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by Nadya Setiawati

MARKET SHARE OR EFFICIENCY? CAUSALITY TEST IN INDONESIAN GENERAL INSURANCE INDUSTRY

Abstract

This study aims to analyze the relationship between market share and technical efficiency of companies in the Indonesian general insurance industry. This study utilizes the data of general insurance companies for the periods 2010-2020 from The Indonesian Financial Services Authority (OJK). The result shows that efficient companies came from the group of firms with relatively high market shares and the group of firms with relatively low market shares. Furthermore, the panel Granger-causality test indicates a one-way direction of causality, where only the market share has an impact on the technical efficiency score. Also, the results of panel regression using the Feasible Generalized Least Square (FGLS) model show that market share has a negative impact on technical efficiency scores. In addition, other variables namely, age of the company, merger and acquisition, and listed in the stock exchange do not have a significant effect on the efficiency score. These results suggest that the quiet-life hypothesis applies in the Indonesian general insurance industry. Hence, the government needs to promote competition among the companies in this industry.

Introduction

Risk and uncertainty are challenges faced by individuals, households, and governments. One way to overcome this risk is to use insurance services (Sinha & Dionne, 2001). Along with the increase in risk and uncertainty at the national and global levels, the insurance industry's role is getting stronger. This is evidenced by the growth of the Non-Bank Financial Institutions (NBFI) sector globally which is driven by an increase in the insurance industry (FSB, 2020). The role of the insurance industry is also seen in the influence of the industry on the NBFI sector in Indonesia. In 2019 the insurance industry had the highest proportion of assets in the NBFI sector with a contribution of 52.99 percent of the total assets in the sector (OJK, 2020).

One sector in the insurance market in Indonesia that continues to experience growth is the general insurance industry. In the periods 2010 - 2020, the value of gross premiums in the general insurance industry continues to increase. As with the value of gross premiums, total assets in the general insurance industry also have a positive trend in the same time frame (OJK, 2010; 2015; 2021). However, the general insurance industry in Indonesia has relatively slow growth in the number of companies with a negative trend. From 2010 to 2020, the number of companies in the industry decreased by an average of 1.2 percent annually. This condition indicates that there are barriers to entry into the market, which are characteristic of a market with several dominant or concentrated companies (Martin, 1979). Whereas high market concentration can affect efficiency and welfare (Indiastuti & Setiawan, 2020). This can be proven by the relatively low-efficiency value of the Indonesian insurance industry compared to developed countries in Asia and Europe (Eling & Luhnen, 2010). In addition, as compared to

other Asian countries, Indonesian general insurance industry has a low penetration in the economy (OECD, 2016).

Two hypotheses can explain the relationship between company dominance based on its market share and efficiency. The first hypothesis is the quite-life (QL) hypothesis proposed by Hicks (1935), which states that a company in a monopoly condition will be free from competition and cause the company to have low incentives in optimizing its efficiency (Setiawan et al., 2012; Alshammari et al., 2019). On the other hand, another hypothesis, namely the efficient-structure (ES) proposed by Demsetz (1973), states that companies with high efficiency can produce at low costs to make the company profit and a higher degree of concentration.

Most studies conducted in the insurance industry indirectly test the ES hypothesis with the QL hypothesis. There is a study that compares the ES hypothesis with the Structure-Conduct-Performance (SCP) hypothesis, where the SCP hypothesis states that market structure can affect performance through company behavior in a market (Mason, 1939; Bain, 1951). This can be shown by Alhassan et al. (2015) whose study found that the ES hypothesis applies to both the life insurance industry and general insurance in Ghana.

Besides the proof between the ES and SCP hypotheses, some studies try to test these two hypotheses with another hypothesis, namely the Relative Market Power (RMP) hypothesis. This hypothesis was developed by Shepherd (1983), which states that an increase in market share causes an increase in market power and is accompanied by an increase in prices and profits. Therefore, under certain conditions, the RMP hypothesis will be the same as the QL hypothesis (Alshammari et al., 2019). The study on the property insurance industry conducted by Choi & Weiss (2005) shows a negative relationship between market share and price and profit, so the ES hypothesis applies to the industry under study. On the other hand, Weiss & Choi (2008) found that in the automotive insurance industry the SCP hypothesis does not apply because market concentration is not positively related to price. Meanwhile, the RMP hypothesis does not apply to states with strict pricing policies or only applies to competitive states. On the other hand, Alhassan & Biekpe (2016) found a positive influence between competition and efficiency in the general insurance industry in South Africa. These findings indicate that the higher the competition, the higher the company's efficiency scores. Conversely, if the lower the competition, the lower the company's efficiency, so based on this, the QL hypothesis is the valid hypothesis. The same thing was also found by Alshammari et al. (2019) on the takaful industry in the Gulf Cooperation Council[1], where the positive relationship between competition and efficiency shows that the QL hypothesis applies in the industry.

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[1] The Gulf Cooperation Council is an economic and political alliance of Middle Eastern countries.

There are also studies related to efficiency in the general insurance industry in Indonesia, such as Abidin et al. (2022), who performed efficiency calculations on general insurance companies in Indonesia in 2017 and 2018. In addition, a study conducted by Abidin & Cabanda (2011) found that large companies have a higher level of efficiency than small companies. However, these studies are still unable to clearly show whether it is efficiency that drives an increase in market share or whether market share has implications for company efficiency. Hence, there is a need to have direct test between market share and efficiency to determine which hypotheses (between QL and ES) that applied. Furthermore, through testing the applicability of ES or QL hypothesis it can generate more approriate policy design to developing the industry (Setiawan et al., 2012).

Therefore, this study has three objectives. First, to measure the market share value and the efficiency score of general insurance companies in Indonesia. Then, this study aims to contribute to the literature by examine the causal relationship between market share and technical efficiency in the insurance industry in Indonesia in order to find out which quiet-life (QL) hypothesis or efficient-structure (ES) hypothesis applies to the industry. The final objective is to explore the relationship between market share variables and technical efficiency based on the results of testing the QL and ES hypotheses on the panel Granger-causality test.

Research Method

This study uses panel data of companies in the general insurance industry sector in the period 2010 – 2020. The data is sourced from the Financial Services Authority (OJK). All variables are deflated using the GDP deflator with the base year 2010 sourced from the Central Statistics Agency (BPS). Based on Table 1, it is known that there is a fairly high variation in each of the variables used in this study.

Variables	Obs	Mean	Std Dev	Min	Max
Operational Cost	831	610.469	102.784	42.778	731.612
Equity	831	720.321	924.996	3.844	7216.718
Technical Reserves	831	455.354	727.749	10	5657.513
Net Claims	831	383.525	300.422	3.125	4545.311
Investment Income	831	65.298	93.437	6.758	694.213
Asset	847	1111.341	1839.203	0	12811.1

Table 1. Descriptive Statistics from 2010 – 2020 in billion Rupiah
Sources: OJK, Processed by authors

Table 1 is a descriptive statistic from the adjusted data. The adjustment was made because there were 0 values and negative values in several variables that would be used as inputs and outputs in the DEA method. In fact, all data used in the DEA method must have a positive value (Joseph, 2002). In addition, there are differences in the number of observations on the variables used in this study, which means that there is a missing value in the data used. Therefore, as Alhassan & Biekpe (2016) did, the authors adjusted the data by adding a certain constant value so that all data were positive. Meanwhile, there are not many alternatives to overcome the missing value problem, so the author eliminates DMU with incomplete data. However, the authors did not make adjustments to the asset variable due to the completeness of the data values, as well as to be able to produce the actual market share value in the general insurance industry in Indonesia.

This study uses four stages of analysis: First, calculate the market share of insurance companies in Indonesia. Then, measure technical efficiency by using Data Envelopment Analysis (DEA). After that, this study uses the Granger-Causality test to examine the causal relationship between technical efficiency and market share. Finally, panel regression was carried out to estimate the direction of the relationship between the two variables based on the results of the Granger Causality test.

In general, market share is the actual part of sales, both in terms of quantity and value of the company's money to the entire market (Cooper & Nakanishi, 2010). Market share in the insurance industry can be calculated through the amount of assets conducted by Cummins, Tennyson & Weiss (1999) or through gross premiums accomplished by Ansah-Adu et al. (2011) and Alhassan et al. (2015). In this study, the market share calculation is conducted by comparing the company's assets with the total assets of the insurance industry in Indonesia.

Efficiency measurements are carried out to see the company's performance compared to the others. The method that is often used to measure efficiency in the insurance industry is Data Envelopment Analysis (DEA) (Luhnen, 2009). DEA is a non-parametric approach that uses linear programming to measure efficiency values based on optimization of the combination of inputs to outputs (Eling & Luhnen, 2010b). Each input-output combination of each Decision Making Units (DMU)[2] will be compared with the most efficient unit of analysis and a value will be obtained between 0 to 1. Where, if the unit gets a value of 1 then the unit is said to be an efficient unit, whereas if the value is further away from the number 1 then the unit is increasingly inefficient.

The DEA model has two assumptions: Charnes et al. (1978) proposed the assumption of Constant Return to Scale (CRS), while Banker et al. (1984) introduced the assumption of Variable Return to Scale (VRS). The CRS assumption only applies when each DMU is operating optimally. Even though there are factors such as imperfect competition markets that can cause DMUs to not operate optimally (Casu & Molyneux, 2003). Therefore, this study uses the VRS assumption because it recognizes that DMUs can operate at a sub-optimal scale (Diacon et al., 2002).

This study seeks to determine the technical efficiency of insurance companies in the form of the company's ability to maximize output from certain inputs (*output oriented*) (Setiawan et al., 2012). This is motivated by the assumption that general insurance companies in Indonesia are in a competitive industry (Barros et al., 2005). Therefore, the firm will compete

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[2] In this study, the DMU in question is an insurance company in Indonesia.

to maximize its output with other companies. The DEA VRS model with output-orientation in this study is denoted by the following equation:

$$max_{\theta,\lambda}\ \phi, \lambda\ \text{s.t.}$$
$$-\phi q_i + Q\lambda \geq 0,$$
$$x_i - X\lambda \geq 0,$$
$$l1'\lambda = 1,$$
$$\lambda \geq 0,$$

Where, ϕ represents technical efficiency (Farrel, 1957) with $1 \leq \phi \leq \infty$ and $\phi - 1$ is a proportional increase in the output of firm i with constant quantity of inputs. While the efficiency score is denoted by $1/\phi$ whose value varies from 0 to 1 (Coelli et al., 2005).

Input Choice

In general, studies related to efficiency in the insurance industry using DEA have three choices of input factors, namely labor, business service and capital. However, in general, there are limited data on labor and business services for companies in the insurance industry. Therefore, Cummins et al. (1999) and Luhnen (2009) proxied the two inputs by the company's operating costs each year divided by the average wage in the insurance sector. However, this cannot be done due to the limited availability of data on average wages in the insurance sector in Indonesia. Thus, in this study, operational costs are used as a proxy for labor and business services as done by Diacon et al. (2002), Ansah-Adu et al. (2011), and Alhassan et al. (2015). Meanwhile, capital input is separated into two categories: debt capital and equity capital. As Luhnen (2009) did, equity capital is proxied by equity. Meanwhile, technical reserves are used to represent the debt capital, according to studies by Alhassan et al. (2015) and Alshammari et al. (2019).

Output Choice

There are three principal approaches in selecting output in the financial services industry: asset (intermediation), user cost, and value-added. However, the value-added approach is commonly used in the literature because of its suitability for use in measuring efficiency in the insurance industry (Cummins & Weiss 2000). Based on this approach, there is an assumption that insurance companies will provide three main services, including (a) risk pooling and risk bearing, (b) financial services related to insured losses, and (c) intermediation. The first two types of services are proxied by net claims as done by Luhnen (2009), although there are other alternatives, by using premium as the proxy. However, the premium cannot represent the output because it is the value of quantity times price (Yuengert, 1993). Meanwhile, the output of intermediation services is proxied by investment income as done by Diacon et al. (2002) Klumpes (2007), and Alhassan & Biekpe (2016).

Input	Output
Operational Cost	Net Claims
Equity	Investment Income
Technical Reserves	

Table 2. List of Input and Output Variables for DEA
Sources: Processed by authors

Technical Efficiency-Company Market Share

To examine the relationship between market share and technical efficiency, which will determine whether the quiet-life (QL) hypothesis or the efficient-structure (ES) hypothesis

applies to the insurance industry in Indonesia, the panel Granger-causality test is used. The regression model used is based on the research of Setiawan et al. (2012), with the following equation.

$$TE_{it} = \alpha_i + \sum_{K=1}^{K} \beta_K TE_{it-K} + \sum_{K=1}^{K} \gamma_K MS_{it-K} + v_{it}$$

$$MS_{it} = \lambda_i + \sum_{K=1}^{K} \alpha_K TE_{it-K} + \sum_{K=1}^{K} \delta_K MS_{it-K} + \varepsilon_{it}$$

Where the TE variable is the technical efficiency and the MS variable is the market share of the insurance company. Both variables will be transformed into log form to ensure that the TE variable remains in the range 0 and 1 even though MS has increased. Through this test, it will be known between the QL hypothesis and the ES hypothesis, which theory applies. Then a panel regression was performed based on the results of the panel Granger-causality test.

$$y_{jt} = a_i + \beta x'_{it} + \beta z_{it} + u_{it}$$

The variables x and y are determined by the results of the panel Granger-causality test. If the ES hypothesis holds, then the variable y is market share and variable x is efficiency. On the other hand, if the QL hypothesis holds, then the y variable is efficiency and the x variable is the industrial concentration. In addition, there is a variable z as a representation of several control variables used in the model. The selection of these control variables is very dependent on the results of the panel Granger-causality test itself. For example, based on the research of Alhassan et al. (2015), when the ES hypothesis applies, the control variables used include total assets, the ratio of losses to premiums obtained, the ratio of debt to assets, the growth rate of GDP, and the inflation rate. Another example, based on research by Alhassan & Biekpe (2016), when the QL hypothesis applies, the control variables used are diversification, total assets, age, claims to premium ratio, reinsurance to premium ratio, and debt to equity ratio. However, in this study, the selection of control variables used will be readjusted based on the literature and the availability of data that can be used.

Result and Discussion

After making several adjustments and estimating market share and conducting DEA, the market share value and technical efficiency score of the general insurance industry in Indonesia in the 2010-2020 periods were obtained. Table 3 shows that in 2010-2020 there are several general insurance companies with a high average level of market share with an average efficiency value equal to 1, such as PT Astra Buana, PT Asuransi Umum Panin, and PT Asuransi Sinar Mas. On the other hand, in the same time span there are several companies that have a low average market share with an efficiency value equal to 1, namely PT Asuransi Wanamekar Handayani, PT Asuransi CHUBB Indonesia, and PT Asuransi Puri Asih. However, the three companies (PT Asuransi Wanamekar Handayani, PT Asuransi CHUBB Indonesia, and PT Asuransi Puri Asih) have ceased to operate since 2011. This indicates that in addition to the level of efficiency, the value of market share also determines the company's ability to survive in the general insurance market in Indonesia.

High Market Share Companies			Low Market Share Companies		
Company's Name	Efficiency	Market Share	Company's Name	Efficiency	Market Share
PT Asuransi Astra Buana	1.000	8.918	PT Asuransi Karyamas Sentralindo	0.968	0.066
PT Asuransi Kredit Indonesia (Persero)	0.961	8.078	PT Asuransi Puri Asih	1.000	0.064
PT Asuransi Jasa Indonesia (Persero)	0.661	8.040	PT Lloyd Indonesia	0.958	0.026
PT Panin Insurance Tbk. (PT Asuransi Umum Panin)	1.000	7.869	PT Asuransi CHUBB Indonesia	1.000	0.013
PT Asuransi Central Asia	0.750	7.518	PT Asuransi Wanamekar Handayani	1.000	0.004

Table 3. Average Value of Efficiency Score and Market Share of Indonesian General Insurance Companies in 2010 – 2020

Sources: Processed by authors

In addition, based on Table 3, it can be seen that the average efficiency value in companies with a high market share, such as PT Asuransi Jasa Indonesia (Persero) and PT Asuransi Central Asia did not achieve an efficiency value equal to 1. In fact, the average value of efficiency is relatively lower compared to companies with the lowest average market share. Thus, this finding has not been able to show a clear relationship between a company's market share and its technical efficiency. Therefore, further analysis is needed to find out a clear relationship between the two variables.

This study uses the panel Granger-causality test using a vector autoregression (VAR) model and a forward orthogonal deviation (FOD) approach. This is done to reduce the number of lost observations due to the unbalanced data (Abrigo & Love, 2016). Meanwhile, the determination of the order is carried out using the model determination criteria (MMSC) by Andrews & Lu (2001) and using the first 4 lags as an instrument. As a result, the first-order panel VAR model was chosen because it has smaller MBIC, MAIC, and MQIC values compared to other orders. By using the fisher-type stationary test (Choi, 2001), it is known that both the market share variable and the efficiency variable are significant at the 1 percent level, so that the panel Granger-causality test can be carried out at the level of these variables.

Independent Variables	Dependent Variables	
	MS	TE
TE	1.365	
MS		11.301***

Table 4. Panel VAR Granger-Causality Test Block Exogeneity Wald Tests

Sources: Processed by authors

Notes: *** Significant at 1%

Table 4 shows that there is only a one-way causality relationship, with the MS variable has a significant effect on the TE variable. Where, the company's market share will affect the efficiency of

the company itself. This shows that the hypothesis that applies to the general insurance industry in Indonesia is the QL hypothesis. Henceforth, an analysis of the effect of market share on efficiency will be carried out because of the applicable QL hypothesis.

As done by Setiawan et al. (2012), this study uses a panel regression model as an additional test of the QL hypothesis in the observed industry. This method is used to determine whether there is a negative impact of market share on the technical efficiency score of general insurance companies in Indonesia. In the panel regression model, the market share variable is transformed into log form as done by Barros et al. (2010) so that the data used can be distributed more normally. In addition, several control variables that can also affect the efficiency level of insurance companies are included, such as company age, dummy mergers and acquisitions, and dummy listed on the stock exchange3. These variables were chosen because in general, older companies have better adaptability and reputation than new companies (Alhassan & Biekpe, 2016). In addition, mergers and acquisitions can also provide benefits for companies such as increased investment income and increased income at every level of risk. Thus, insurance companies that carry out mergers and acquisitions can experience increased efficiency (Cummins et al., 1999). Meanwhile, the dummy variable listed on the stock exchange is used to capture the effect of transparency on government requirements (Barros et al., 2010).

Based on the results of the Hausman test, the prob>chi2 value is 0.0069, which means that the null hypothesis is rejected or the fixed-effect model is more suitable to use than the random-effect model. Then, the heteroscedasticity test was carried out using the Modified Wald test for groupwise heteroscedasticity. The result is the value of prob>chi2 is equal to 0, or the value is smaller than the p-value of 0.05. As a result, there is a heteroscedasticity problem in the model. Therefore, this study uses the generalized least squares (GLS) method to overcome these problems. The results of the estimates made with GLS are shown in Table 5.

Variables	TE
Ln(marketshare)	-0.004***
	(0.001)
Age	9.08*10-6
	(7.22e-05)
merger & acquisition	-0.005
	(0.003)
Listed	0.001
	(0.004)
Constant	0.684***
	(0.003)
Observation	831
Number of Companies	92
Standard errors in parentheses	
*** p<0.01, ** p<0.05, * p<0.1	

Table 5. Feasible Generalized Least Squares Results
Sources: Processed by authors

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[3] Company age data and data on mergers and acquisitions are obtained from the company's official website and the OJK insurance directory; meanwhile, data listed on the stock exchange can be accessed on the old Indonesia Stock Exchange. www.idx.co.id/perusahaan-tercatat/profil-perusahaan-tercatat

Based on the results of Feasible Generalized Least Squares (FGLS) in Table 5, it can be seen that market share and technical efficiency have a negative relationship and significant at a 1 percent level. This means that the higher of market share owned by the company, the company's efficiency score will decrease. This finding is in line with the research of Alshammari et al. (2019) which shows the company's efficiency score will decrease when the company's market share increases. Thus, based on the results of the panel Granger-causality test as well as the results of the panel regression, the QL hypothesis can be said to be proven in the Indonesian general insurance industry.

Meanwhile, all control variables used in the model: company age, merger and acquisition dummy, and stock exchange listed dummy; does not have a significant effect on the efficiency score of general insurance companies in Indonesia.

Conclusion

This study attempts to test the QL hypothesis with the ES hypothesis through the panel Granger-causality test in the Indonesian general insurance industry in the period 2010 − 2020. In addition, this study also conducted panel data regression as an additional test of the applicable hypothesis.

The estimation results that have been carried out show that efficient companies (efficiency score = 1) are found in groups of companies with relatively high and relatively low market shares. Then the results of the Granger-Causality test show that, there is a one-way causality relationship where only market share affects efficiency. Therefore, based on these results, the QL hypothesis becomes a hypothesis that applies to the general insurance industry in Indonesia. This is supported by the panel regression results which show that there is a negative effect of market share on company efficiency in the general insurance industry in Indonesia.

This study indicates that the validity of QL hypothesis in Indonesian general insurance industry. Therefore, there is a need for government intervention to encourage competition among the companies and free-entry in this industry. Hence, through increasing the competition among the companies, it can drive better efficiency in general insurance sector and deliver greater social benefits for the society.

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Proofread This part of the sentence contains an error or misspelling that makes your meaning unclear.

P/V You have used the passive voice in this sentence. You may want to revise it using the active voice.

Article Error You may need to use an article before this word.

Frag. This sentence may be a fragment or may have incorrect punctuation. Proofread the sentence to be sure that it has correct punctuation and that it has an independent clause with a complete subject and predicate.

Proper Nouns You may need to use a capital letter for this proper noun.

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Proofread This part of the sentence contains an error or misspelling that makes your meaning unclear.

S/V This subject and verb may not agree. Proofread the sentence to make sure the subject agrees with the verb.

P/V You have used the passive voice in this sentence. You may want to revise it using the active voice.

Confused You have used either an imprecise word or an incorrect word.

Article Error You may need to use an article before this word. Consider using the article **the**.

Article Error You may need to remove this article.

Missing "," Review the rules for using punctuation marks.

Article Error You may need to use an article before this word.

Missing "," Review the rules for using punctuation marks.

Article Error You may need to use an article before this word. Consider using the article **the**.

Missing "," Review the rules for using punctuation marks.

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Article Error You may need to use an article before this word.

P/V You have used the passive voice in this sentence. You may want to revise it using the active voice.

S/V This subject and verb may not agree. Proofread the sentence to make sure the subject agrees with the verb.

Hyph. Review the rules for using punctuation marks.

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Article Error You may need to remove this article.

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