

Conference Paper

Hospital Efficiency in Indonesia with Frontier Analysis

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Abstract

Hospitals are health care institutions for people who provide individual health services. Health services in hospitals are provided for inpatients, outpatients, and emergency unit patient. Facilities in the hospital are also provided for the fulfillment of health services for all patients. However, currently, there are still many doctors who are unbalanced in getting patients. For example, in a hospital, there is a doctor who is a favorite of patients, so they have a large queue of patients. However, on the other hand, some doctors are not favorites so that almost no patients come. This makes the hospital inefficient in terms of labor and time. This study discusses the efficiency of existing resources in hospitals which includes input variables (beds, general practitioners, specialist doctors, nurses, pharmacists, medical technicians, health workers, non-health workers, building area) and output variables (inpatient, outpatient, and patient emergency unit). The method used in this study is Stochastic Frontier Analysis using Frontier 4.1 software. The results indicated that more than 50% of the hospitals are below the efficiency average. This happens for the three types of output.

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1. Introduction

Health is an overall condition that includes the physical, mental, and social aspects of each human being (Setiyo, 2015). The health industry is one indicator that supports economic progress and prosperity. Also, the health industry is also one of the government's priorities because it is related to the quality of human resources. Health is the right of all Indonesian people, and the people of Indonesia are entitled to proper health facilities. One facility that supports health is the role of hospital growth (Syukro, 2017).

In the current era of globalization, the population of a country if monitored from year to year is increasing. Indonesia is the fourth most populous country in the world, with a population of 258,316,051 people (Dickson, 2018). When compared with the ratio of the population in the world, Indonesia is recorded at 3.5% of the population in the world. However, when viewed from population growth in Indonesia in 2012-2016, population

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growth is increasing. Population growth, which continues to increase from year to year needs special attention, especially in terms of health. Health is the most important thing in human life. The health industry in Indonesia has a bright future because the need for health is classified as mandatory and urgent. The growth in the number of hospitals is considered important to meet people's needs. Apart from that, the need for resources in the hospital must be able to meet the wishes of patients. However, in reality, there are still many hospitals that have excessive human resources due to uneven placement in each hospital. As a result, there are hospitals that are inefficient in terms of resources within the hospital. One method approach that can measure efficiency is the stochastic frontier analysis (SFA) method. Efficiency measurement with the SFA assessment is based on the production function. This SFA approach can only be used for analysis with multiple inputs and one output variable. The analysis that can be done through the SFA method includes knowing which DMUs or production units are relatively efficient, which production units are not yet or less efficient. The SFA method can also analyze profit and non-profit companies (Coelli, Rao, O'Donnell, & Battese, 2005).

2. Literature Review

Efficient comes from Latin "efficere" which means to produce or make. An activity or action that we do can be said to be efficient if it reaches maximum results. So efficiency is when the sacrifice or effort that we do is proportional to the maximum results that we get. Based on KBBI, the Big Indonesian Dictionary, efficiency is defined as the ability to do work properly and adequately (by saving energy, time, and cost). According to Robbins & Coulter (2010), Efficiency refers to getting the most output from the least input. Because managers handle rare inputs, including resources such as people, money and equipment - how these resources can be used efficiently. Efficient is often referred to as "doing things right", that is by not wasting resources. The type of method used to measure the level of efficiency Also into two, namely parametric methods and nonparametric methods. Parametric methods for measuring the level of efficiency, including ratio analysis and Stochastic Frontier Analysis (SFA). Ratio analysis is an approach that provides information about the relationship between one input and one output, and its weaknesses cannot be used for cases with many inputs to the output whereas Stochastic Frontier Analysis (SFA) can only accommodate one output with many inputs.

Efficiency related to resources, especially doctors, is very instrumental in increasing hospital profits. Research in Germany, which took physician practice data from 2008

- 2010 using panel data of 5,964 practices and using the SFA method, showed that management of disease management by specialists produced higher profit efficiency values. Apart from that, handling practices in groups can be more efficient than individual practices (Kwietniewski & Schreyögg, 2016). Another study that supports this research is Pross, Strumann, & G (2018), where the study used data from 2006 to 2013 with a total of 1100 observations in German hospitals. The results of the study are that regional (regional) and hospital special categories can improve resource efficiency. Then a Vietnam study conducted by Pham (2011) also supported that there was evidence of an increase in overall technical efficiency from 65 percent in 1998 to 76 percent in 2006. Hospital productivity increased by around 1.4 percent per year, mainly due to increased technical efficiency. Also, provincial hospitals are more technically efficient than central hospitals and hospitals located in various regions (Pham, 2011). In Coelli, Rao, O'Donnell, & Battese (2005) state that modern efficiency measurements were first pioneered by Farrell (1957), working with Debreu and Koopmans, by defining a simple measure to measure the efficiency of a company that can take into account much input. According to Coelli, Rao, O'Donnell, & Battese (2005), there are two types of efficiency measurements, namely:

1. Input-Oriented Measures

Input-oriented measurements show that a number of inputs can be reduced proportionally without changing the amount of output produced (Arcaya & Yumanita, 2006).

2. Output-Oriented Measured

Output orientation measures when many outputs can be increased proportionally without changing the number of inputs used. (Arcaya & Yumanita, 2006).

Data use processing Frontier Software 4.1. Frontier Software 4.1. This can be used to predict production functions with various choices, namely:

1. Predict the production function model with panel data that is not balanced (balance) and has a normal distribution cut off,
2. the two-stage regression function by calculating the estimation of production functions and efficiency than the results of predictions on the value of the effect of inefficiencies from specific variables (such as managerial, producer characteristics, etc.) and
3. estimating cost functions and predicting efficiency both technical efficiency and cost efficiency functions.

3. Methodology/Materials

This research uses quantitative methods. Quantitative methods are research methods that are based on a positivist philosophy, and sampling techniques are generally done randomly, data collection uses research instruments, data analysis to test predetermined hypotheses (Sekaran, 2013). The data used is hospital data obtained from the health ministry page data of the Republic of Indonesia. Time data collection (Time horizon) for the related variable is One-Shot Cross-Sectional, that is, and research carried out data is only taken once in a given period, to answer research questions or research hypotheses (Sekaran, 2013). In this study, data collection from the population of all hospitals in Indonesia in 2018. The type of research used is associative (describing the relationship and causal influence of causation) and descriptive (describing a problem or problem in a variable such as average, median, mode, etc.) supporting previous studies that have been done. The data used to estimate and hypothesis test the Cobb Douglas production function is adjusted data from the complete data relating to inpatients totaling 1550 hospitals and 1405 for outpatients.

4. Results and Findings

The research results in this dissertation are the results of the efficiency of Stochastic Frontier Analysis (SFA). The following is the result of frequency efficiency from the SFA results

TABLE 1: Inpatient.

Data	Frequency
$E \leq 0,1$	0
$0,1 < E \leq 0,2$	283
$0,2 < E \leq 0,3$	272
$0,3 < E \leq 0,4$	255
$0,4 < E \leq 0,5$	232
$0,5 < E \leq 0,6$	179
$0,6 < E \leq 0,7$	160
$0,7 < E \leq 0,8$	80
$0,8 < E \leq 0,9$	54
$E \leq 0,9$	35
TOTAL	1550

When referring to inefficient classification according to Coelli, Rao, O'Donnell, & Battese (2005) and paying attention to the results of calculations using the Stochastic

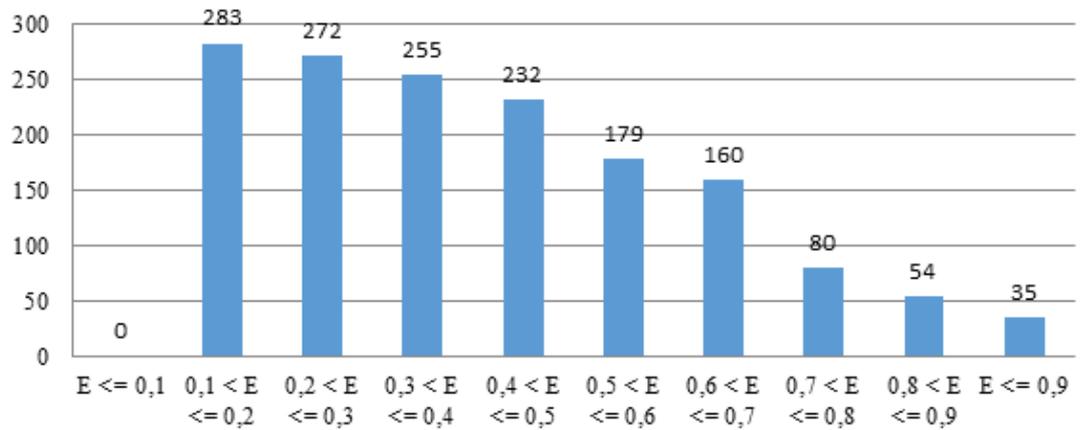


Figure 1: Efficiency Value of Inpatient.

Frontier Analysis (SFA) function presented in Table 1 and Figure 1, showing that the majority of hospital management is still less efficient as many as 1,381 hospitals (90%) seen from the efficiency value of inpatients, accordingly. There are 283 hospitals or around 18% with efficiency levels below 0.2, 272 hospitals with efficiency levels between 0.2 - 0.3, 255 hospitals with an efficiency level of 0.3 - 0.4, 232 hospitals with an efficiency level of 0.4 - 0.5, 179 hospitals with a level efficiency of 0.5 - 0.6, 160 hospitals with efficiency levels of 0.6 - 0.7, 80 hospitals with efficiency levels 0.7 - 0.8, 54 hospitals with efficiency levels 0.8 - 0.9, and 35 hospitals with efficiency levels 0.9 - 1.0. This inefficiency is probably caused by hospital management factors that have not been optimal and characteristic characteristics of the hospitals studied.

TABLE 2: Skewness Coefficients.

N	Valid	1550
	Missing	0
	Mean	.415106548
	Std. Deviation	.2129311506
	Skewness	.548
	Std. Error of Skewness	.062
	Minimum	.1001228
	Maximum	.9991986

To further support the results in Table 2 and Figure 2 quantitatively the slope coefficients (skewness coefficients) are estimated using the formula (Black, 2010): $Sk = (3(\mu - Md)) / \sigma$.

The estimation results obtained by the coefficient of +0.548. This shows that the distribution of efficiency that is ramped to the right is positive (positively skewed). This means that most hospitals studied specifically for inpatients are more inefficient.

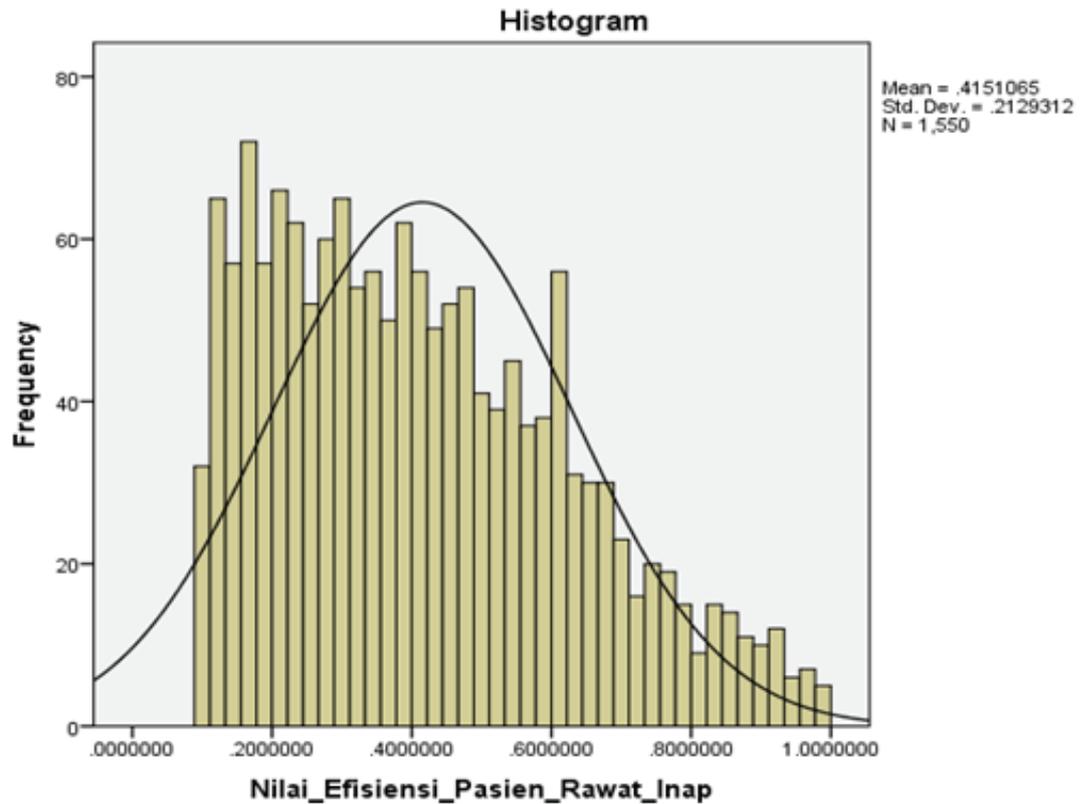


Figure 2: Skewness Coefficients.

TABLE 3: Outpatient.

Data	Frequency
$E \leq 0,1$	0
$0,1 < E \leq 0,2$	323
$0,2 < E \leq 0,3$	240
$0,3 < E \leq 0,4$	197
$0,4 < E \leq 0,5$	174
$0,5 < E \leq 0,6$	170
$0,6 < E \leq 0,7$	123
$0,7 < E \leq 0,8$	81
$0,8 < E \leq 0,9$	52
$E \leq 0,9$	45
TOTAL	1405

If we refer to inefficient classification according to Coelli, Rao, O'Donnell, & Battese (2005) and pay attention to the results of calculations using the Stochastic Frontier Analysis (SFA) function presented in Table 3 and Figure 3, showing that the majority is still less efficient, namely 1,227 hospitals (87%) seen from the efficiency of outpatients. There are 323 hospitals or around 23% with efficiency levels below 0.2, 240 hospitals

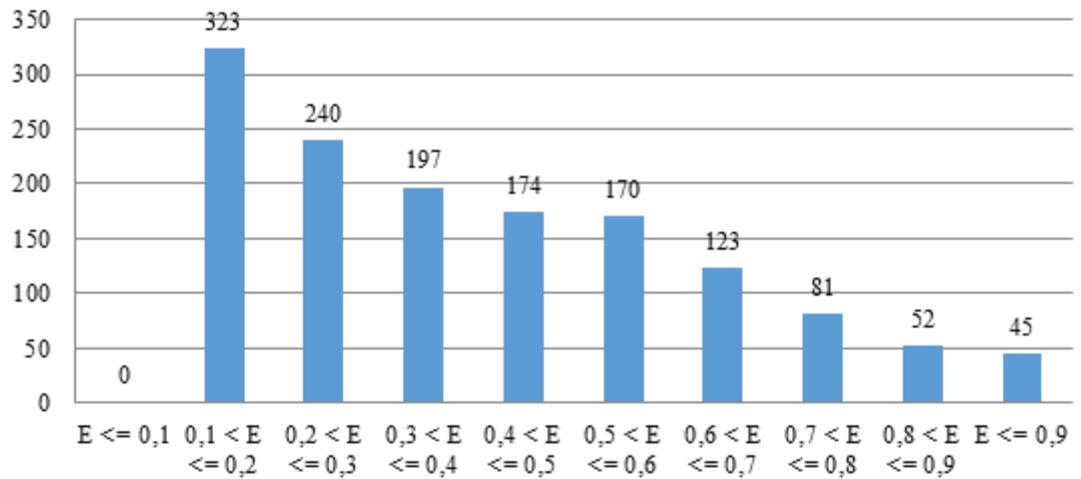


Figure 3: Efficiency Value of Outpatient.

with efficiency levels between 0.2 - 0.3, 197 hospitals with efficiency levels of 0.3 - 0.4, 174 hospitals with an efficiency level of 0.4 - 0.5, 170 hospitals with a level of efficiency. Efficiency of 0.5 - 0.6, 123 hospitals with an efficiency level of 0.6 - 0.7, 81 hospitals with an efficiency level of 0.7 - 0.8, 52 hospitals with efficiency levels 0.8 - 0.9, and 45 hospitals with efficiency levels 0.9 - 1.0. This inefficiency is probably caused by hospital management factors that have not been optimal and characteristic characteristics of the hospitals studied.

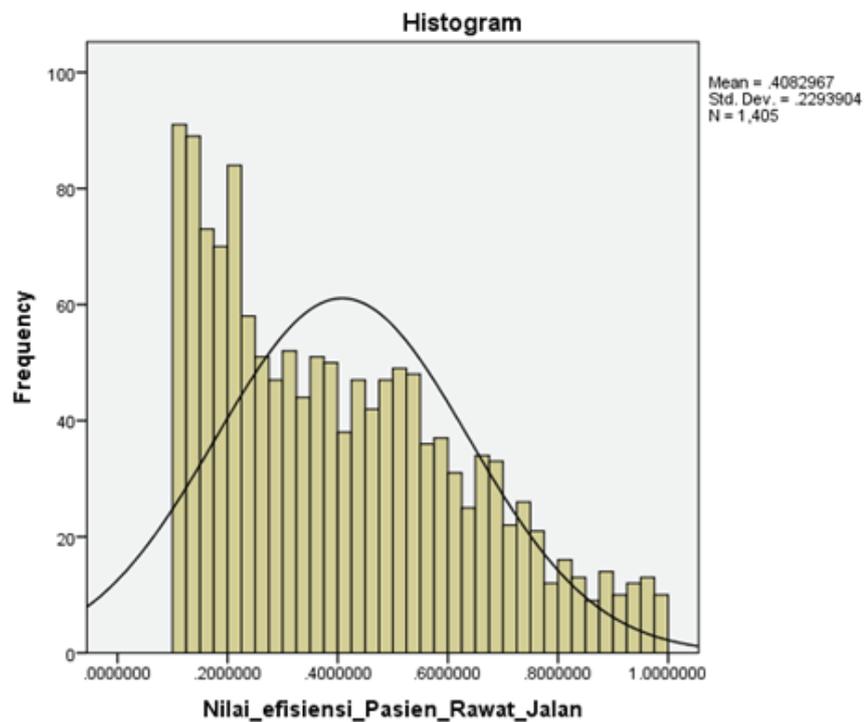


Figure 4: Positive Skewed.

TABLE 4: Positive skewed.

N	Valid	1405
	Missing	0
	Mean	.408296696
	Std. Deviation	.2293903902
	Skewness	.596
	Std. Error of Skewness	.065
	Minimum	.1000410
	Maximum	.9983617

Estimation results with the same formula, namely $Sk = (3(\mu - Md)) / \sigma$ obtained slope coefficient of +0.596. This shows that the distribution of efficiency levels is right-positive (positively skewed). This means that most hospitals studied specifically for outpatients are more inefficient.

5. Conclusion

Based on the results obtained, there are still many inefficient hospitals. This causes the hospital sometimes not optimal in maximizing the available resources. It is better for hospitals to pay attention to inpatients and outpatients in the best manner.

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