
Stochastic Frontier Approach for Measuring the Efficiency of Indonesian Insurance Industry

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This study uses case studies of 79 general insurance companies both conventional and sharia in Indonesia with a period of 2016-2018. The data used is secondary data obtained from the financial statements of each insurance company. This study uses a cost frontier approach and is measured based on the total cost variable (Y), total assets, equity, total claims, total premiums, total investment, and investment assets owned. From this research, it is found that the factors that influence the efficiency of sharia insurance companies are the number of claims and the amount of premiums. While the amount of insurance, the cost is influenced by claims, the amount of premiums, total assets, and the amount of investment.

Keywords: Efficiency; Stochastic Frontier Analysis; General Insurance; Cost Frontier

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INTRODUCTION

Globally, the trend of growth and development of the world's Islamic insurance market share tends to increase. This is indicated by the total direct premium of global sharia insurance in 2016 reaching USD 4 703 billion then increasing by 2.2 percent in 2017 to USD 4 892 billion. In addition, when the financial market return rate is low, Islamic insurance can survive and grow by 2.8 percent or USD 2 234 billion in 2017 compared to 2016 (Islamic Financial Service Industry Stability Report, 2019).

The development of general insurance in Indonesia since 2015 shows an increasing trend in terms of assets. Based on Indonesian Insurance Statistics data published by OJK. In 2017 total conventional general insurance assets increased very sharply compared to 2016. In 2016 total conventional general insurance assets amounted to 362 920 billion rupiah, then increased to 124 461 265 billion rupiah. Meanwhile, the total assets of sharia general insurance show an increasing trend

every year, although the value is relatively small compared to conventional general insurance assets.

Table 1: Growth of Sharia and Conventional Insurance Assets in Indonesia

Year	Total Sharia Insurance Assets (IDR billion)	Total Conventional Insurance Assets (IDR billion)
2016	30,907	362,920
2017	37,136	124,461,265
2018	42,027	138,248,100
2019	43,751	151,735,260

Sources: Statistik Perasuransian Indonesia, OJK

The sharia and conventional insurance sectors still have a very large room for development, so it is necessary to further identify the performance of both sharia and conventional insurance in order to develop the insurance industry in Indonesia. This is marked by the development of the number of insurance in Indonesia.

Table 2: Development of Number of Insurance Companies in Indonesia, Period 2017 – 2019

The Description	2017	2018	2019
Full fledge sharia life insurance	7	7	7
Sharia business unit life insurance	23	23	23
Full fledge sharia general insurance	5	5	5
Sharia business unit general insurance	25	24	24
Full fledge sharia reinsurance	1	1	1
Sharia business unit reinsurance	2	2	2
Life insurance	54	53	53
General insurance	75	74	74
Reinsurance	6	6	6

Sources: Statistik Perasuransian Indonesia, OJK

Table 2 shows that the number of general insurance companies with sharia business units decreased from 25 units in 2017 to 24 units in 2018. The same thing happened to conventional life insurance, which decreased from 54 units in 2017 to 53 units in 2018. In addition, conventional general insurance also experienced a decline from 75 units in 2017 to 74 units in 2018. On the other hand, the number of full-fledged sharia life insurance companies, sharia business unit life insurance, full-fledged sharia general insurance, sharia reinsurance, and conventional reinsurance did not change. The decrease was due to the spin-off of the sharia unit from a sharia insurance company to a conventional insurance company.

Government regulations regarding minimum insurance capital, as well as plans for several Islamic insurance companies to conduct spin-offs in accordance with the law on insurance. So, it can be predicted that in the years to come the number of sharia insurance will

continue to grow. The Indonesian Sharia Insurance Association (AASI) considers that the sharia insurance industry has the opportunity to penetrate the 5.0 percent market share. This potential is supported by the role of regulators and the financial industry which encourages the insurance industry to develop further. In order to encourage the growth of sharia insurance market share, OJK encourages insurance industry players to accelerate the realization of the separation or spin off of sharia business units. As is known in Law No. 40 of 2014 concerning insurance, it is stated that an insurance company or reinsurance company that has a sharia business unit with a tabarru' value and the participant's investment funds have reached at least 50%, are required to separate the sharia business unit in no later than 10 years. since the law was enacted or at the latest at the end of 2024.

In order for the spin-off to be carried out more quickly by meeting the requirements, the sharia business

unit must strive to improve competitiveness and quality considering that the sharia insurance market share is still volatile. Therefore, it is necessary to analyze the efficiency on a regular basis to evaluate and minimize errors in determining decisions that will make the company's performance increase. Efficiency analysis is also useful to determine the company's managerial ability in managing the company. Therefore, this study aims to analyze the efficiency level of conventional insurance and sharia insurance so that insurance companies know how ready each company is to face spin offs.

LITERATURE REVIEW

According to the Big Indonesian Dictionary, efficiency is the correct way of doing things without wasting energy, time and money. Efficiency is a concept that has generally been used in measuring the performance of a company. A company is said to be efficient if the company can minimize costs in producing certain outputs or can maximize profits by using a combination of existing inputs. An institution can be said to be efficient if it uses a number of input units that are less than the number of input units used by other institutions and produces the same amount of output, and uses the same number of input units, but can produce a larger amount of output.

There are three types of efficiency, namely technical efficiency, allocative efficiency, and a combination of the two efficiencies called economic efficiency (Coelli, 1996). According to Coelli (1996), company efficiency consists of two components, namely:

1) Technical efficiency which describes the company's ability to obtain maximum output from a set of inputs,

2) Allocative efficiency which describes the company's ability to use inputs in the maximum proportion, at their respective prices. The two components when combined will be a measure of economic efficiency.

One approach to measure efficiency is the frontier approach. The frontier approach is divided into two types, namely the parametric and nonparametric frontier approaches. The parametric approach is measured using parametric statistical tests such as the Stochastic Frontier Approach (SFA) and the Distribution Free Approach (DFA), while the nonparametric frontier approach is measured using a nonparametric statistical test using the Data Envelopment Analysis (DEA) method.

Stochastic Frontier Approach (SFA)

Starting with the assumption that a function produces as much as possible with a certain input function that can be written in the formula:

$$y_i = f(x_i; \beta)$$

Here y_i is the maximum output affected by x_i as input and β which is an unknown parameter vector. After that, the disturbance term is entered in the model which represents the disturbance, measurement error and exogenous shock that is out of control, $\varepsilon_i = v_i + u_i$ component is the error component and the technical inefficiency v_i , so the model can be written:

$$y_i = f(x_i; \beta) + \varepsilon_i$$

The characteristic of the frontier production function is the separation of the impact of the shock of the exogenous variable on the output through the contribution of variance that describes the technical efficiency. SFA is used because it has a specific functional form of the production relationship between inputs and outputs which makes the results more accurate. Efficiency measurement consists of two components, namely technical efficiency and allocative efficiency. Technical efficiency reflects the company's ability to get maximum output from available inputs, while allocative efficiency reflects the company's ability to use inputs in optimal proportions according to certain costs (Coelli et al, 1998). SFA has advantages over other models because it involves a disturbance term that represents disturbances, measurement errors and exogenous shocks that are out of control. The frontier production function describes the maximum production that can be produced for a given number of production inputs. The characteristic of the frontier production function is the separation of the impact of the shock of the exogenous variable on the output through the contribution of variance that describes the technical efficiency.

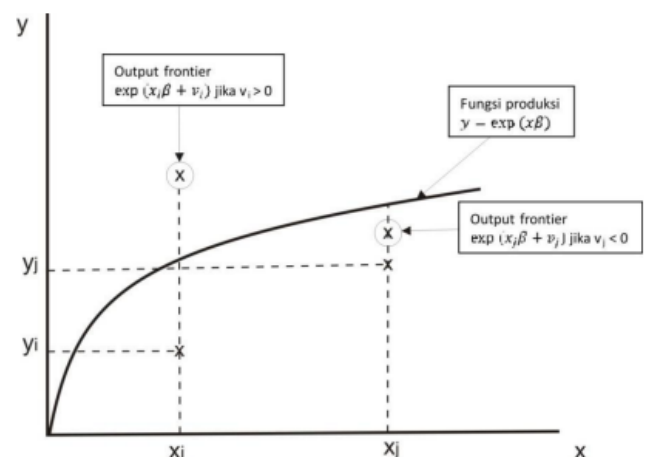


Figure 1: Stochastic frontier production curve.

METHODOLOGY

The data used in this study is secondary data in the form of panel data obtained from the financial statements of sharia and conventional general insurance companies for the 2016-2018 period. This data was obtained from the website of the Financial Services Authority (OJK) in the form of Indonesian Insurance Statistics and from the websites of Islamic insurance companies and conventional insurance in the form of financial reports. In addition, this study also uses other complementary data obtained from related literature, books, journals, and internet media.

The data analysis method used in this research is descriptive analysis and quantitative analysis. Descriptive analysis is used to explore and clarify a problem. On the other hand, the quantitative analysis used in this research is the Stochastic Frontier Approach (SFA).

The quantitative analysis used in this study uses a parametric approach that applies stochastic frontier analysis (SFA). SFA is one of the methods used in estimating the production limit (frontier) and also measuring the level of production efficiency. SFA is used because it has a specific functional form of the production relationship between inputs and outputs which makes the results more accurate.

This study implements a Cobb Douglas production function model with inputs consisting of capital and labor with fixed technology assumptions. SFA analysis in this study is based on the cost frontier. Output-oriented measurement that measures the value of efficiency in the total costs incurred by insurance in general, both conventional and sharia when converting inputs into outputs. Efficiency is measured based on the variables of total assets, equity, total claims, total premiums, total investment, and investment assets owned by general insurance, both sharia and conventional. Estimation of SFA parameters using STATA software. The efficiency score is between 0 to 1, when the efficiency value is 1, the insurance company has been operating fully and efficiently. On the other hand, when the efficiency value is close to zero, the insurance company is not operating efficiently.

The Stochastic Frontier model in this study uses a modified Cobb Douglas model:

$$\ln(\text{Total cost}_{it}) = \beta_0 + \beta_1 \ln \text{Total_Asset}_{it} + \beta_2 \ln \text{equity}_{it} + \beta_3 \ln \text{claim}_{it} + \beta_4 \ln \text{premi}_{it} + \beta_5 \ln \text{investment}_t + \beta_6 \ln \text{investment_asset}_{it} + V_{it} - U_{it}$$

Where:

Total cost : Total costs incurred by Sharia and conventional General Insurance

Total_Asset : Total assets owned by Sharia and conventional General Insurance

<i>equity</i>	: Total equity owned by Sharia and conventional General Insurance
<i>Claim</i>	: Total Sharia and conventional general insurance claims
<i>premi</i>	: Total premiums for Sharia and conventional General Insurance
<i>investment</i>	: Total investment owned by Sharia and conventional General Insurance
<i>aset_investasi</i>	: Total investment assets owned by Sharia and conventional General Insurance
<i>V</i>	: Statistical noise, is a random error of factors that cannot be explained by the data
<i>U</i>	: Technical inefficiency explained by the size variable

RESULT AND DISCUSSION

Descriptive Statistic

Table 3 shows the descriptive statistics of all the variables used in this study. In this discussion will explain the general description of all variables. All of these variables are used to show the efficiency of sharia insurance (takaful), conventional insurance, and all insurance both in general insurance.

Table 3: Descriptive Statistics on General Insurance (in millions of rupiah)

Variable	Mean	Min	Max
Total Cost (Y)	401,108.9	795	4,017,094
Total_Asset (X1)	1,076,211	29,572	10,452,506
Equity (X2)	405,325.4	25,755.19	4,667,403
Claim (X3)	221,710	106	2,326,473
Premi (X4)	553,468.6	226	7,431,188
Investment (X5)	34,605.55	829	527,758
Investment_Asset (X6)	515,267.8	287	5,444,436

In general insurance, the total cost variable in Table 3 shows an average of IDR 401 billion with a maximum value of IDR 4 trillion with a minimum value of IDR 795 million. In the general insurance industry, the average total asset reaches 1 trillion rupiah with a maximum value of 10 trillion rupiah and a minimum value of 29 billion rupiah. Meanwhile, the average equity during the period reached 405 billion rupiah with a maximum value of 5 trillion rupiah and a minimum value of 25 billion rupiah. The amount of claims in the general insurance industry reached an average of 221 billion rupiah with a maximum value of 2 trillion rupiah and a minimum value of 106 million rupiah. Meanwhile, the

premium in the general insurance industry reached an average of 553 billion rupiah with a maximum value of 7 trillion rupiah with a minimum value of 226 million rupiah. General insurance industry investment during the 2016-2018 period showed an average of 34 billion rupiah with a maximum value of 527 billion rupiah with a minimum value of 829 million rupiah. Meanwhile, the investment assets of the general insurance industry during that period showed an average of 515 billion rupiah with a maximum value of 5 trillion rupiah and a minimum value of 287 million rupiah.

Level of Cost Efficiency in General Insurance

This section will explain the overall efficiency level of the general insurance industry, whether sharia,

conventional, or in general during the 2016 to 2018 period. If the company has a score of 1, it can be concluded that the company is efficient and able to combine optimal inputs for production. From its output, whereas if the company has an efficiency score of 0 then it can be concluded that the company is inefficient or unable to optimally combine its inputs and production outputs.

Sharia general insurance (Takaful)

The cost efficiency value of sharia general insurance during the 2016-2018 period using the stochastic frontier approach (SFA) method can be seen in Table 4.

Table 4: Value of takaful cost efficiency for the period 2016-2018

DMU Code	Cost Efficiency Value			Mean Cost Efficiency Scores
	2016	2017	2018	
1	0.86252	0.93107	1	0.931196
2	1	0.6189	0.54552	0.721472
3	1	0.60352	0.39808	0.667199
4	0.57573	1	1	0.858576
5	1	0.87986	0.93018	0.936678
6	0.58771	0.82382	1	0.803842
7	0.95681	1	0.96208	0.972962
8	1	0.6823	0.90807	0.863456
9	1	0.88364	1	0.961211
10	0.93459	0.94561	1	0.960065
11	0.79472	1	0.7665	0.960065
12	0.89182	0.55515	1	0.853737
13	1	1	0.90802	0.815657
14	0.84938	0.94103	1	0.969339
15	0.85143	1	0.91254	0.930136
16	1	0.6859	0.82155	0.921322
17	0.89708	0.98656	1	0.835814
18	0.9067	1	0.90104	0.961212
19	0.91375	1	1	0.935913
20	1	0.99834	0.9912	0.971247
21	0.66856	1	0.82704	0.996513
22	0.86319	0.87704	1	0.831865
Mean Coft Efficiency	0.88882	0.8824	0.90326	0.893613
Minimum	0.57573	0.55515	0.39808	0.667199
Maximum	1	1	1	0.996513
Standard Deviation	0.13038	0.15137	0.15736	0.087202

Based on the results in Table 4, the level of cost efficiency in sharia general insurance during the 2016-2018 period shows mixed results for each company. The average level of cost efficiency at 22 sharia general

insurance companies during the 2016-2018 period experienced an increase in efficiency. It can be seen that in 2016 the average cost efficiency value of all sharia general insurance was 0.888, and in 2017 it tended to be

stable although the value decreased slightly to 0.882, but in 2018 it increased to 0.903. It can be concluded that the condition of cost efficiency in the sharia general insurance industry is quite good and almost close to the most efficient condition.

In addition to explaining the entire Islamic insurance industry, this study also discusses the average for each company during the 2016-2018 period. Overall, the general sharia insurance industry is still not efficient because the efficiency value is 0.893613. It is necessary to increase the level of efficiency so that the sharia general insurance industry becomes the most efficient, namely the efficiency value is 1. When viewed from the average cost efficiency value, the highest average cost efficiency value of 0.996513 is the efficiency value at the Takaful Sonwelis company (no 21). This shows that the ability of the best takaful company is Sonwelis takaful, which optimally manages the company's inputs to make

the company's output. While the takaful company Reliance (no 3) is a company that has the smallest level of cost efficiency during the 2016-2018 period compared to other companies. At the beginning of 2016 the company was efficient, but during 2017 it decreased to 0.603. The efficiency level of the company is decreasing to 0.398. This shows that the company's performance is decreasing because the level of efficiency is decreasing. The company's performance in managing inputs optimally to make the company's output decrease. Therefore, the management of the company needs to be considered again so that there is no bankruptcy.

Conventional General Insurance

The level of efficiency of conventional general insurance costs during the 2016-2018 period using the stochastic frontier approach (SFA) method can be seen in Table 5.

Table 5: Value of cost efficiency for conventional general insurance for the 2016-2018 period

DMU Code	Cost Efficiency Value			Mean Cost Efficiency Scores
	2016	2017	2018	
1	0.92779	0.86261	1	0.930135
2	0.97764	1	0.93795	0.971862
3	0.59244	0.84196	1	0.811463
4	0.92318	0.93033	1	0.951171
5	0.9463	0.9772	1	0.974497
6	0.93179	0.99275	1	0.974848
7	1	0.99741	0.99745	0.998286
8	1	1	0.9414	0.980465
9	0.8457	0.92837	1	0.92469
10	0.79402	0.96202	1	0.918677
11	0.7742	0.75378	1	0.842659
12	0.96666	0.95126	1	0.972641
13	0.94902	0.94473	1	0.964583
14	0.84942	0.89853	1	0.915983
15	1	0.68291	0.61663	0.766511
16	0.88843	0.90221	1	0.93021
17	0.97231	1	0.94021	0.970842
18	0.90945	0.95537	1	0.954939
19	0.93041	1	0.98324	0.971215
20	0.87192	1	0.81442	0.895446
21	1	0.91189	0.82662	0.912834
22	0.89304	0.97583	1	0.956291
23	0.8345	0.92947	1	0.921321
24	0.96683	0.93622	1	0.967681
25	0.97069	0.99173	1	0.987472
26	0.99602	0.96252	1	0.986179
27	1	0.96158	0.95715	0.972912

28	0.94034	1	0.98994	0.97676
29	1	0.97965	1	0.993215
30	0.85363	1	0.95489	0.936173
31	0.99715	0.83287	1	0.943337
32	0.98425	0.99131	1	0.991851
33	0.75751	0.97027	1	0.909259
34	1	0.98123	0.91474	0.96532
35	1	0.87052	0.64448	0.838333
36	1	0.99465	0.9999	0.998183
37	0.83264	1	0.93983	0.924154
38	0.99647	1	0.99766	0.998044
39	1	0.99524	0.96379	0.986344
40	0.91051	1	0.89935	0.936621
41	1	0.95654	0.98783	0.981457
42	1	0.97979	0.96479	0.981526
43	0.98396	0.97195	1	0.985304
44	1	0.98372	0.99875	0.994154
45	0.94807	0.98603	1	0.978034
46	1	0.809	0.7275	0.845498
47	0.97361	1	0.97167	0.981759
48	1	0.93481	0.98883	0.974545
49	0.94365	0.98637	1	0.976672
50	0.97699	1	0.97334	0.983442
51	0.97892	1	0.98867	0.989196
52	0.90747	0.94836	1	0.951943
53	1	0.94451	0.94027	0.961592
54	0.9608	1	0.92067	0.960489
55	0.94942	1	0.98121	0.976876
56	0.99626	1	0.86945	0.955237
57	1	0.93994	0.94402	0.96132
Mean Coft Efficiency	0.94041	0.95276	0.95748	0.950219
Minimum	0.59244	0.68291	0.61663	0.766511
Maximum	1	1	1	0.998286
Standard Deviation	0.07911	0.06516	0.08239	0.048555

Based on the results in Table 5, the level of cost efficiency in conventional general insurance during the 2016-2018 period shows mixed results for each company. Overall during this period, conventional general insurance companies showed a fairly high level of efficiency, which was 0.950. This shows that conventional insurance companies in Indonesia need a little efficiency improvement to reach the efficient level. Of the 57 sharia general insurance companies during the 2016-2018 period, the average is quite stable. It can be seen that in 2016 to 2018 the value is quite the same, namely 0.9. It can be concluded that the

condition of cost efficiency in the general insurance industry is still quite stable because in the last three years, although it still needs a little more improvement to make the conventional insurance industry efficient.

This study also discusses the average for each company during the 2016-2018 period. When viewed from the average cost efficiency value for each company, the highest average cost efficiency value is 0.998286 which is the efficiency value at the general insurance company Tokio Marine (no 7). In addition, if we look at the value of cost efficiency in this company, it shows a value that is almost close to efficient, although only in

2016 it got the most perfect efficiency score, namely one. This shows that the general insurance company's ability to optimally and efficiently manage the company's inputs to produce a company's output.

Unlike the case with general insurance company Aig Ins (no 15). The company was a company during the 2016-2018 period showing the lowest level of efficiency compared to other companies, which was 0.766511. At the beginning of 2016 the company was efficient, but the last two years experienced a decrease in efficiency so that it reached a cost efficiency level of 0.616 in 2018. This shows that this company has a decline in company

performance, the efficiency value of this company for the last 3 years has always increased. Therefore, it is necessary to improve management in managing inputs so that the management can be more optimal and efficient, and ultimately not go bankrupt.

General insurance in Indonesia

In this section, we will discuss the efficiency level of general insurance in Indonesia, both sharia insurance and conventional insurance. A summary of the efficiency level of general insurance costs during the 2016-2018 period using the stochastic frontier approach (SFA) method can be seen in Table 6.

Table 6 Cost efficiency value of the general insurance industry in Indonesia

All DMU	2016	2017	2018	Mean Cost Efficiency 2016-2018
Mean	0.926042337	0.933165728	0.942384692	0.933864252
Min	0.5757344	0.5551505	0.3980753	0.6671986
Max	0.9999974	0.9999974	0.9999974	0.9982862
Std. Deviasi	0.098039134	0.101114608	0.11017333	0.066249007

Based on the results in Table 6, the level of cost efficiency of general insurance in Indonesia during the 2016-2018 period shows mixed results for each year. In general, the general insurance industry in Indonesia during the 2016-2018 period on average experienced an increase. It can be seen that in 2016 the average cost efficiency value of all sharia general insurance was 0.926, and in 2017 it experienced a small increase to 0.9331, and increased again in 2018 to 0.9423. It can be concluded that the condition of cost efficiency in the general insurance industry as a whole shows an increase and is stable. The value of a high level of cost efficiency which is close to the efficient value of 1 indicates the general insurance industry in Indonesia is quite efficient, although it still needs improvement to become the most efficient level.

This section will discuss the average efficiency value of each general insurance company in Indonesia during the 2016-2018 period. Overall from 2016-2018, general insurance companies in Indonesia got a cost efficiency value of 0.9338. This value indicates that the condition of cost efficiency in general insurance in Indonesia is approaching the most efficient, but needs to be improved again. When viewed from the average cost efficiency value of each company, the highest average cost efficiency value of 0.9982 is the efficiency value of the conventional general insurance company Tokio Marine (no 29). This shows that the cost efficiency of the conventional general insurance industry is higher than that of the takaful industry. This

is also supported by the higher average cost efficiency during the 2016-2018 period, which is higher for the conventional general insurance industry than the takaful industry in Indonesia. Therefore, overall it is necessary to increase efficiency so that in general the level of efficiency will increase and become efficient.

In general, the company that has the lowest level of efficiency is the takaful company Reliance (no 3). The company was a company during the 2016-2018 period showing the lowest level of efficiency compared to other companies in Indonesia, which was 0.6671986. The average level of cost efficiency of the sharia general insurance industry shows a less efficient value than conventional general insurance, where the company that has the lowest level of efficiency is also a sharia insurance company. This shows the need to increase efficiency for the Islamic insurance industry, especially Reliance takaful companies so as not to cause bankruptcy.

Factor Affecting of Cost Efficiency in Insurance

This section will discuss the factors that affect the level of cost efficiency in the general insurance industry in Indonesia. The discussion consisted of sharia insurance, conventional insurance, and insurance in general in Indonesia. Determination of the factors that affect the level of cost efficiency using the stochastic frontier analysis (SFA) method. Table 7 shows the results of the cost efficiency frontier analysis of each model, namely the sharia insurance model, the conventional insurance model, and the insurance model in general.

Tabel 7: Estimates of Factor affected Cost Efficiency in Sharia Insurance (Takaful),
Conventional Insurance, and All Insurance

V. Independen	Dependen Variable logtotalbiaya (Y)					
	Takaful		Conventional Insurance		All Insurance	
	Coef	Z-stat	Coef	Z-stat	Coef	Z-stat
Cons	0.208	0.24	1.189	6.60***	0.694	2.01**
Logtotalaset (X1)	0.134	0.80	0.085	1.08	0.092	1.25
Logekuitas (X2)	0.095	0.63	0.084	1.55	0.094	1.52
Logklaim (X3)	0.333	7.78***	0.535	22.12***	0.444	21.09***
Logpremi X4)	0.438	7.33***	0.221	6.36***	0.326	12.33***
Loginvestasi (X5)	-0.022	-0.25	0.049	2.26**	0.035	1.32
logaset_investasi (X6)	0.006	0.14	-0.093	-2.18**	-0.028	-0.97

Notes: *, **, *** significant at 10%, 5%, dan 1%

Based on table 7, In the takaful industry in Indonesia, the level of cost efficiency is influenced by the premium paid and the amount of claims received by insurance members. The amount of claims has a positive and significant effect on the level of cost efficiency with a coefficient value of 0.333. This shows that each increase in the amount of claims by 1 unit will increase cost efficiency by 0.333 units, *ceteris paribus*. These results are in accordance with research conducted by (Fenn, Vencappa, Diacon, Klumpes, & O'Brien, 2008) with case studies of insurance companies in Europe. It states that to streamline costs in the takaful industry in Indonesia, it can be influenced by increasing/lowering the cost of claims that must be paid by sharia insurance members. Determination of the amount of increase/decrease in premiums can be considered by how much cost efficiency is improved.

In addition, the premium cost also has a positive and significant effect on the level of cost efficiency with a coefficient value of 0.438. This shows that each increase in the amount of premium paid by insurance members by 1 unit can increase the level of cost efficiency of the takaful industry in Indonesia by 0.438 units. Similar to the previous factor, namely the cost of claims, determining the amount of increase/decrease in claims needs to be considered for takaful companies in Indonesia. This is because it will affect the level of cost efficiency and will definitely affect insurance members directly.

Unlike the case with conventional insurance, the level of cost efficiency is not only influenced by premiums and claims, but there are other factors that influence, including the amount of investment and the amount of investment assets. The amount of investment made by the conventional general insurance industry has a positive and significant effect on the level of cost efficiency with a coefficient value of 0.049. This shows that the greater the investment owned by the company can increase cost efficiency by 0.049 units. One of the insurance company's instruments to manage finances is through investment. The conventional insurance industry must consider the amount of investment

owned, this is because investment can have a positive effect on cost efficiency.

Similar to the takaful industry, the conventional general insurance industry is also affected by the amount of claims received by insurance members. The size of the claim has a positive and significant effect with a coefficient value of 0.535. These results are in line with research conducted by the European insurance industry (Fenn et al., 2008). This shows that the higher the claims given to conventional insurance members, the higher the cost efficiency value by 0.535 units, *ceteris paribus*. This shows that one way to increase cost efficiency in conventional general insurance is to increase the amount of claims received by insurance members.

In addition, the variable premium costs also affect the level of cost efficiency of the conventional general insurance industry. The premium cost has a positive and significant effect on the level of cost efficiency with a coefficient value of 0.221. This shows that the greater the claims given to insurance members, the higher the efficiency of the insurance costs by 0.221 units. In addition to the size of the claim, the amount of premium also needs to be considered with the aim of increasing the level of cost efficiency. Premiums are one of the things that are directly related to insurance members, therefore determining the increase in the amount of premiums also needs to be considered so as not to cause losses for insurance members.

The last variable that affects the level of cost efficiency in this study is investment assets. The amount of investment assets owned by conventional insurance companies has a negative and significant effect on the level of cost efficiency with a coefficient value of -0.093. This shows that the more investment owned by the conventional insurance industry can reduce the level of cost efficiency by -0.093 units, *ceteris paribus*. This shows that the need for attention in ownership of investment assets, because the greater the investment assets can lead to lower cost efficiency of conventional insurance companies.

In the takaful industry, variables that have a significant effect on increasing the level of cost efficiency include the size of claims and the amount of

premiums. Where these variables are positively related to the level of cost efficiency. This shows that to increase the cost efficiency value of the takaful industry, it can be done by increasing the amount of claims and premiums, but must reduce the amount of equity owned. Whereas in the conventional general insurance industry, the level of cost efficiency is significantly influenced by the size of the claim, the amount of premium, investment, and investment assets. Where the amount of claims, premiums and investment are positively related, while the amount of investment assets is negatively related. This shows that to increase the level of cost efficiency in conventional general insurance, it can be done by increasing the amount of claims received by members, the amount of premiums paid by insurance members, and the amount of company investment, but must reduce the number of investment assets owned by the company.

The results are different if this research is assessed on the general insurance industry in Indonesia as a whole, both sharia insurance (takaful) and conventional insurance. The purpose of this research is to look at the factors that affect the level of cost efficiency of the general insurance industry in Indonesia in general. Based on the results in Table 5, in general the variables that affect the level of efficiency of general insurance costs are the amount of claims and the amount of premiums. The amount of claims has a positive and significant effect on the level of cost efficiency with a coefficient value of 0.444. This shows that the greater the claims given to insurance members, the higher the efficiency level of general insurance costs in Indonesia by 0.444 units. Claims are benefits received by insurance members, an increase in the amount of claims given can certainly increase the benefits received by insurance members. This will increase the cost efficiency of general insurance in Indonesia. Claims can be something that needs to be considered by general insurance companies in Indonesia, because the size of the claim can significantly affect cost efficiency.

In addition, the amount of premium paid by insurance members also affects the level of cost efficiency of general insurance in Indonesia. The amount of premium has a positive and significant effect on the level of cost efficiency with a coefficient value of 0.326. This shows that if the premium increases by one unit, it can increase the level of cost efficiency in general insurance by 0.326 units, ceteris paribus. Setting the amount of premium paid can also be a factor to increase the cost efficiency value of general insurance. However, the positive influence shown on the premium variable needs to be considered. A large increase in premiums can affect the ability to pay insurance members. Therefore, a large increase in premiums must be balanced with other increases such as an increase in claims, so as to increase cost efficiency with these two factors. In general, the findings in this study have been carried out by researchers such as Saputra et al. (2020),

Rusydiana & Nugroho (2017), Wulandari & Cabanda (2016) and Ulansari & Septiarini (2020) for comparative cases between conventional and sharia insurance. Meanwhile Indrarini et al. (2019) and Fauziah et al. (2020) specifically measures the efficiency level of the Islamic insurance industry in Indonesia.

CONCLUSION

This study aims to look at the factors that affect the level of cost efficiency of the general insurance industry in Indonesia in general. From this research, it is found that the factors that affect the cost efficiency of Islamic insurance companies are the number of claims and the amount of premiums. This is because the determination of the amount of increase/decrease in premiums is considered through how much cost efficiency is improved. Whereas in conventional insurance, cost efficiency is influenced by the number of claims, the amount of premiums, total assets, and the amount of investment. so that companies in the conventional insurance industry must consider the amount of assets they have, this is because asset values can have a positive effect on cost efficiency.

Knowing the factors that affect the efficiency level of the insurance industry, both sharia and conventional, is needed to increase the competitiveness and quality of the insurance industry in order to increase the market share of the insurance industry in Indonesia. In addition, efficiency analysis is also useful so that the spin-off implementation is faster and insurance companies can meet the requirements. Therefore, periodic efficiency analysis is needed to evaluate and minimize errors in determining decisions which will later make the company's performance increase.

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Appendix 1: List of insurance industry in Indonesia

DMU Code	Institution name
Islamic Insurance (Takaful)	
1	BUMIDA
2	AXA GENERAL
3	RELIANCE
4	ASEI
5	WAHANA TATA
6	KRESNA MITRA
7	PAN PACIFIC
8	JASARAHARJA PUTERA
9	MEGA
10	TRI PAKARTA
11	SINARMAS
12	PAROLAMAS
13	ACA SYARIAH
14	TPI SYARIAH
15	RAMAYANA SYARIAH
16	BRIN SYARIAH
17	ASTRA SYARIAH
18	ADIRA SYARIAH
19	ASKRIDA SYARIAH
20	CHUBB SYARIAH
21	SONWELIS TAKAFUL
22	JASINDO TAKAFUL
Conventional Insurance	
23	MULTI ARTHA GUNA
24	HARTA AMAN PRATAMA
25	PAROLAMAS
26	LIPPO GENERAL
27	FPG INDO
28	ZURICH INS
29	TOKIO MARINE
30	SAMSUNG TUGU
31	QBE
32	SOMPO
33	MSIG
34	KOOKMIN BEST INS
35	KSK INS
36	CHINA TAIPING
37	AIG INS
38	AXA INDO
39	ALLIANZ UTAMA
40	CHUBB GENERAL
41	BESS CENTRAL INS
42	ASEI

43	SIMAS NET
44	CAKRAWALA PROTEKSI
45	MITRA PELINDUNG
46	WAHANA TATA
47	VIDEI
48	VICTORIA
49	TUGU PRATAMA INDO
50	TUGU KRESNA PRATAMA
51	TRI PAKARTA
52	STACO
53	SUMIT OTO
54	SINAR MAS
55	SARANA LINDUNG UPAYA
56	RELIANCE
57	RAMA SATRIA
58	RAKSA PRATIKARA
59	PURNA ARTANUGRAHA
60	PAN PACIFIK
61	KRESNA MITRA
62	MEGA PRATAMA
63	MEGA
64	MALACCA TRUST
65	JASA TANIA
66	JASA RAHARJA PUTERA
67	MNC GENERAL
68	INTRA ASIA
69	EKA LLOYD
70	DAYIN MITRA
71	BCA UMUM
72	ACA
73	BUANA INDEPENDENT
74	BRINS
75	BOSOWA
76	BINTANG
77	BINAGRIYA UPAKARA
78	BHAKTI BHAYANGKARA
79	BERDIKARI

Appendix 2: Cost efficiency of insurance industry in Indonesia

DMU Code	Cost efficiency score			Mean of Cost Efficiency Scores
	2016	2017	2018	
1	0.8625	0.9311	1	0.9312
2	1	0.6189	0.54552	0.7215
3	1	0.6035	0.39808	0.6672
4	0.5757	1	1	0.8586
5	1	0.8799	0.93018	0.9367
6	0.5877	0.8238	1	0.8038
7	0.9568	1	0.96208	0.973
8	1	0.6823	0.90807	0.8635
9	1	0.8836	1	0.9612
10	0.9346	0.9456	1	0.9601
11	0.7947	1	0.7665	0.8537
12	0.8918	0.5552	1	0.8157
13	1	1	0.90802	0.9693
14	0.8494	0.941	1	0.9301
15	0.8514	1	0.91254	0.9213
16	1	0.6859	0.82155	0.8358
17	0.8971	0.9866	1	0.9612
18	0.9067	1	0.90104	0.9359
19	0.9137	1	1	0.9712
20	1	0.9983	0.9912	0.9965
21	0.6686	1	0.82704	0.8319
22	0.8632	0.877	1	0.9134
23	0.9278	0.8626	1	0.9301
24	0.9776	1	0.93795	0.9719
25	0.5924	0.842	1	0.8115
26	0.9232	0.9303	1	0.9512
27	0.9463	0.9772	1	0.9745
28	0.9318	0.9928	1	0.9748
29	1	0.9974	0.99745	0.9983
30	1	1	0.9414	0.9805
31	0.8457	0.9284	1	0.9247
32	0.794	0.962	1	0.9187
33	0.7742	0.7538	1	0.8427
34	0.9667	0.9513	1	0.9726
35	0.949	0.9447	1	0.9646
36	0.8494	0.8985	1	0.916
37	1	0.6829	0.61663	0.7665
38	0.8884	0.9022	1	0.9302
39	0.9723	1	0.94021	0.9708
40	0.9094	0.9554	1	0.9549
41	0.9304	1	0.98324	0.9712
42	0.8719	1	0.81442	0.8954
43	1	0.9119	0.82662	0.9128

44	0.893	0.9758	1	0.9563
45	0.8345	0.9295	1	0.9213
46	0.9668	0.9362	1	0.9677
47	0.9707	0.9917	1	0.9875
48	0.996	0.9625	1	0.9862
49	1	0.9616	0.95715	0.9729
50	0.9403	1	0.98994	0.9768
51	1	0.9796	1	0.9932
52	0.8536	1	0.95489	0.9362
53	0.9971	0.8329	1	0.9433
54	0.9842	0.9913	1	0.9919
55	0.7575	0.9703	1	0.9093
56	1	0.9812	0.91474	0.9653
57	1	0.8705	0.64448	0.8383
58	1	0.9946	0.9999	0.9982
59	0.8326	1	0.93983	0.9242
60	0.9965	1	0.99766	0.998
61	1	0.9952	0.96379	0.9863
62	0.9105	1	0.89935	0.9366
63	1	0.9565	0.98783	0.9815
64	1	0.9798	0.96479	0.9815
65	0.984	0.972	1	0.9853
66	1	0.9837	0.99875	0.9942
67	0.9481	0.986	1	0.978
68	1	0.809	0.7275	0.8455
69	0.9736	1	0.97167	0.9818
70	1	0.9348	0.98883	0.9745
71	0.9437	0.9864	1	0.9767
72	0.977	1	0.97334	0.9834
73	0.9789	1	0.98867	0.9892
74	0.9075	0.9484	1	0.9519
75	1	0.9445	0.94027	0.9616
76	0.9608	1	0.92067	0.9605
77	0.9494	1	0.98121	0.9769
78	0.9963	1	0.86945	0.9552
79	1	0.9399	0.94402	0.9613
Mean Cost Efficiency	0.926	0.9332	0.94238	0.9339
Minimum	0.5757	0.5552	0.39808	0.6672
Maximum	1	1	1	0.9983
Standard Deviation	0.098	0.1011	0.11017	0.0662