DETERMINANTS OF BANK PROFIT EFFICIENCY: EVIDENCE FROM INDONESIA

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Abstract

This study investigates the determinants of banks' profit efficiency over period 2005-2009 in Indonesian banks. Specifically it examines bank size, credit risk, capital, ownership structure and market share on banks profit efficiency. A two stage research methods is employed. First, the scores of bank efficiency are estimated using Stochastic Frontier Analysis (SFA). Second, the scores obtained are linked to a series of determinants of bank efficiency using regression techniques. The results show that score efficiency of bank in Indonesia is still inefficient. Therefore that there is a high potential to increase profit efficiency in Indonesian banks. Other result show that size, capital, ownership structure and market share of bank have significant impact on bank profit efficiency but credit risk has insignificant impact on bank profit efficiency. These results offer practical contribution to bank managers, practitioners and policy makers on the relevance of a number driving factors of bank efficiency that might help them to improve bank efficiency and banking system efficiency.

Keywords: *bank profit efficiency, stochastic frontier analysis and ownership structure*

JEL Codes: G21

I.   INTRODUCTION

Bank efficiency is one of bank performance indicators. Bank efficiency is an indicator in measuring the overall performance of bank activities. Efficiency is often defined as an organization's ability to produce maximum output using a certain input level, or use the minimum input to the level of output. Efficient and effective utilization of resources are key to the success of a bank. Some developments and recent events in the banking industry have greater   emphasis on banking efficiency. Various changes in the banking sector in Indonesia such as bank restructuring, privatization and bank prudential regulation have done to improve the banking sector. These changes are expected to encourage the creation of efficiency in the banking sector. The creation of banking efficiency is expected to encourage the banking system to be resilient against shocks and competition and ultimately to encourage the stability of the financial system.

The objectives of this study is to measure the efficiency of banks in Indonesia using the concept of profit efficiency using the Stochastic Frontier Approach (SFA). Efficiency measurements perform for the period 2005-2009. The results of efficiency score then regressed with the various determinants of bank efficiency to find out what factors can explain the difference in efficiency between banks. There are many determinants factor of banking efficiency. We examine the impact of several factors including bank size, bank risk management, bank capital, bank ownership structure and bank market share on banking efficiency.

The results show that the efficiency of banks in Indonesia for the period 2005-2009 is still not efficient. The average score for the profit efficiency is less than one, which means that banks have not be able to optimize the use of inputs to maximize output. Thus there is still potential for banks in Indonesia to improve efficiency.Other result show that size, capital, ownership structure and market share of bank have significant   impact on bank profit efficiency but credit risk have insignificant impact on bank profit efficiency. These results offer practical contribution to bank managers, practitioners and policy makers on the relevance of a number driving factors of bank efficiency that might help them to improve bank efficiency and banking system efficiency.

2. METHODOLOGY

This study uses two stages. The first stage is to measure the efficiency of profit using the Stochastic Frontier Analysis. The second stage, the efficiency scores regressed with the various factors that affect the efficiency of the bank.

2.1. Stochastic Frontier Approach

The stochastic frontier approach (SFA) was developed by Aigner, Lovel and Schmidt (1977). The SFA specifies a functional form for the cost, profit or production frontier allows for random error. According to Berger and Humprey (1997), The SFA posits a composed error model where inefficiency are assumed to follow an asymmetric distribution usually the standard normal. Both the inefficiencies and the errors are assumed to be orthogonal to the input, output, or environmental variable specified in the estimation equation. The estimated inefficiency for any bank is taken as the conditional mean or mode of the distribution of the inefficiency term, given the observation of the composed error.

Profit efficiency measures how close a bank is to producing the maximum possible profit as a best practice bank on the frontier for a given level of inputs and output. In this research we use the alternative profit efficiency. The profit function is derived as follows:

$$\text{Ln} (\pi + \theta) = f(w, p, z, v) + \ln u_\pi + \ln \varepsilon_\pi \tag{1}$$

Where π measures the profit bank, in this research we use earning before tax (EBT). We define profit efficiency as the ratio of actual predicted profit of a bank and the maximum predicted profit that could be earned if the bank was as efficient as the best bank in the sample.

$$\pi \, \text{eff}^b = \frac{\hat{\pi}^b}{\hat{\pi}^{maks}} = \frac{\left\{ \exp\left[\hat{f}(w^b, p^b, z^b, v^b) \right] x \exp\left[\ln \hat{u}_{\pi o}^b \right] \right\} - \theta}{\left\{ \exp\left[\hat{f}(w^b, p^b, z^b, v^b) \right] x \exp\left[\ln \hat{u}_{\pi o}^{max} \right] \right\} - \theta} \tag{2}$$

where $\mu_{\pi o}^{max}$ is the maximum value of μ_π^b in the sample.

The computer program Frontier (version 4.1d) used in this research to get score of profit efficiency.

2.2. The Determinants of Bank Efficiency

In the literature, bank efficiency is influenced by bank size, bank risk management, bank capital, market share and ownership of banks.

One of the important questions associated with the banking consolidation policy is whether bank size affects the efficiency. If the big banks are more efficient than small banks, then Indonesian banks enjoy increasing returns to scale. Based on the literature on the economic scale, the size of bank will have a positive effect on bank efficiency but for banks that extremely large, the effect of size can be negative. Hence, the effects of size on efficiency may be non linier.

Research on the effect of bank size on the efficiency found inconsistent results. Kwan and Eisenbeis (1997) found negative results, whereas other studies have found positive results (Berger, et al., 1993). The results of other studies (Cebenoyan, et al., 1993); (Mester, 1996)) found no significant results.

The second factor affecting the efficiency of bank is risk management The need for risk management in the banking sector is absolutely important. In this study, we only examine the risk of credit risk. Changes in credit risk will affect the overall performance of the bank (Cooper, et al., 2003). During conditions of increasing uncertainty, banks will diversify their portfolio to reduce risk. The effects of credit risk on bank efficiency differs across various research. Altunbas et al.(2000) and Altunbas et al. (2001) states that the efficiency is less sensitive to credit risk, while Hughes and Mester (1998) stated the opposite result

The third factor affecting the efficiency of bank is bank capital. Casu and Molyneux showed a negative relationship between bank capital and inefficiencies, Low capital will increase the cost of borrowing, which in turn decreases the efficiency, or in other words there is a positive relationship between bank capital and efficiency(Casu and Molyneux, 2003). Some studies have also found that higher capitalization banks are more efficient than lower capitalization banks. This is consistent with Moral Hazard theory which states that manager of institutions closer to bankcruptcy may be inclined to pursue their own interests (Berger and Humphrey, 1997)

Bank ownership structure also affects the efficiency of bank. Various studies showed that foreign owned banks are more efficient than domestic banks. The advantages of foreign banks come from bank management expertise, fundraising and better procedures. Although the impact of foreign bank presence encourages competition and affect the efficiency of domestic banks, the results of empirical studies showed inconsistent results. Empirical studies surveyed by Berger found that foreign-owned institutions are less efficient than domestic financial institutions (Berger and Humphrey, 1997). In the case of U.S., study by Hasan and Hunter found that foreign banks are less cost efficient compared to domestic banks (Hasan and Hunter, 1996). DeYoung and Nolle also find that foreign banks

have lower profit efficiency than domestic banks (DeYoung and Nolle, 1996). A study conducted by Miller and Parkhe in 14 countries found that domestic banks are more profit efficient than foreign bank (Miller and Parkhe, 2002). On other hand, some study finds that foreign banks more efficient than domestic banks (Sturm and Williams, 2004 ; Bonin et al.,(2005) ; Berger et al, (2005; 2009); and Delis and Papanikolaou)

The issue of ownership structure will also be linked to the issue of privately owned banks and publicly owned banks. The issue of public versus private ownership on the efficiency is built from the mechanism of market discipline by the shareholders. The argument is a lack of market discipline mechanism weakens owners' control over management, making management free to pursue its own agenda, and giving it fewer incentives to be efficient. Some studies showed lack of market discipline in the capital markets will lead to public companies are less efficient than private firms (Altunbas, et al., 2001); (Athanasoglou, et al., 2008). In the concentrated ownership structure,   control mechanisms and market discipline will run that lead publicly-owned banks more efficient than privately owned banks. Some studies (Berger and Humphrey, 1997); (Casu and Molyneux, 2003), showed that publicly-owned banks are more efficient than privately owned banks.

The Relative Market Power hypothesis links the market share of banks to bank efficiency. Theory of Relative Market Power (RMP) states that only firms with large market share and well product differention are able to exercise market power in pricing these products and earn supernormal profits (Berger, 1995).

3. EMPIRICAL RESULTS AND DISCUSSION

Measurement of profit efficiency scores in this study use bank as intermediary institutions. In this study, the inputs of banks are the third-party funds and other operating expenses. The output of banks are loans, placements with other banks, and non interest income. The score of profit efficiency of banks in Indonesia in 2005-2009 are presented in Table 1

Table 1. Profit Efficiency of Indonesian Banks Period 2005-2009

	2005	2006	2007	2008	2009
Mean	0.53	0.52	0.51	0.44	0.41
SD	0.23	0.01	0.24	0.27	0.27
Min	0.03	0.01	0.01	0.01	0.02
Max	0.87	0.90	0.90	0.95	1.00

Average profit efficiency of banks in Indonesia has decline over the period. During the period 2005-2009 the average score of bank's profit efficiency in

Indonesia is less than one. The results show that score efficiency of bank in Indonesia is still inefficient. Therefore that there is a high potential to increase profit efficiency in Indonesian banks

Based on bank category, the most efficient banks is the rural development banks

(61 per cent), along with foreign banks (58 per cent). Rural development banks have higher profit efficiency because their spread margin or net interest margin is high. Rural Development banks provides a low interest rate on deposits, but charge high interest on loans. The foreign banks were able to obtain a higher profit efficiency from developing or diversifying non interest income. Banks profit efficiency based on bank categories presented in table 2.

Table 2. Banks Profit Efficiency Based on Bank Category

Bank Category	2005	2006	2007	2008	2009	Average
SOB	0.50	0.53	0.51	0.38	0.33	0.45
FECB	0.48	0.44	0.41	0.28	0.23	0.37
Non FECB	0.48	0.41	0.47	0.41	0.32	0.42
RDB	0.60	0.57	0.62	0.62	0.64	0.61
JVB	0.59	0.61	0.52	0.45	0.43	0.52
FOB	0.57	0.68	0.61	0.52	0.54	0.58

Category Definitions, SOB= State Owned Bank, FECB= Foreign Exchange Commercial Bank, Non FECB= Non Foreign Exchange Commercial Bank, RDB= Rural Development Bank, JVB= Joint Venture Bank and FOB= Foreign owned bank.

Based on total assets, it appears that the larger of the bank size, then the profit efficiency increases, but after reaching a certain point of profit efficiency, it will be decreased. The highest profit efficiency is achieved when the number of bank assets in the range of one trillion-five trillion Indonesian rupiah (IDR). Banks profit efficiency based on total assets are presented in Table 3.

Table 3. Banks Profit Efficiency based on Total Assets

Total Assets	2005	2006	2007	2008	2009	Average
≤ 1T IDR	0.49	0.46	0.45	0.39	0.35	0.43
1T- 5T IDR	0.59	0.55	0.53	0.52	0.46	0.53
>5T- 20 T IDR	0.48	0.55	0.55	0.45	0.47	0.50
>20 T IDR	0.54	0.49	0.51	0.34	0.33	0.44

After banks profit efficiency scores obtained, then the efficiency score is regressed with bank size, bank risk management, bank capital, bank ownership (foreign vs. domestic vs. non-listed and listed) and the bank's market share. Regression models for analysis are as follows:

$$PE = \alpha + \beta_1 Size + \beta_2 Size^2 + \beta_3 NPL + \beta_4 CAR + \beta_5 FOR + \beta_6 LIST + \beta_7 + \varepsilon \ \ldots\ldots..(3)$$

Where PE: bank profit efficiency, size: Ln total assets, NPL: non performing loan, CAR: capital adequacy ratio, FOR: foreign owned bank, List: listed bank and MS: bank market share.

Table 4. presents the effect of size, NPL, CAR, ownership structure and market share on banks profit efficiency.

Table 4. Estimation Results

Prediction	Variable	coeficient	t-statistic
β_1 positive	Size	0.3315**	2.5664
β_2 negative	Size^2	-0.0109**	-2.4754
β_3 negative	NPL	-0.4550	-1.2028
β_4 positive	CAR	0.0221***	2.7254
β_5 Positive	FOR	0.0652**	2.5156
β_6 Positive	LIST	-0.1762***	-5.7840
β_6 Positive	MS	2.6334***	2.7338
R^2	0.1043		
F-statistik	8.8362		
Number of observation	539		

***, **, and * indicate significance respectively at 1%, 5% and 10%

Variable definitions, Size = logarithm natural of total assets, NPL= gross non performing loan (%) . CAR= capital adequacy ratio MS= Market Share FOR= Foreign ownership and List= listed.

Bank size has a significant positive effect and bank size squared has a significant negative effect, this suggests that the effect of bank size on profit efficiency is not linear. These results indicate that the larger size of the bank's profit efficiency will increase to a certain point and will go down after that point. This suggests the existence of economies of scale in Indonesian banks.

NPL has a negative coefficient but not significant, thus the hypothesis that credit risk has a negative effect on profit efficiency is not supported. The results of this study contrary with study of (Kaparakis, et al., 1994) who found a positive

relationship between the inefficiency of banks and non performing loan ratio to total loan.

Capital adequacy ratio (CAR) has a significant positive effect on profit efficiency. The results are consistent with the (Casu and Molyneux, 2003) and Girardone et.al(2004) who found a negative relationship between bank capital and inefficiency or a positive relationship between bank capital and efficiency. Positive relationship between capital adequacy and profit efficiency can be explained by the phenomenon of banks that have large capital banks tend to be healthy and have the ability to generate higher profits. This results supports the theory of Moral Hazard which states that manager of institutions closer to bankcruptcy may be inclined to pursue their own interests (Berger and Mester, 1997).

Based on ownership structure, foreign banks are more efficient than domestic banks. The results are consistent with the study of Sturm and Williams (2004) in Australia which found that foreign banks are more efficient than domestic banks because of advantages in terms of scale efficiency. These results are also consistent with Bonin et al.,(2005) ; Berger et al, (2005; 2009); Delis and Papanikolaou (2009) that also found that the most efficient bank is foreign bank. The results of this study confirm Global Advantage Hyphothesis which states that foreign banks have advantages over domestic banks. The advantages of foreign banks come from bank management expertise, fundraising and better procedures.

Listed banks have lower efficiency than non listed on banks. The results are consistent with Altunbas, et al (2001), Athanassoglou et.al (2008)), Delis and Papanikolaou (2009) who found that the listed banks are less efficient than non listed banks.The results can be explained as follows. Based on the data banks are being sampled in this study, non listed banks have higher average profit efficiency in term of SFA and Return on Assets (ROA). Higher profit efficiency in non listed banks comes from lower price of fund from their deposits. The results are inconsistent with research showing that the bank listed on the stock is more efficient than banks that are not listed on the stock exchange (Berger et al., 1997); (Casu et al., 2003).

Bank‘s market share has positive effects on bank efficiency. The results are consistent with the Berger (1995) who found the positive effect of the market share on bank efficiency. These results can be explained by the theory of Relative Market Power (RMP) states that only firms with large market share and well product differention are able to exercise market power in pricing these products and earn supernormal profits (Berger, 1995). The market share of deposits held

by banks gives banks an opportunity to get income from the products and services that banks provided. The market share of deposits allows banks to place funds in a variety of banking outputs such as loans, securities, certificates of Bank Indonesia and others. Good management in placing these funds on outputs will give a potential profit and increase efficiency.

4. CONCLUSION

The objective of this study is to investigate the determinants of banks' profit efficiency over the period 2005-2009 in Indonesian banks. Specifically it examines bank size, credit risk, capital, ownership structure and market share on banks profit efficiency. A two stage research methods is employed. First, the efficiency scores of banks are estimated using the Stochastic Frontier Analysys (SFA). Second, the scores obtained are linked to a series of determinants of bank efficiency using regression techniques.

The results showed that the efficiency of banks in Indonesia for the period 2005-2009 is still not efficient. The average score for the profit was less than one, which means the bank has not been able to optimize the use of inputs to maximize output. Thus there is still potential for banks in Indonesia to improve efficiency. Other result shows that size, capital, ownership structure and market share of banks have significant impact on bank profit efficiency but credit risk has insignicant impact on bank profit efficiency.

These results offer practical contribution to bank managers, practitioners and policy makers on the relevance of a number of factors driving bank efficiency that might help them to improve bank efficiency and banking system efficiency.

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