 with a value of 0.603 and 0.747, respectively. The lowest average SE values were in 2017 and 2022, with values of 0.872 and 0.947, respectively. The average efficiency score for each Sharia life insurance company (DMU) from 2017 to 2023 is as follows:

Table 5. Average Sharia Life Insurance Efficiency Score

No	DMU	CRS	VRS	SE
1	AIA Financial	0,727	0,787	0,912
2	Alianz Life Syariah Indonesia	0,946	0,971	0,975
3	Asuransi Jiwa Syariah Kitabisa	0,627	0,736	0,853
4	Asuransi Syariah Keluarga Indonesia	0,529	0,848	0,635
5	Avrist Assurance	0,251	0,257	0,980
6	AXA Mandiri Financial Services	0,787	0,808	0,963
7	BNI Life Insurance	0,350	0,354	0,988
8	BRI Life	0,536	0,560	0,956
9	Capital Life Syariah	0,286	0,321	0,935
10	Central Asia Raya	0,509	0,573	0,889
11	Chubb Life Insurance Indonesia	0,674	0,733	0,901
12	Jiwa Syariah Al Amin	0,564	0,581	0,975
13	Jiwa Syariah Bumiputera	0,773	0,782	0,980
14	Jiwa Syariah Jasa Mitra Abadi	0,909	0,992	0,917
15	Manulife Indonesia	0,525	0,529	0,992
16	Panin Da-Ichi Life	0,596	0,682	0,905
17	Prudential Sharia Life Assurance	0,989	0,989	1,000
18	Simas Jiwa	0,484	0,630	0,789
19	Sinarmas MSIG	0,563	0,587	0,969
20	Sun Life Financial Indonesia	0,728	0,819	0,896
21	Takaful Keluarga	0,872	0,910	0,959

Note: TE: Technical Efficiency, PTE: Pure Technical Efficiency, SE: Scale of Efficiency
Source: Processed data, 2024

Referring to Table 5, there is no Sharia Life Insurance in Indonesia that has reached a maximum efficiency of 1,000 based on the assumption of Constant Return to Scale (CRS) or Variable Return to Scale (VRS). Prudential Sharia Life Assurance had the highest average efficiency score (0.989). Meanwhile, the company with the lowest average efficiency on the assumption of CRS and VRS is Avrist Assurance, with scores of 0.251 and 0.257, respectively. The companies with the lowest and highest average efficiency scores of 0.635 and 1,000, respectively, on the SE assumption are Asuransi Syariah Keluarga Indonesia and Prudential Sharia Life Assurance. Figure 4 shows the efficiency of Sharia life insurance, assuming that the CRS and VRS have similar movement tendencies.



Note: CRS: Constant return to scale, VRS: Variable return to scale

Figure 3. Sharia life insurance efficiency trends
Source: Processed data, 2024

Figure 3 provides information related to the efficiency trends of Sharia Life Insurance in Indonesia during the 2017-2023 research period. The efficiency level fluctuated from year to year and tended to decline in the final period. In general, the trends in the CRS and VRS assumptions had a similar pattern. The level of efficiency based on the assumption of VRS decreased throughout the 2018 period until 2022. However, this level will increase throughout 2023.

DEA analysis produces potential improvements to achieve an optimal level of efficiency. This analysis uses the last year of observation analyzed separately from the other periods to obtain the required values. In this study, the Banker, Charnes, and Cooper (BCC) and Charnes, Cooper, and Rhodes (CCR) models were used. The BCC model was used to separate TE and efficiency scales. CCR was used to obtain technical values and factors influencing efficiency (source). The BCC and CCR models aimed to produce more comprehensive and complementary outputs. Figure 5 shows the results of the Potential Improvement measurements using the BCC and CCR models.

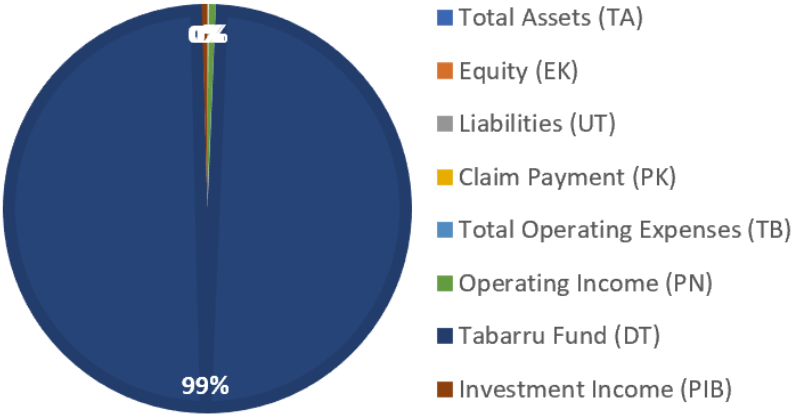


Figure 4. Potential improvement BCC assumptions
Source: Processed data 2024

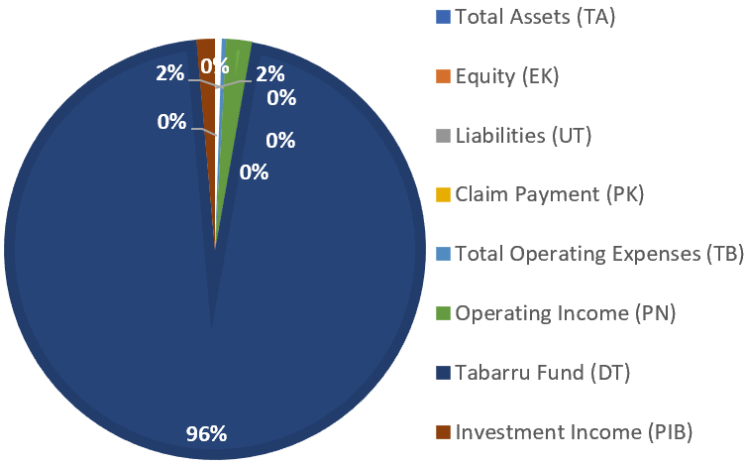


Figure 5. Potential improvement CCR assumptions
Source: Processed data 2024

Figures 5 and 6 contain general information related to the input and output variables of Sharia Life Insurance inefficiency. Based on the BCC analysis, the output variables serving as the source of the inefficiency of Sharia Life Insurance are business income and new tabbaru funds. To achieve optimal efficiency, the output variable and new tabarru' funds must be increased by 1% and 99%, respectively.

Efficiency of Sharia general insurance

Twenty general insurance companies were measured using the DEA method, resulting in 20. Data envelopment analysis (DEA) measurements from 2017 to 2023 used a common frontier. Table 6.

shows the average TE, PTE, and SE of Sharia General Insurance in Indonesia for 2017 (Panel A), 2018 (Panel B), 2019 (Panel C), 2020 (Panel D), 2021 (Panel E), 2022 (Panel F), 2023 (Panel G), and the entire year (Panel H).

Table 6. Sharia General Insurance efficiency panel

Years/Type of efficiency	Mean	Min	Max	St.Dev
Panel A (2017)				
TE	0,739	0,067	1,000	0,234
PTE	0,830	0,089	1,000	0,237
SE	0,889	0,529	1,000	0,127
Panel B (2018)				
TE	0,757	0,379	1,000	0,202
PTE	0,835	0,411	1,000	0,195
SE	0,910	0,551	1,000	0,117
Panel C (2019)				
TE	0,784	0,523	1,000	0,177
PTE	0,842	0,551	1,000	0,157
SE	0,933	0,523	1,000	0,110
Panel D (2020)				
TE	0,812	0,411	1,000	0,179
PTE	0,877	0,482	1,000	0,146
SE	0,920	0,597	1,000	0,099
Panel E (2021)				
TE	0,791	0,348	1,000	0,231
PTE	0,852	0,494	1,000	0,176
SE	0,910	0,553	1,000	0,124
Panel F (2022)				
TE	0,797	0,144	1,000	0,241
PTE	0,897	0,490	1,000	0,160
SE	0,893	0,144	1,000	0,210
Panel G (2023)				
TE	0,778	0,126	1,000	0,272
PTE	0,883	0,327	1,000	0,181
SE	0,870	0,126	1,000	0,231
Panel H (All Years)				
TE	0,780	0,067	1,000	0,223
PTE	0,860	0,089	1,000	0,182
SE	0,904	0,126	1,000	0,155

Note: TE: Technical efficiency, PTE: Pure technical efficiency, SE: Scale of efficiency
Source: Processed data 2024

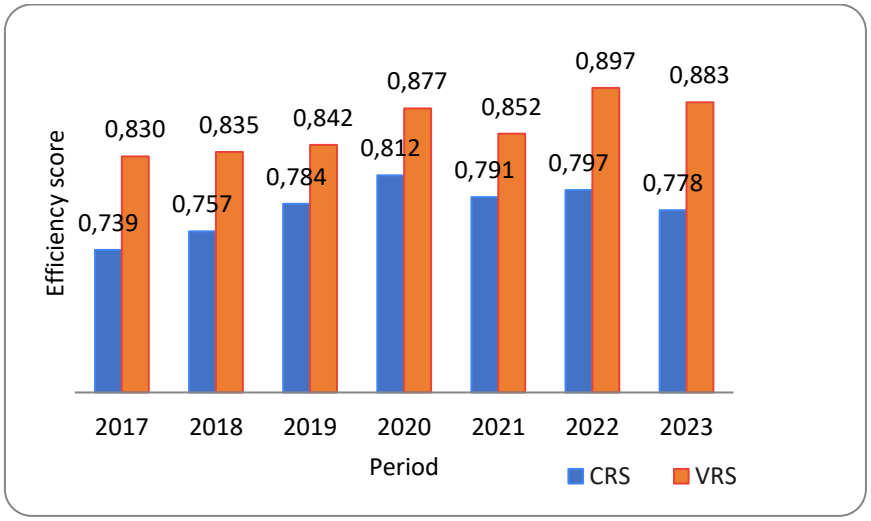
The efficiency of Sharia General Insurance in Indonesia fluctuates from year to year. The lowest and highest TE scores were in 2027 and 2020, with values of 0.739 and 0.812, respectively. The highest and lowest average PTE scores were in 2017 and 2022, respectively, with values of 0.830 and 0.897, respectively. In addition, the lowest and highest average Scale Efficiency (SE) scores were in 2023 and 2019, with values of 0.870 and 0.933, respectively. The average efficiency scores for each DMU from 2017 to 2023 are presented in Table 7.

Table 7 shows that no Sharia General Insurance in Indonesia has reached the maximum efficiency (1,000) on the CRS assumption. However, when viewed from the highest score on the CRS assumption, Tri Pakarta becomes the insurance company with the highest average efficiency score of 0.999. The companies with the lowest average efficiency on the CRS and VRS assumption are Mandiri AXA General Insurance and Ramayana Tbk with a score of 0.508 and 0.559, respectively. Meanwhile, the companies, with the lowest and highest average efficiency scores on the SE assumption are Mandiri AXA General Insurance and Jasaraharja Putera, with an average score of 0.557 and 1,000, respectively.

Table 7. Average Sharia general insurance efficiency score in Indonesia

No	DMU	CRS	VRS	SE
1	Alianz Utama Indonesia	0,932	0,965	0,964
2	Askrida Syariah	0,801	0,859	0,909
3	Asuransi Central Asia	0,791	0,800	0,989
4	Asuransi Umum Mega	0,604	0,652	0,920
5	BRI Asuransi Indonesia	0,799	0,975	0,820
6	Bumiputeramuda 1967	0,836	0,943	0,889
7	Chubb Syariah Indonesia	0,899	0,920	0,976
8	Jasaraharja Putera	0,936	0,936	1,000
9	Jasindo Syariah	0,798	0,829	0,962
10	Mandiri AXA General Insurance	0,508	0,914	0,557
11	Maximus Graha Persada	0,670	0,845	0,787
12	Ramayana Tbk	0,530	0,559	0,948
13	Realiance Indonesia	0,799	0,861	0,882
14	Sinar Mas	0,628	0,829	0,772
15	Sonwelis Takaful	0,964	0,965	0,999
16	Staco Mandiri	0,838	0,911	0,916
17	Takaful Umum	0,850	0,861	0,985
18	Tri Pakarta	0,999	1,000	0,999
19	Tugu Pratama Indonesia	0,763	0,783	0,972
20	Wahana Tata	0,650	0,787	0,831

Note: DMU: Decision-making unit; CRS: Constant return to scale; VRS: Variable return to scale; SE: scale of efficiency
Source: Processed data 2024



Note: CRS = Constant return to scale, VRS = Variable return to scale

Figure 6. Sharia general insurance efficiency trends
Source: Processed data 2024

Figure 6 provides information related to the efficiency trends of Sharia General Insurance in Indonesia during the 2017-2023 research period. The efficiency level fluctuated from year to year and tended to decline in the final period. The trends in the CRS and VRS assumptions had a similar pattern. The level of efficiency based on the assumption of VRS increased from 2018 to 2020.

DEA analysis produces potential improvements to achieve an optimal level of efficiency. The variables to be optimized can be reported through a potential improvement analysis. This analysis used the last year of observation to obtain the idea of the values to be achieved. The following are the results of the potential improvement measurements using the BCC and CCR models.

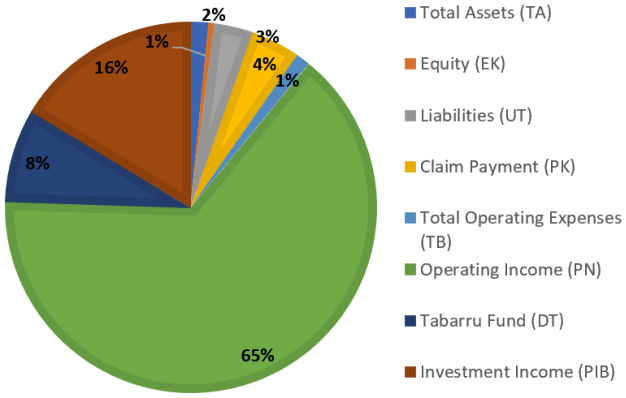


Figure 7. Potential improvement (BCC) Sharia general insurance
Source: Processed data, 2024

Figure 7 provides general information regarding the input and output variables, which are the source of the inefficiency of Sharia general insurance in Indonesia. Based on the analysis assuming BCC, the input variables acting as sources of inefficiency are total assets, equity, liabilities, claim payments, and total operating expenses. The output variables were business income, tabbaru funds, and investment income. The input variables must be lowered by 4%, 3%, 2%, and 1% in claim payments, liabilities, total assets, total operating expenses, and equity, respectively, to achieve an optimal level of efficiency. Meanwhile, the output variables such as business income, new tabbaru funds, and investment income need to be increased by 65%, 8%, and 16%, respectively. The biggest cause of inefficiency in Sharia general insurance is income.

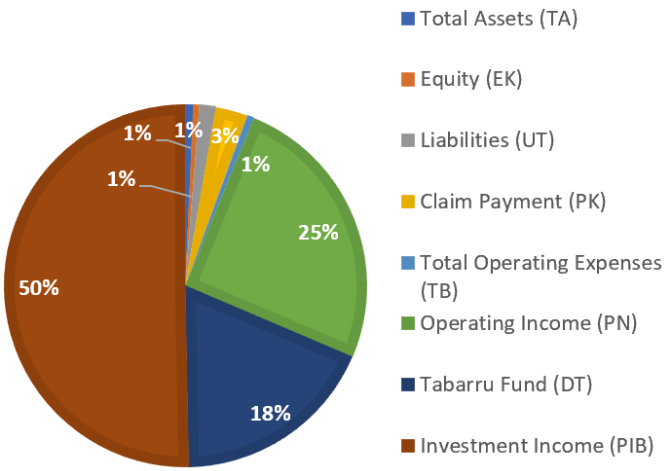


Figure 8. Potential improvement (CCR) Sharia general insurance
Source: Processed data, 2024

In Figure 8 of the CCR assumption, the sources of inefficiency in the input variables are total assets, equity, liabilities, claims payments, and total operating expenses. The source of inefficiency for the output variables includes business income, Tabarru funds, and investment income. To achieve optimal efficiency, Sharia General Insurance on input variables must be reduced by 1% on total assets, equity, liabilities, and total operating expenses, as well as 3% on claim payments. The output variable needs to be increased by 50%, 25%, and 18% in investment income, business income, and Tabarru funds, respectively.

Discussion

The efficiency score of the CRS and VRS methods shows that the Sharia Life Insurance Company from 2017 to 2023 has not been efficient. This inefficient condition is caused by the use of input

variables, including total assets, equity, claims payments, costs and debts, Tabarru funds, and net investment income. This is in line with previous research where Sharia life insurance operated inefficiently in 2014 and 2017 (Sukmaningrum et al., 2023). The occurrence is also similar to the conditions of life and family Takaful in Malaysia. Prior studies have shown that market behavior and performance trends in these segments often mirror broader industry dynamics, particularly in relation to consumer preferences, regulatory development, and competitive pressures. Empirical evidence indicates that life and family Takaful operators experience comparable patterns in demand fluctuations, pricing structures, and product innovation cycles, reflecting the sector's sensitivity to broader economic conditions and shifts in customer expectations. The industry also faces structural challenges, such as rising operational costs, affordability concerns, and increased competition from conventional insurance providers, all of which shape strategic decisions and influence market performance. In addition, ongoing regulatory reforms continue to guide the development of the Takaful sector, prompting operators to strengthen governance practices, risk management frameworks, and capital positions to ensure long-term sustainability. Together, these factors suggest that the patterns observed in Malaysia's Takaful sector are part of wider systemic trends that affect similar markets in the region (Lee et al., 2019; Lee et al., 2019; Lee et al., 2018).

Based on the BCC and CCR models, the biggest cause of inefficiency is the output variable of Tabarru Funds. In line with the findings that show that most Sharia life insurance companies are inefficient, which is reflected in the output gap in these variables, including tabarru funds. This condition indicates that the company has not been able to maximize its expected output potential based on the level of inputs available (Puspitasari et al., 2026). The tabarru fund aims to help other insurance participants in the event of a risk. Sub-optimal receipts have implications for the difficulty of making claims when there are risks, such as illness and accidents, experienced by Sharia life insurance policyholders. Therefore, a policy that can be implemented by a company is to increase the number of insurance participants through the promotion and literacy of Sharia life insurance. If the number of insurance participants increases, the tabarru and investment funds will also increase.

On average, Sharia general insurance has not reached perfect efficiency, and the trend shown in the graph illustrates that efficiency performance has improved in the early to mid-term phases. At this stage, both CRS and VRS show gradual improvements, indicating improvements in operational processes and the ability to manage available resources. The widening gap between VRS and CRS towards the end of the period provides an important clue that the main barriers to efficiency stem more from production scale inaccuracies rather than from operational technical processes. This means that although Sharia general insurance is already working quite technically, the scale of the activities carried out has not allowed full efficiency. The findings of this study are in line with previous studies, which show that the general insurance industry is still in a state of inefficiency. These inefficiencies have been proven to significantly influence a company's financial performance. The results of the analysis also confirm that, although the levels of production and investment efficiency are different, the general insurance companies that are able to achieve efficiency in capital allocation are the ones that are the most successful in converting these efficiencies into improvements in overall business performance (Malya & George, 2025).

Investment income, business income, and Tabarru funds are maximized through promotion and sales strategies, specifically motor vehicle insurance products, personal accidents, property, and miscellaneous. OJK and AASI reports that the largest contribution of Sharia general insurance comes from the motor vehicle business, personal accidents, property, and miscellaneous lines at 36.46%, 31.11%, 15.60%, and 8.04%, respectively. The results under the CRS and VRS assumptions show that the efficiency values over the last seven years are below 1 because Sharia general insurance in Indonesia is inefficient. From 2023 to 2027, the market share and contribution of Sharia general insurance were 3.7% and 3.8%, respectively, in 2022. The efficiency scores of Sharia general and life insurance are in the range of 0.8 and 0.6, respectively. This is in accordance with previous research, where Sharia general insurance is more efficient than Sharia life insurance (Fauziah et al., 2020). The output of the Sharia general insurance company is improved by increasing business income, investment, and Tabarru funds. The strategies applied to maximize

output are promotion, education, and literacy to the public regarding the importance of Sharia general insurance.

The efficiency score of Sharia general insurance (≈0.8) is higher than that of Sharia life insurance (≈0.6), showing better adaptability. However, achieving full efficiency requires integrated policy interventions between Law No. 4 of 2023 concerning the Development and Strengthening of the Financial Sector (PPSK). This includes the implementation of a Policy Guarantee Program and the strengthening of regulations through the new POJK to increase public confidence. Because inefficiencies are structural, regulatory reform and development strategies are key to improving the competitiveness and inclusion of Sharia insurance. Strengthening can be carried out through stronger capital, digitization, and synergy of the Islamic financial ecosystem to reduce costs and expand economic scale.

Conclusion

In conclusion, the efficiency of Sharia insurance companies in Indonesia requires significant improvement, particularly in segments hindered by low business income, investment, and Tabarru funds. Although Sharia general insurance shows a positive trend, it still faces challenges related to disproportionately high operating expenses and liabilities. Strategic efforts should focus on increasing income streams and aligning inputs more proportionally with outputs, supported by the PPSK Law, as a strategic instrument for capital strengthening and mandatory spin-offs to create a more competitive institutional structure. Theoretically, these findings confirm the relevance of Data Envelopment Analysis (DEA) in a regulated sector, providing a practical basis for policymakers to evaluate the effectiveness of the PPSK Law and for institutions to conduct targeted benchmarking and performance monitoring.

Despite these insights, this research is subject to several methodological and empirical limitations, as the non-parametric nature of DEA makes the results highly sensitive to data quality and unable to fully distinguish technical inefficiencies from external noise. Potential inconsistencies in the primary data regarding the initial implementation of the PPSK Law may also affect the analytical accuracy. To address these gaps, future research should combine DEA with parametric approaches such as Stochastic Frontier Analysis (SFA) or alternative methods such as the Malmquist Productivity Index and Bootstrap DEA. Furthermore, expanding the research scope to include variables such as digitalization, governance indicators, and cross-sector comparisons will better capture the long-term dynamics of efficiency.

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Author Contributions

Conceptualization: Sunarmo Sunarmo
Data curation: Sunarmo Sunarmo
Formal analysis: Sunarmo Sunarmo
Investigation: Sisca Debyola Widuhung
Methodology: Sunarmo Sunarmo
Project administration: Aisyah Tiar Arsyad
Supervision: Sunarmo Sunarmo
Validation: Sunarmo, Nasywaa Nasywaa
Visualization: Nasywaa Nasywaa
Writing – original draft: Aisyah Tiar Arsyad
Writing – review & editing: Sisca Debyola Widuhung, Sunarmo Sunarmo

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