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Performance Evaluation Of Insurance Companies Using Data Envelopment Analysis (Studies Empirical On Insurance General Listed On The Indonesian Stock Exchange Period 2020-2023)

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ABSTRACT
The study analyzes the efficiency levels of general insurance companies listed on the Indonesia Stock Exchange from 2020 to 2023 using the Data Envelopment Analysis (DEA) method, specifically the input-oriented variable return to scale (VRS) model. The study uses total assets and operational expenses as input variables and premium income and claims paid as output variables. The results show that out of the 13 companies sampled, Asuransi Ramayana Tbk achieved optimal technical and scale efficiency with a lambda value of 1 throughout the 2020-2023 period. Other companies reached technical and scale efficiency but were not consistent over the four-year period. Academically, this research contributes to existing literature by adding theories on company performance efficiency using the DEA method in general insurance companies listed on the IDX. Practically, the analysis results provide insights into areas that need improvement by management to enhance efficiency. Thus, this study offers additional insights for various stakeholders to improve the performance and competitiveness of the insurance industry in the future.

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INTRODUCTION

Insurance is a non-bank financial institution whose role is to collect funds from the public to prevent possible losses from occurring due to an uncertain event in the future. (Wangi & Darwanto, 2020). Company insurance generally own role Which very vital in guard stability finance public And business with provide protection financial to risk Which No unexpected (Rahmalia, 2023).

The Indonesian General Insurance Association (AAUI) noted that until December 2023 there were 132 insurance companies consisting of 79 general insurance, 49 life insurance, 2 social security programs. The growth of this company triggers an increase in the condition and amount of assets, investments, claims and premiums. The following is a graph of the business growth of Insurance Companies in Indonesia in 2019-2023.

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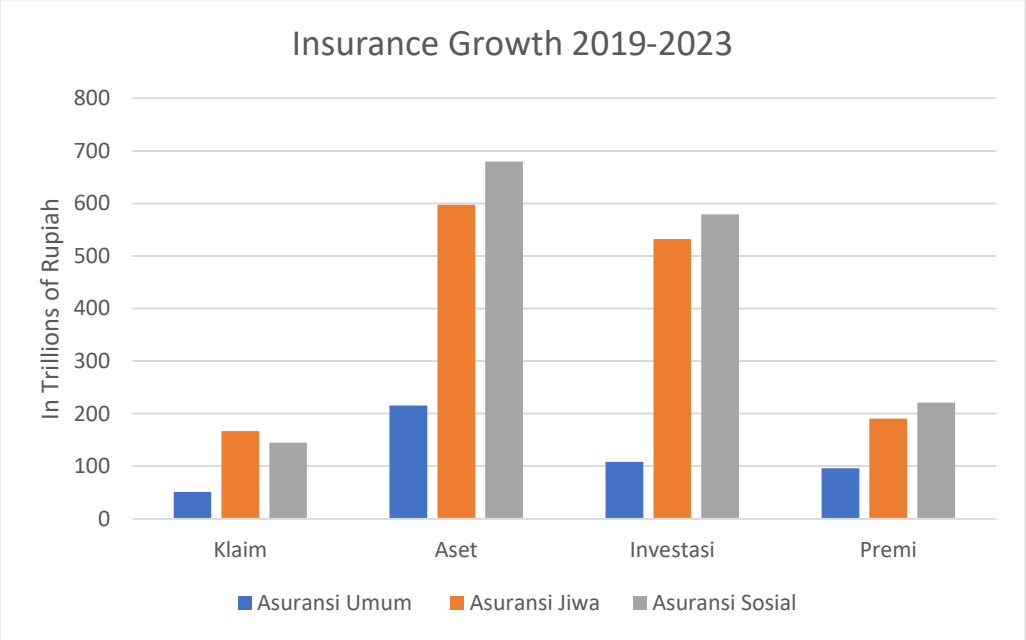

Insurance Business Growth Graph in Indonesia period 2019-2023
Source : OJK, data processed

Figure 1 shows the growth of the insurance sector in Indonesia during the 2019-2023 period based on the average total value of claims, assets, investments and premiums in trillions of rupiah for general insurance, life insurance and social insurance. Life Insurance shows the highest claim value with an average of around 166.76 trillion rupiah, followed by Social Insurance with an average of 144.75 trillion rupiah, while General Insurance has the lowest average claim of 50.65 trillion rupiah. Meanwhile, in terms of assets, Social Insurance recorded the highest value with an average of 679.81 trillion rupiah, followed by Life Insurance with an average of 597.22 trillion rupiah, and General Insurance with an average of 215.71 trillion rupiah. In investment value, Life Insurance shows dominance with an average investment value of 531.99 trillion rupiah, followed by Social Insurance with 578.91 trillion rupiah, and General Insurance with 107.99 trillion rupiah. In terms of premiums, Social Insurance has the highest average of 220.77 trillion rupiah, followed by Life Insurance with 190.66 trillion rupiah, and General Insurance with 96.02 trillion rupiah. Based on graph 1, it can be seen that Life Insurance and Social Insurance have a significant contribution in terms of claims, assets, investments and premiums compared to General Insurance during the 2019-2023 period. This reflects significant differences in the scale of operations and financial capabilities between these types of insurance. The steady increase in the value of assets and investments, especially in Life Insurance and Social Insurance, shows healthy and sustainable growth in the insurance sector in Indonesia, but more attention needs to be paid to general insurance in its contribution through claims, assets, investments and premiums. Therefore, for optimal company performance, efficiency levels or values must be measured. By assessing

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the level of efficiency, the company will know how much its ability is to optimize existing resources.

It is very important to assess the level of efficiency of insurance companies. Efficiency assessments can be a reference for companies to determine managerial capabilities in carrying out their operations. Efficiency measurements can also be an indicator to assess a company's managerial ability in facing intense competition in the national sharia insurance industry, in addition to emphasizing reducing operational costs. Efficiency is not only about reducing costs, but also includes the relationship between *input* and *output , so that input* management can produce optimal *output .* Companies that use fewer *inputs but produce* more (Dwijayanti et al., 2022).*output can be considered more efficient*

Understanding the efficiency of insurance company performance through analytical tools such as *Data Envelopment Analysis* (DEA) is very important. This will help in formulating strategies and policies that support the growth of the insurance sector, which can ultimately strengthen the national economy. Method *Data Envelopment Analysis* (DEA) is approach *nonparametric* Which based linear *programming* For evaluate performance efficiency from a units Work or *Decision Making Unit* (DMU) (Seran et al., 2023). DEA Also used For evaluate the relative performance of a number of entities, such as companies or business units, within convert a number of *input* become *output* . Method This developed by Abraham Charles, William W. Cooper, And Edwardo Rhodes on beginning in 1978. This method allows measuring efficiency without requiring assumptions certain about functional form production or distribution. This method can also find out what variables are sources of inefficiency and is able to provide a *projected value* for these variables to achieve optimal efficiency

Literature Review

Insurance

According to the Decree of the Minister of Finance of the Republic of Indonesia No. 792 of 1990 financial institutions are all bodies whose activities are in the financial sector, collecting and distributing funds to the public. Financial institutions are divided into two types, namely bank institutions and non-bank financial institutions. Insurance is a non-bank financial institution that provides risk management services through premiums from customers. Insurance is one of the non-bank financial industries that carries out agreements between two parties, where the insured party binds himself to the insured by receiving insurance premiums (Hasanatina et al., 2021).

Efficiency

In general, efficiency aims to achieve maximum results using minimal resources. Efficiency reflect ability a organization or entity in manage source Power company to achieve the goals and objectives reflected in performance results achieved through various strategy Which implemented (Ghoni & Efendi, 2021). The concept of efficiency can be understood from two main perspectives namely the technical perspective (*Engineering*) and the economic perspective (*Economics*) (Seran et al., 2023). In this research, we will examine the concept of efficiency from this point of view management that prioritizes an economic perspective. Insurance performance efficiency refers to the insurance company's ability to

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manage resources optimally to achieve maximum results. An efficient insurance company is able to provide financial protection to policyholders at competitive premiums, while maintaining profitability (Dwinata, 2024). Efficient insurance performance also includes intelligent risk management, effective claims management, and determining premiums that are appropriate to the risks taken (Kori et al., 2024).

Data Envelopment Analysis (DEA) Method

The Data Envelopment Analysis (DEA) method is a non-parametric technique used to measure the efficiency of Decision *Making Units* (DMU) in organizations or companies that have diverse *inputs* and *outputs* . Measurement efficiency with DEA generally use two The first model is the *Constant Return to Scale* (CCR) model. This model assumes that ratio between additional *inputs* and *outputs* remains constant, which means if there is an increase *in input* x times, then *output* Also will increase as big as x time. The second model is *Variable Return to Scale* (VRS) which assumes that ratio between additional *inputs* and *outputs* not fixed, meaning increasing *input* does not always result in increased *output* which is proportional but can be more or less. There are two measurement orientations in DEA, namely the first *input* orientation, perspective This consider efficiency as effort For reduce use *input* , However still produce *output* in amount Which consistent. Both *output* orientations, this perspective considers efficiency as an effort to improve *output* in a way proportional with use level *input* Which still.

METHODS

Descriptive analysis is a method for presenting data that has been processed and interpreted objectively, with the aim of providing appropriate and relevant information related to the topic being discussed. Descriptive analysis uses DEAP version 2.1 makes it easier for the author to measure the efficiency of each general insurance company in the research period, namely 2020-2023

Data Types and Sources

The data used in this research is panel data in the form of annual financial reports of general insurance companies for the period 2020-2023. Financial report data was obtained from the Indonesian Stock Exchange website. Apart from that, this research also uses other complementary data obtained from related literature, journals, books and internet media.

Population

The entire object to be studied or the population used is the annual report of all General Insurance companies listed on the Indonesian Stock Exchange for the 2020-2023 period which is published on the Indonesian Stock Exchange Website every year (2020-2023).

Data Analysis Model

The data analysis model used in this research is quantitative descriptive analysis using the Data Envelopment Analysis method which is used with the Variable return to scale model which is oriented towards input variables to calculate the efficiency score of general insurance companies listed on the Indonesia Stock Exchange.

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Variables and Operational Research

Table 1 describes the input and output variables used in insurance company efficiency analysis. The input variables consist of Total Assets (X1), which is the total amount of the company's financial and non-financial assets at the end of the period, and Operational Expenses (X2), which are the total costs incurred by the company to support its operations, both measured in IDR units. Output variables include Premium Income (Y1), which is the total income from selling insurance policies, as well as Claims Paid (Y2), which is the amount of money paid in response to claims from customers.

Analysis descriptive is method for present the data that has been processed and interpreted in a way objective , with objective give appropriate and relevant information related with topics discussed . Analysis descriptive using DEAP version 2.1 makes it easier writer For measure efficiency in each company insurance general in period study that is 2020-2023

Table 1. Operational Variables

Variable	Definition	Unit of Measure
	Input Variables	
Total Assets (X1)	The total amount of an insurance company's financial and non-financial assets at the end of the period	*IDR*
Operational Expenses (X2)	The total costs incurred by the company to support operations	*IDR*
	Variable Output	
Premium Income (Y1)	Total revenue earned by the company and sales of insurance policies	*IDR*
Claim Paid (Y2)	The amount of money paid in response to a claim	*IDR*

RESULTS AND DISCUSSION

Application of the Data Envelopment Analysis (DEA) method to general insurance companies listed on the Indonesia Stock Exchange by analyzing *input - output variables* using a value added approach which is a combination of the production approach and the intermediation approach which assumes that the insurance company provides three main services, namely insurance as *risk. pooling* , insurance provides *reel services,* insurance as a financial intermediary company (Huang & Eling, 2013).

The added value approach uses components of company assets and liabilities, which include investment activities, company capital and expenses that are the company's obligations. Meanwhile, the *output* variables are premium income and claim payments. These *input* and *output* variables reflect the three main services of insurance companies (Cummins & Zi, 1998).

DEA evaluation aims to measure the company's technical efficiency and scale by comparing *the output* to *input ratio* . This process allows the identification of companies that

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are operating efficiently as well as providing insight into areas that require improvement. Through this analysis, general insurance companies can improve their operational performance and competitiveness in an increasingly competitive market. Table 2 shows a description of the *input variables* in the form of total assets and operational expenses of general insurance companies listed on the Indonesia Stock Exchange for the 2020-2023 period.

Table 2. Description Variable Inputs
Figures are presented in rounding millions

No	Issuer Code	Insurance Company Name	2020	Year 2021	Year 2022	Year 2023
1	ABDA	Bina Dana Arta Insurance Tbk				
		Total Assets	2,477,782	2,495,891	2,472,106	2,664,451
		Operational Expenses	414,382	369,939	417,837	427,837
2	AHAP	Asuransi Harta Aman Pratama Tbk				
		Total Assets	577,745	666,904	933,279	3,661,950
		Operational Expenses	179,390	214,168	234,020	659,324
3	AMAG	Multi Artha Guna Insurance Tbk				
		Total Assets	4,737,130	4,652,818	4,705,846	8,777,951
		Operational Expenses	625,517	574,992	631,151	1,330,706
4	ASBI	Bintang Insurance Tbk				
		Total Assets	871,769	954,657	989,811	970,378
		Operational Expenses	255,688	243,998	219,654	215,441
5	ASDM	Insurance Dayin Mitra Tbk				
		Total Assets	859,877	822,740	888,974	982,940
		Operational Expenses	129,502	130,379	132,177	145,659
6	ASJT	Tania Services Insurance Tbk				
		Total Assets	365,764	527,852	499,032	498,723
		Operational Expenses	80,992	75,068	72,642	79,556
7	ASMI	PT Asuransi Maximus Graha Persada Tbk.				
		Total Assets	990,992	981,090	1,063,471	961,063
		Operational Expenses	171,263	186,225	186,225	272,747
8	ASRM	Ramayana Insurance Tbk				
		Total Assets	1,516,563	1,411,160	1,627,242	1,850,769
		Operational Expenses	552,794	606,205	785,603	851,040
9	LPGI	Lippo General Insurance Tbk				

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No	Issuer Code	Insurance Company Name	2020	Year 2021	Year 2022	Year 2023
		Total Assets	2,815,578	2,923,286	2,930,665	2,769,428
		Operational Expenses	513,488	530,879	510,027	501,064
10	MTWI	PT Malacca Trust Wuwungan Insurance Tbk .				
		Total Assets	551,011	534,963	989,742	1,179,690
		Operational Expenses	75,144	86,702	128,757	95,675
11	PNIN	Paninvest Tbk				
		Total Assets	34,211,725	35,275,479	35,694,847	23,630,140
		Operational Expenses	882,422	812,156	810,907	9,645,416
12	MONUMENT	PT Asuransi Tugu Pratama Indonesia Tbk				
		Total Assets	19,460,095	20,188,056	21,581,305	25,137,943
		Operational Expenses	927,691	975,770	1,151,997	1,440,714
13	VINS	PT Victoria Insurance Tbk .				
		Total Assets	322,342	356,588	297,046	242,935
		Operational Expenses	20,727	22,488	22,753	6,518

Table 3 shows a description of *the output variables* in the form of premium income and claims paid from general insurance companies listed on the Indonesia Stock Exchange for the 2020-2023 period.

Table 3. Description of Output variables
Figures are presented in rounding millions

No	Issuer Code	Insurance Company Name	2020	Year 2021	Year 2022	Year 2023
1	ABDA	Bina Dana Arta Insurance Tbk				
		Premium Income	802,235	713,230	714,075	846,992
		Claim paid	370,888	275,973	290,863	317,132
2	AHAP	Asuransi Harta Aman Pratama Tbk				
		Premium Income	837,197	577,004	702,878	1,517,986
		Claim paid	254,646	292,025	533,199	750,458
3	AMAG	Multi Artha Guna Insurance Tbk				
		Premium Income	1,992,080	2,109,968	2,225,683	4,013,472
		Claim paid	764,286	763,239	849,386	1,553,669
4	ASBI	Bintang Insurance Tbk				
		Premium Income	474,837	487,824	471,409	406,866
		Claim paid	197,265	162,216	224,439	220,861

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No	Issuer Code	Insurance Company Name	2020	Year 2021	Year 2022	Year 2023
5	ASDM	Insurance Dayin Mitra Tbk				
		Premium Income	1,107,198	1,071,773	1,212,546	1,333,695
		Claim paid	158,306	159,742	111,344	101,875
6	ASJT	Tania Services Insurance Tbk				
		Premium Income	167,131	197,340	169,851	194,641
		Claim paid	114,171	89,511	75,577	75,561
7	ASMI	PT Asuransi Maximus Graha Persada Tbk.				
		Premium Income	396,965	952,389	1,773,568	1,897,301
		Claim paid	320,137	239,152	175,192	202,041
8	ASRM	Ramayana Insurance Tbk				
		Premium Income	1,485,993	1,784,315	2,226,473	2,152,405
		Claim paid	882,401	1,036,790	1,166,220	1,138,070
9	LPGI	Lippo General Insurance Tbk				
		Premium Income	1,733,497	2,185,977	2,759,681	3,544,242
		Claim paid	951,724	1,431,598	1,980,323	94,594
10	MTWI	PT Malacca Trust Wuwungan Insurance Tbk .				
		Premium Income	371,431	377,462	690,640	636,190
		Claim paid	197,472	248,751	251,460	228,918
11	PNIN	Paninvest Tbk				
		Premium Income	2,527,887	2,376,853	2,254,499	2,217,799
		Claim paid	1,715,444	1,613,710	1,849,505	1,520,270
12	MONU-MENT	PT Asuransi Tugu Pratama Indonesia Tbk				
		Premium Income	6,057,127	5,986,273	6,705,580	7,709,524
		Claim paid	8,069,759	2,832,902	2,284,626	2,785,387
13	VINS	PT Victoria Insurance Tbk .				
		Premium Income	128,750	101,455	131,089	131,843
		Claim paid	49,369	58,145	53,463	60,307

Source BEI 2023, data processed

DEA Analysis Results

Efficiency calculations using Data Envelopment Analysis have criteria where a general insurance company will be declared efficient if the value is 100% or 1. Meanwhile, it will be declared inefficient if the value is <100% or <1.

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Table 4. DEA Analysis Results for General Insurance Companies

Period	2020			2021			2022			2023		
Firm	crste	vrste	scale	crste	Vrste	scale	crste	vrste	scale	crste	vrste	scale
ABDA	0.37	0.376	0.982	0.33	0.332	0.992	0.247	0.288	0.858	0.363	0.435	0.834
AHAP	1	1	1	0.756	0.957	0.789	0.833	0.984	0.846	0.543	0.741	0.733
AMAG	0.482	0.786	0.614	0.599	0.758	0.79	0.499	0.507	0.983	0.544	1	0.544
ASBI	0.471	0.563	0.836	0.413	0.587	0.704	0.404	0.538	0.751	0.55	0.588	0.935
ASDM	1	1	1	1	1	1	0.963	0.986	0.976	1	1	1
ASJT	0.628	1	0.628	0.485	0.774	0.626	0.35	0.648	0.54	0.457	0.556	0.822
ASMI	0.677	0.777	0.87	0.809	0.81	0.999	1	1	1	1	1	1
ASRM	1	1	1	1	1	1	1	1	1	1	1	1
LPGI	0.761	0.948	0.802	1	1	1	1	1	1	0.85	1	0.85
MTWI	0.899	1	0.899	1	1	1	0.747	0.768	0.973	0.73	1	0.73
PNIN	0.382	0.406	0.939	0.684	0.685	0.999	0.587	0.588	0.999	0.113	0.307	0.367
TUGU	1	1	1	1	1	1	0.793	1	0.793	0.445	1	0.445
WIN	0.772	1	0.772	0.894	1	0.894	0.835	1	0.835	1	1	1
Mean	0.726	0.835	0.873	0.767	0.839	0.907	0.712	0.793	0.889	0.661	0.817	0.789

Source : Data processed researcher , 2023

Based on Table 4 , it shows that during 2020-2023 there was 1 company considered most efficient both in technical efficiency and scale efficiency, namely ASRM insurance company. This indicates that the *input use* of total assets and operational expenses has been carried out optimally to maintain *the output of* premium income and claims paid in the general insurance company and makes ASRM the main *benchmark* for other companies in achieving optimal efficiency. Meanwhile, ASDM companies experienced efficiency in the 2020-2021 period, but there was a slight decline in 2022, but in 2023 they again showed efficiency both technically and on scale.

TUGU Company shows engineering efficiency from 2020 to 2023, but is only efficient on scale in 2020-2021 and experiences a decline in 2022-2023. The VINS company consistently maintained technical efficiency from 2020 to 2023, but was not efficient on a scale in 2020-2022, although it increased in 2023. The LPGI company was optimal in efficiency in 2021-2023, but was not efficient in the previous year. Meanwhile, the ASMI company was inefficient in 2020-2021, but will start to be efficient in 2022-2023 by optimizing the use of total assets and operational expenses to maintain premium income and claims paid.

ABDA and PNIN companies show the lowest efficiency during 2020-2023. ABDA is highly technically inefficient, with its lowest annual technical efficiency value of 0.376 in 2020, decreasing to 0.332 in 2021, reaching a low of 0.288 in 2022, and increasing slightly to 0.435 in 2023. Although the scaled efficiency value is quite high, there is a slight decline in 2022 and 2023, indicating that the company is still close to optimal scale but needs to improve in the use of *inputs* to maintain *output* .

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PNIN shows inefficiencies, especially in scale efficiencies. In 2023, the PNIN scale efficiency value is the lowest among all companies analyzed, only 0.367. Previously, the PNIN scale efficiency value was almost perfect in 2021 and 2022 at 99.9%, but fell drastically in 2023. In technical efficiency, PNIN showed variability with low values in 2020, increased in 2021 and 2022, but fell again drastically in 2023. ABDA needs focus on technical efficiency, while PNIN needs to focus on scale efficiency to improve performance.

During the 2020-2023 period, the average technical efficiency (TE) and scale efficiency (SE) of general insurance companies experienced fluctuations. Average TE, which measures resource utilization to produce *output* , varies from year to year. In 2020, the average TE was 83.5%, rising slightly to 83.9% in 2021, falling to 79.3% in 2022, and rising again to 81.7% in 2023. This shows variation in insurers' ability to maximize their technical efficiency each year.

Average scale efficiency (SE), which measures how close a company is operating to optimal scale, shows a different trend. In 2020, the average SE was 87.2%, increasing significantly to 90.7% in 2021, indicating the company is closer to optimal scale. However, the average SE decreased to 88.9% in 2022 and fell further to 78.9% in 2023, indicating the company's difficulty in maintaining optimal operating scale in recent years.

CONCLUSION

This analysis shows that despite improvements in technical efficiency and scale in recent years, general insurance companies on the Indonesia Stock Exchange also face challenges that affect their efficiency. Companies need to continue to evaluate and optimize the use of assets and operational expenses to increase efficiency in premium income and claims paid.

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