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A B S T R A K

Banyak bank berlomba-lomba mencapai efisiensi bank demi keberlangsungan usaha di tengah persaingan sektor perbankan. Hal ini menjadi penyebab pentingnya sector perbankan mengkaji efisiensi biaya bank secara reguler. Tujuan penelitian ini untuk menganalisis variabel-variabel apa saja yang mempengaruhi efisiensi biaya bank di Indonesia. Variabel yang digunakan dalam penelitian ini adalah ukuran bank, kecukupan modal (CAR), pengembalian asset (ROA), kelompok bank berdasarkan modal inti, risiko kredit (NPL), pertumbuhan ekonomi (EG) dan inflasi. Penentuan variabel input dan output bank menggunakan pendekatan intermediasi bank. Penelitian ini menggunakan data panel pada 38 bank di Indonesia periode tahun 2012-2018. Metode analisis dengan Stochastic Frontier Analysis (SFA). Hasil penelitian ini mengungkapkan empat hal. Pertama, ukuran bank berpengaruh negative terhadap efisiensi biaya bank. Kedua, resiko kredit berpengaruh positif terhadap efisiensi biaya bank. Ketiga, kecukupan modal berpengaruh positif terhadap efisiensi bank. Keempat, kelompok bank modal inti kecil berpengaruh negative terhadap efisiensi biaya bank. Variabel eksternal bank tidak berpengaruh terhadap efisiensi biaya bank di Indonesia.

A B S T R A C T

Many banks are competing to achieve bank cost efficiency for business continuity amidst the competition in the banking sector. So banks need to review cost-efficiency regularly. The purpose of this study was to analyze determinants of bank cost efficiency. Variable use bank size, capital adequacy, return on asset, group of the bank, credit risk, economic growth, and inflation on bank cost efficiency in Indonesia. Determination of bank input and output variables using a bank intermediation approach. This study used panel data on 38 banks in Indonesia for the period 2012-2018. This

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paper used the Stochastic Frontier Analysis (SFA) analysis method. The results of this study reveal four things. First, bank size has a negative effect bank cost efficiency. Second, credit risk has a positive effect on bank cost efficiency. Third, capital adequacy has a positive effect on bank efficiency. Fourth, the small core capital bank group has a negative effect on bank cost efficiency. Bank external variables do not affect bank cost efficiency in Indonesia.

INTRODUCTION

Bank has an impact on economic growth, therefore a country needs to pay attention to and support the banking sector to achieve its efficiency. Banking efficiency is one of the important indicators in assessing the best performance of a bank. A bank with maximum efficiency performance is estimated to be able to carry out the banking intermediation function optimally. Banks as intermediary institutions are very strategic for the economic development of a country. This is because the contribution of banks on a micro-economy scale is a source of financing for entrepreneurs and individuals.

A high level of operational efficiency indicates that banking performance will be better in allocating financial resources to increase investment activities and economic growth. The bank's operational efficiency is influenced by many factors including the bank's internal and external factors (Marsondang *et al*., 2020). However, in 2018, the OJK report revealed that the level of banking efficiency in Indonesia is still low, prompting the Financial Services Authority to take action (Otoritas Jasa Keuangan, 2018). Several conditions of bank efficiency in Indonesia are still low because banks have not operated optimally. Commercial banks for the period 2012 – 2016 have not operated optimally because they have not been able to optimize bank profits (Karimah *et al*., 2016). In addition, the bank has not achieved efficiency due to the merged bank ownership management. The merger of several domestic banks with foreign banks can reduce or improve banking performance (Prima, 2018). Therefore, the banking sector must strive to achieve bank efficiency.

Concerning the achievement of efficiency and banking performance, Bank Indonesia and the financial services authority (OJK) are trying to intervene to carry out supervision under the Keputusan Bersama BI – OJK No.15/1/KEP.GBI/2013 /PRJ-11/D.01/2013 on 18 October 2013 concerning Cooperation and Coordination in the Context of Implementing the Duties of Bank Indonesia and the Financial Services Authority (Bank Indonesia, 2018). Moreover, OJK Regulation Nomor 6/POJK.03/2016 concerning Business Activities and Office Networks divides banks based on the bank's core capital. Banks with core capital above Rp 30 trillion are categorized as Commercial Banks for Business Activities 4. Banks with core capital between Rp 5 - 30 trillion are categorized as Commercial Banks for Business Activities 3. Banks with core capital between Rp 1 - 5 trillion are categorized as Banks General Business Activities 2. Banks with core capital below Rp 1 trillion are categorized as

Commercial Banks Business Activities 1. Bank distribution based on core capital aims to encourage banks to improve their efficiency.

The importance of reviewing bank cost efficiency is because it is related to the return of bank core capital and affects the performance of commercial banks (Sunardi, 2017). With the efficiency in the banking sector, especially cost efficiency, optimal profits will be obtained, increasing the number of funds disbursed, more competitive costs, improved service to customers, banking security and health will increase (Buchory, 2015). The study of bank cost efficiency can be carried out using a bank intermediation approach. This is related to the determination of the bank's input and output variables. The approach to determining bank inputs and outputs consists of an intermediation approach, an asset approach, and a production approach (Hadad *et al*., 2003; Kurnia, 2004). The intermediation approach is a more appropriate approach for evaluating the performance of financial institutions in general because of the characteristics of financial institutions as financial intermediation (Berger & Humphrey, 1997).

The efficiency of the banking sector is influenced by the bank's internal factors (Apriyana *et al*., 2015; Imran, 2018; Nițoi & Spulbar, 2015). And influenced by external factors of the bank (Marsondang *et al*., 2020; Ngan, 2014). In calculating bank efficiency, it can be done using parametric and non-parametric methods (Andor & Hesse, 2011; Batir *et al*., 2017; Silva *et al*., 2017; Vu *et al*., 2019). However, the results of measuring efficiency with parametric and non-parametric methods are different (Ngo & Tripe, 2016).

The parametric method uses stochastic frontier analysis (SFA) while the non-parametric method uses linear programming (Non-Parametric Linear Programming Approach). The SFA method is increasingly developing in assessing the level of efficiency so that Frontier 4.1 software appears to estimate the cost efficiency function with panel data (Coelli, 1996). The cost function model for panel data developed by Coelli in 1992 is known as the Stochastic Frontier function model (Belotti *et al*., 2013).

This study will conduct a study of bank cost efficiency by determining the input and output variables using a bank intermediation approach (Berger & DeYoung, 1997; Hadad *et al*., 2003). Calculating bank cost efficiency with the parametric approach of the SFA method (Coelli, 1996). However, this research has a difference from other research (research gap), namely the bank's internal factors. In the internal factor, the bank adds a new variable, namely the bank group based on core capital. The bank group is divided into four sections, namely banks with a core capital of 1IV. The grouping of banks based on the amount of capital is determined by the financial services authority (OJK). This study aims to analyze what factors affect bank cost efficiency in Indonesia. There are two contributions of this research. The first shows the level of bank cost efficiency in Indonesia for the period 2012 -2018. Second, the contribution of this study reveals the analysis of bank internal factors and bank external

factors that affect bank cost efficiency in Indonesia.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Determination of bank input and output variables using an intermediation approach (Kurnia, 2004). The intermediation approach is a more appropriate approach to evaluate the performance of financial institutions in general because of the characteristics of financial institutions as financial intermediation (Berger & Humphrey, 1997). Conceptually, the bank intermediation approach uses three input variables, namely capital costs or W_1, interest cost or W_2, labor cost or W_3. s well as using one output variable, namely the number of credits or Q_1 (Fang *et al*., 2011; Karimah *et al*., 2016; Niţoi & Spulbar, 2015). Total cost is the sum of two bank fees, namely interest costs and operational costs.

Bank internal and external factors play a role in achieving bank cost efficiency. The internal variables of the bank are bank size, capital adequacy or capital equity ratio (CAR), credit risk or non-performing loan (NPL), return on assets or Return on Assets (ROA), and bank core capital. While the external variables of the bank are economic growth (GDP Growth) and Inflation (Apriyana *et al*., 2015; Kallel *et al*., 2019; Karimah *et al*., 2016).

In several studies with inter-country studies; Niţoi & Spulbar (2015) aims to analyze differences in bank cost efficiency in Western and Eastern European countries in 935 banking industries for the period 2005-2011 using the SFA method. The results reveal that economic growth and credit risk have a positive effect on bank cost efficiency. Apriyana *et al*. (2015) aim to analyze the level of cost efficiency of the SFA method in ASEAN countries, namely Indonesia, Singapore, Malaysia, the Philippines, and Thailand using SFA against 23 commercial banks in the region in the period 2005-2012. The results showed that there was a significant relationship between cost efficiency and bank internal factors, namely ROE. Even external shocks in the form of the global crisis that occurred in 2008 affected increasing bank costs. Ngo & Tripe (2016) aims to examine the choice of the method of calculating bank cost efficiency with the SFA approach in Vietnam and New Zealand. The results of the study found that the model used in determining bank cost efficiency was underestimated. The achievement of bank cost efficiency is linked to the activities of the banking system. It was found that the high banking system was found in New Zealand and the low banking system was found in Vietnam.

Research on bank cost efficiency in one China. Zhuang *et al*. (2019) aim to examine the relationship between bank cost efficiency and China's economic growth for the period 1995 – 2014 using the SFA method. The results show that the efficiency of the financial aspect has an impact on the regional economic growth of developing countries. Bank cost efficiency has a positive effect on regional economic growth. Imran (2018) tries to identify poor banks to bring banks to concentrate on improving

their performance and assessing the efficiency of 38 banks in Bangladesh. The results reveal that the average efficiency of banking costs is 88.5 percent where efficiency is lower in state-owned banks than in private-owned banks and NPL has a significant effect on reducing overall bank cost efficiency. Vu *et al*. (2019) explain that to calculate the cost efficiency of 32 banks in Vietnam for the 2011-2015 periods is using the SFA and DEA methods. Using two perspectives in assessing bank cost efficiency, namely the global bank perspective, and the bank rate perspective. The results show that there are 7 banks out of 35 that have efficiency below the average efficiency of 70 percent. The high level of bank efficiency is a bank with a score of 96.8 percent. It was also found that bank size, banking age, and bank ownership had an impact on bank efficiency. Furthermore, Imran (2018) mentions that to measure and identify cost efficiency in 35 banks in Bangladesh for the period 2011-2015 using the SFA method. The results reveal that 5 banks have the highest efficiency out of 35 banks. Most banks have not yet achieved cost efficiency. Branch banks show that the average cost of branch banks increases, thereby reducing efficiency.

A study reveals that internal factors in the form of bank size affect bank efficiency (Imran, 2018; Newell & Peng, 2009). Capital adequacy (CAR) affects bank cost efficiency (Dong *et al*., 2014; Newell & Peng, 2009). The level of bank profitability as measured by return on assets (ROA) and return on equity (ROE) affects bank cost efficiency (Dong *et al*., 2014; Rahmawati, 2015). Credit risk (NPL) affects bank cost efficiency (Fang *et al*., 2011; Imran, 2018; Newell & Peng, 2009). Banks that have a large or small level of credit risk influence bank efficiency (Fang *et al*., 2011). Based on the background and previous research, there are seven hypotheses in this study. The first hypothesis is that bank size affects bank cost efficiency. The second hypothesis is that capital adequacy (CAR) affects bank cost efficiency. The third hypothesis is that the return on assets (ROA) affects bank cost efficiency. The fourth hypothesis is that the bank's core capital affects bank cost efficiency. The fifth hypothesis is that credit risk (NPL) affects bank cost efficiency. The sixth hypothesis is that GDP Growth has an effect on bank cost efficiency. The seventh hypothesis is that inflation has an effect on bank cost efficiency.

RESEARCH METHOD

Data and variable

The population in this study is all commercial banks operating as many as 115 banks per the year 2018. The determination of the sample uses a sampling technique known as purposive sampling. Purposive sampling is one of the non-random sampling techniques where the researcher determines the sampling by determining specific characteristics that are following the research objectives so that it is expected to be able to answer the research problem (Etikan *et al*., 2016). The sample bank observations were 38 banks because they were registered with the OJK. In addition to

being registered with the OJK, this sample of 38 banks has a bank core capital category which is regulated in OJK regulation Number 6/POJK.03/2016 concerning Business Activities and Office Networks Based on Bank Core Capital. In this regulation, 38 banks fall into this category.

This study uses panel data on 38 commercial banks with a period of 2012 to 2018 so the total observations are 266. The sample in this study is divided into four groups of banks based on core capital. With the composition of core capital 1 as many as 6 banks, core capital 2 as many as 15 banks, core capital 3 as many as 13 banks, and core capital 4 as many as 5 banks (Otoritas Jasa Keuangan, 2019).

The data is obtained from the source of the data used comes from the website of Bank Indonesia and the website of the Financial Services Authority in the form of annual financial reports from 2012-to 2018. This research is also supported by several reports from Bank Indonesia (BI), the Indonesian banking directory (DPI), and the Banking Supervision Report (LPP) from the OJK.

Bank input and output variables are determined through the bank intermediation approach. The Intermediation Approach was first initiated by Sealey & Lindley (1977). The Bank Intermediation approach in treating bank deposits acts as a liaison between Lenders and Borrowers. In this study, there are three input variables, namely the cost of interest (the price of funds), the cost of physical capital (the price of capital), and the cost of employees (the price of labor). While the output variable used is only one, namely total credit or loans. The use of three variable inputs and one output is based on a bank intermediation approach which aims to convert the deficit to a bank surplus.

Table 1
Operational Research Variables

Symbol	Variable	Variable Meaning
TC	Total cost	Total interest costs and other operating costs
		Output
O1	Total loans	Total loans granted
		Input
W1	Price of fund	Interest fees (Interest Expenses)/third-party funds
W2	Price of capital	Cost of capital (Non-Interest Income)/ Fixed Assets
W3	Price labor	Labor cost/Number of labor
		Independent Variable (Exogenous)
X1	Size bank	Total assets proxy (Ln total assets)
X2	NPL	Non Performance Loan
X3	CAR	Capital Adequacy Ratio
X4	ROA	Return on Asset
Xdummy	D1-3	Group of banks based on core capital I-IV. The largest bank core capital indicator.
X5	Economic Growth	Economic growth
X6	Inf	Annual inflation

Various internal and external variables affect bank cost efficiency. In this study, the bank's internal variables consist of five variables while the external variables consist of two variables. The internal variables of the bank are bank size, capital adequacy ratio (CAR), credit ratio or non-performance loan (NPL), return on assets or Return on Assets (ROA), and bank groups based on core capital. External variables consist of economic growth and inflation.

SFA Model Specifications

In answering the research problem formulation, there are two modal specifications in this research. The first model examines the average and variation of bank cost inefficiencies and examines the non-monotonic effect on efficiency. So the translog cost function is as follows:

$$\ln\left(\frac{TC}{W3}\right) = \beta_0 + \beta_1 \ln\left(\frac{W_1}{W_3}\right) + \beta_2 \ln\left(\frac{W_2}{W_3}\right) + \beta_3 \ln(Q_1) + \frac{1}{2}\left[\beta_4 ln\left(\frac{W_1}{W_3}\right)^2 + \beta_5 ln\left(\frac{W_2}{W_3}\right)^2 + \beta_6 ln(Q_1)^2\right] + \beta_7 \ln\left(\frac{W_1}{W_3}\right).\ln\left(\frac{W_2}{W_3}\right) + \beta_8 \ln\left(\frac{W_1}{W_3}\right) \ln(Q_1) + \beta_9 \ln\left(\frac{W_2}{W_3}\right) \ln(Q_1) + v_{i,t} + u_{i,t} \quad \ldots\ldots 1$$

Notes:
Ln $\left(\frac{TC}{W3}\right)$ = logarithm of total bank fees i in year t
w_1 = input price of the fund
w_2 = input price of capital
w_3 = input price of labor
Q_1 = output in terms of loans
v_i = error term explains statistical noise
u_i = non negative random variable represents inefficiency

Parameters using the cost function above use the MLE (Maximum Likelihood Estimation) approach in Frontier 4.1 software. Maximum Likelihood Estimation is a technique to find the most probable or appropriate function in explaining the observed data.

The second model is a model that analyzes the determinants of variables with a bank intermediation approach. Internal and external variables have an impact on bank cost efficiency. The bank's internal variables consist of bank size, CAR, NPL, ROA, and bank groups based on core capital. Bank's external variables consist of GDP Growth and inflation. So the capital equation is as follows:

$$U_{it} = \beta_1 Size_{it} + \beta_2 CAR_{it} + \beta_3 NPL_{it} + \beta_4 ROA_{it} + \beta_5 GDP_{it} + \beta_6 inf_{it} + \beta_7 D1_{it} + \beta_8 D2_{it} + \beta_9 D3_{it} \quad \ldots\ldots 2$$

Notes :
U_{it} = cost efficiency level of bank i in year t for the bank intermediation approach
$Size_{it}$ = size of bank i in year t
CAR_{it} = capital adequacy ratio of bank i in year t
NPL_{it} = non performance loan of bank i in year t
ROA_{it} = return on asset of bank i in year t
D_{1-3} = dummy variable of group of banks based on core capital I-IV

GDP_{it} = exogenous variable, economic growth
inf_{it} = exogenous variable, annual inflation
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ = coefficient of variables

ANALYSIS AND DISCUSSION

The calculation of bank cost efficiency using the stochastic frontier analysis (SFA) method using frontier 4.1 software. The results of cost-efficiency measurements of 38 banks using the bank intermediation approach are shown in full in Table 2. This study made observations in 2012 -2018. This is supported by the ability of the SFA method to explain changes from time to time, not just technical matters (Fiorentino *et al*., 2006).

The results of cost efficiency have an estimated value greater than 1. In measuring the production frontier the efficiency value is between 0 to 1, while measuring the cost frontier the value is between 1 and infinity (Coelli, 1996). This value indicates that the bank manages input to output variables exceeding the efficiency limit or experiencing inefficiency. The estimated average cost efficiency of 38 banks in Indonesia from 2012 to 2018 is shown in Figure 1.

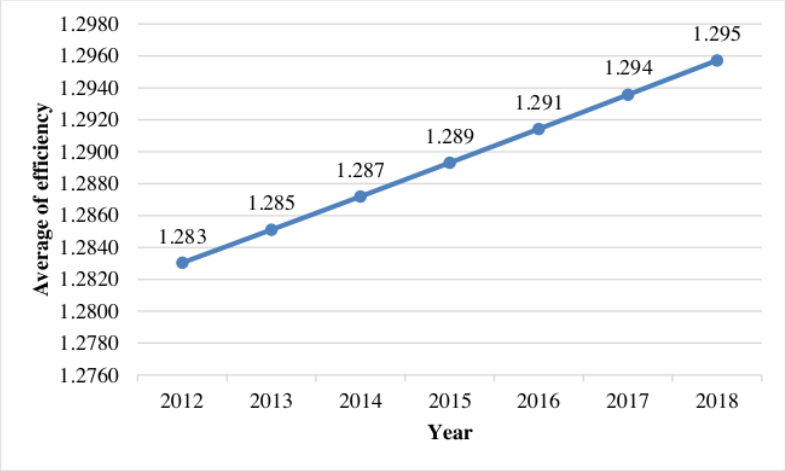

Figure 1
Estimated Average Bank Cost Efficiency
Source: *Frontier* 4.1.

Figure 1 reveals that the average cost efficiency of banks is getting further from the efficiency with the trend of the graph going upwards. This shows the estimated average cost efficiency of 38 banks for the period 2012-2018 with the highest average efficiency being 1.295 in 2018 and the lowest being 1.283 in 2012. This reveals that cost efficiency in 2012 was better than in other years. This is supported by a cost-efficiency study of Indonesian domestic banks which revealed that the value of cost efficiency was higher in the 2012-2016 period (Masitoh & Gustyana, 2019).

In detail, the average efficiency of 38 commercial banks is described in Table 3. Bank cost efficiency in 2012 the major core capital groups are BNI (1.066), Bank Mandiri (1.184), Bank BRI (1.114), Bank BCA (1.031), and Bank CIMB Niaga (1.072). In addition, the highest estimated bank cost efficiency in 2012 -2018 is NOBU Bank (Code 31) with an efficiency value above 1.7. This means that the inefficiency found in this bank is the greatest compared to other banks. The bank with the best efficiency value in 2012 – 2018 is Bank BCA (Code 4) with an efficiency value of 1.03. This means that BCA banks experience the lowest inefficiency compared to other banks. This is due to the lowest NPL of BCA banks. This will reduce the bank's operational costs.

Determinants of Cost Efficiency bank intermediation Approach

Knowing the effect of variable X on the translog model of bank cost efficiency with the bank intermediation approach, a test was carried out by comparing the Likelihood Ratio (LR) test with the Code and Palm Table (Kodde and Palm, 1986). If LR Test is 16.074 in which $\alpha = 1$ dan X = 9. So, 51.487 > 16.074 means that there is an inefficiency factor in the translog model of bank cost efficiency.

Table 4
Results of Data Processing Determinants of Cost Efficiency

Variable	Coefficient	*St-error*	t *ratio*	Significance
Bank Size	-0.412	0.205	-2.012**	Significant negative
NPL	0.092	0.035	2.620**	Significant positive
CAR	0.030	0.017	1.801***	Significant positive
ROA	0.139	0.104	1.341	
INF	-0.041	0.043	-0.964	
EG	0.410	0.278	1.478	
D1	-0.405	0.397	-1.022	
D2	-0.696	0.450	-1.547	
D3	-2.281	1.155	-1.974***	Significant negative
sigma-sq	0.381	0.217	1.752	
Gamma	0.960	0.025	37.948	
log-likelihood		73.160		

Source: Processed Data, 2020
Note Significant velue *=1%, **=5%, ***=10%

Table 4 above shows the variable bank size, NPL has a significant effect at the 5 percent level on bank cost efficiency. Variables CAR and Dummy 3, namely the group of banks with low core capital significantly affect the level of 10 percent. The results of the estimation of the determinants of cost efficiency answer the following hypotheses:

First, bank size significantly affects the cost efficiency of commercial banks at the 5 percent level. This answers the first hypothesis, namely bank size affects bank cost efficiency. This finding also indicates bank cost inefficiency. The negative sign means that the larger the size of the bank, the lower the cost-efficiency. The same results found in Vu *et al*. (2019) revealed that bank size affects the cost efficiency of

the banking sector in Vietnam. This can happen because the addition of branch offices will increase operational costs and reduce bank cost efficiency. The size of the bank affects efficiency, where a bank with a larger size is more efficient than a smaller bank (Batir *et al*., 2017; Kuchler, 2013). This is due to the higher interest costs returned to third-party banks with smaller sizes. Smaller bank interest costs are higher for the sustainability of bank operations.

Second, capital adequacy (CAR) significantly affects the cost efficiency of the commercial bank group at the level of 10 percent. This answers the second hypothesis, namely that capital adequacy (CAR) affects bank cost efficiency. A positive sign means that the higher the CAR, the lower the cost-efficiency or the higher the inefficiency. The same results were obtained in the research of Indonesian Islamic commercial banks which revealed that the CAR variable had a positive and significant effect on bank cost efficiency (Sunardi, 2017) This means that the higher the CAR value of the bank, the more efficient the bank's costs will be.

Third, return on assets (ROA) does not affect bank cost efficiency. This does not answer the third hypothesis, namely that the return on assets (ROA) affects bank cost efficiency. It is suspected that the return on assets (ROA) will have more influence on profits or profitability because ROA is used to measure the effectiveness of the company in generating profits by utilizing its assets.

Fourth, the small core capital bank group (D3) significantly affects the bank's cost efficiency at the level of 10 percent. This answers the fourth hypothesis, namely that the core capital group affects bank cost efficiency. In addition, this finding shows the existence of bank cost inefficiencies. The negative sign on the D3 variable means that if the group of small core bank capital increases, the bank's cost inefficiency will decrease.

Fifth, credit risk (NPL) significantly affects the cost efficiency of the commercial bank group at the 5 percent level. This answers the fifth hypothesis, namely credit risk affects bank cost efficiency. This finding also shows the existence of bank cost inefficiencies. The positive sign means that the higher the NPL, the lower the cost-efficiency. The same thing happened to Imran's (2018) research which revealed that NPL had a significant effect on reducing overall bank cost efficiency in Bangladesh.

Sixth, economic growth (EG) does not affect bank cost efficiency. This does not answer the sixth hypothesis, namely that economic growth affects bank cost efficiency. It is suspected that the transition to changes in economic growth does not directly affect bank operations.

Seventh, inflation does not affect bank cost efficiency. This does not answer the seventh hypothesis, namely that inflation affects bank cost efficiency. It is suspected that the transition to changes in inflation does not directly affect bank operational activities, specifically bank cost efficiency.

CONCLUSION, LIMITATIONS, AND SUGGESTIONS

The results of this study reveal that the variables of bank size (bank size), capital adequacy (CAR), credit risk (NPL), and small core bank groups have a significant effect on bank cost efficiency in Indonesia. The Bank group variable has the highest effect on bank cost efficiency. Meanwhile, the variable capital adequacy (CAR) has the lowest effect on bank cost efficiency.

The thing that is of concern in this study is that small core capital banks affect bank cost efficiency through setting bank fee inputs. Banks must minimize the input of operational costs and input of employee costs to increase bank efficiency. On the other hand, banks must strive to increase bank output through lending to the public. Therefore, the banking sector needs to manage operational costs and personnel costs wisely to minimize total costs. This is done by the banking sector in Europe and Asia.

The results of this study also reveal that there are differences in the estimated cost efficiency values of 38 commercial banks in Indonesia based on core capital. The results of the study show that in the period 2012-2018 the level of bank cost efficiency was higher in 2012 than in other years. In other words, the SFA method shows that the highest bank cost inefficiency occurred in 2018 at 25.57 percent.

This study covers the external and internal variables of the bank and cannot be separated from government policies. The difficulty or limitation of this research is the change in policies related to bank grouping based on core capital. Announcements from the financial services authority (OJK) that update bank groups will affect the number of sample banks in this study. In addition, the authors experience limitations in accessing banking financial statement information on each bank's website. Because each bank will announce its financial statements openly and completely a year or even two years later.

This study reveals that small core capital banks affect bank cost efficiency. It is even found that cost inefficiency is found in the input variable of bank costs. Therefore, there are two suggestions written by the researcher. First, it is suggested that the banking sector manages operational costs and personnel costs wisely to minimize total costs. This is as done by the sector. Bank cost-efficiency policies can be carried out by using technology to reduce large employee costs. Second, the analysis of bank cost efficiency is reviewed according to changes in bank groups announced by the financial services authority. This is necessary because every week, every month, and every year all banks experience changes in financial transactions so that it will change the category of the bank's core capital.

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APPENDIX

Table 2
List of Banks for 2012-2018

Bank Code	Bank Name	Core Capital Group
B1	Bank Negara Indonesia	IV (capital > 30 Trillion)
B2	Bank Mandiri	IV
B3	Bank Rakyat Indonesia	IV
B4	Bank MandiriBCA	IV
B5	Bank CIMB Niaga Tbk	IV
B6	Bank Ekonomi Raharja	III (capital 5- 30 T)
B7	Bank Bukopin	III
B8	Bank Tabungan Negara	III
B9	Bank Danamon Indonesia	III
B10	Bank Pembangunan Daerah Jawa Barat	III
B11	Bank Pembangunan Daerah JATIM	III
B12	Bank Maybank Indonesia	III
B13	Bank Permata	III
B14	Bank Tabungan Pensiunan Nasional	III
B15	Bank Mayapada International	III
B16	Bank Mega	III
B17	Bank OCBC NISP	III
B18	Bank Pan Indonesia	III
B19	Bank BRI Agro	II (capital 1-5 Trillion)
B20	Bank MNC International	II
B21	Bank Capital Indonesia	II
B22	Bank Nusantara Parahyangan	II
B23	Bank Bumi Arta	II
B24	Bank Ganesha	II
B25	Bank Ina Perdana	II
B26	Bank QNB Indonesia	II
B27	Bank Maspion Indonesia	II
B28	Bank Sinar Mas	II
B29	Bank Victoria	II
B30	Bank China Construction Bank Indonesia	II
B31	Bank Nobu	II
B32	Bank Woori Saudara Indonesia	II
B33	Bank Agris	I capital < 1 Trillion
B34	Bank Artos	I
B35	Bank Yudha Bhakti	I
B36	Bank Harda Internasional	I
B37	Bank Pembangunan Daerah Banten	I
B38	Bank Of India Indonesia	I

Table 3
Estimated Bank Cost Efficiency

Bank	2012	2013	2014	2015	2016	2017	2018
1	1.066	1.066	1.067	1.067	1.068	1.068	1.069
2	1.184	1.186	1.187	1.188	1.189	1.191	1.192
3	1.114	1.114	1.115	1.116	1.117	1.117	1.118
4	1.031	1.031	1.031	1.031	1.032	1.032	1.032
5	1.072	1.073	1.073	1.073	1.074	1.074	1.075
6	1.141	1.142	1.143	1.144	1.145	1.146	1.147
7	1.407	1.410	1.413	1.416	1.419	1.422	1.425
8	1.533	1.537	1.541	1.545	1.549	1.553	1.557
9	1.079	1.080	1.080	1.081	1.081	1.082	1.082
10	1.196	1.198	1.199	1.200	1.202	1.203	1.204
11	1.187	1.188	1.189	1.191	1.192	1.193	1.195
12	1.297	1.299	1.301	1.303	1.306	1.308	1.310
13	1.350	1.352	1.355	1.357	1.360	1.362	1.365
14	1.205	1.207	1.208	1.210	1.211	1.212	1.214
15	1.589	1.594	1.598	1.603	1.608	1.612	1.617
16	1.742	1.747	1.753	1.759	1.766	1.772	1.778
17	1.414	1.417	1.420	1.423	1.426	1.429	1.432
18	1.773	1.779	1.785	1.792	1.798	1.805	1.811
19	1.240	1.242	1.244	1.245	1.247	1.249	1.250
20	1.399	1.402	1.405	1.408	1.411	1.414	1.417
21	1.723	1.729	1.735	1.740	1.746	1.752	1.758
22	1.201	1.202	1.204	1.205	1.206	1.208	1.209
23	1.121	1.122	1.122	1.123	1.124	1.125	1.126
24	1.214	1.216	1.217	1.219	1.220	1.222	1.223
25	1.290	1.292	1.294	1.296	1.298	1.300	1.302
26	1.102	1.102	1.103	1.104	1.104	1.105	1.106
27	1.236	1.237	1.239	1.241	1.242	1.244	1.246
28	1.248	1.250	1.252	1.253	1.255	1.257	1.259
29	1.698	1.704	1.709	1.715	1.721	1.726	1.732
30	1.260	1.262	1.264	1.266	1.268	1.270	1.271
31	1.757	1.763	1.769	1.775	1.782	1.788	1.794
32	1.113	1.114	1.115	1.115	1.116	1.117	1.118
33	1.121	1.122	1.123	1.123	1.124	1.125	1.126
34	1.048	1.049	1.049	1.049	1.049	1.050	1.050
35	1.056	1.057	1.057	1.057	1.058	1.058	1.058
36	1.028	1.028	1.028	1.028	1.028	1.029	1.029
37	1.398	1.401	1.404	1.406	1.409	1.412	1.415
38	1.104	1.105	1.106	1.106	1.107	1.108	1.108

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