MACROECONOMICS AND BANKING EFFICIENCY VARIABLES IN INDONESIA

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Abstract

This study aims to investigate the performance of the technical efficiency of the banks listed on the Indonesia Stock Exchange (IDX) during the period 2008-2012 . This study uses a two-stage approach, first measuring the technical efficiency of banks using the method of data envelopment analysis (DEA), and the second stage to estimate the influence of macroeconomic factors, namely interest rates, inflation rates, and exchange rates on the technical efficiency using Tobit regression model. Based on the results of the measurement of technical efficiency of the 22 banks using the DEA method, on average the level of technical efficiency of banks has not reached the level of 100 % optimum efficiency. Macroeconomic factors influence the estimation results using the Tobit regression model showed that the variable interest rates affect the technical efficiency of banks is negative, while the rate of inflation and the exchange rate affects positively . The empirical findings of this study have implications for national banks, especially banks listed on the Stock Exchange : (1) the bank must improve technical efficiency in its operations in order to achieve optimal efficiency score of 100 percent, and (2) with better technical efficiency , banks may face turbulence changes that occur in macroeconomic factors, especially interest rates, inflation rates, and exchange rates.

Keywords : *Efficiency banks , macroeconomic, data envelopment analysis , Tobit regression*

BACKGROUND OF STUDY

Efficiency aspect for national banking industry is one of the most important aspects that must be considered by any banking managementsin order to earn healthy and sustainable financial performances.According to Wheelock and Wilson (1995), efficiency is an important measurement from banking operational conditions and namely one of the indicator keys of the success of a bank. Meanwhile Berger and Mester (1997), regard that the importance of an efficiency for a banking company can be viewed from either the micro perspective or the macro prospective.Based on the micro perspective within stricted rivalry condition, in order to be settled and developing, a bank must be efficient during the whole operational activities. Meantime from the macro perspective, an efficient banking industry can influence financial intermediation costs and, as a whole, the financial system stability. This is

due to the immensely strategic role of the banking industry as an intermediator and a producer of financial services. By means of its higher efficiency level, the banking performance ought to be better in allocating its financial sources and finally can increase the investing activities and the economical growth (Weill, 2003).

The range of bank efficiency tremendously depends on some factors which can be controled by the company management (internal factors) and some factors which are out of the company management control (external factors). These internal factors are determinants which reflect the policies and the decision of the bank itself, such as fund raising and usage (fund management), capital (capital management), liquidity management and expense management. Whereas, external determinants more influenced by macroeconomics variable, namely inflation and interest rates. Inflation becomes the macroeconomics stability indicator, and directly related to the interest rate, as well as the interest cost and revenue. The unstability of macroeconomics, in general will cause a bad impact towards banking sector performances. The capability of a bank to manage its interest rate under a high range of inflation can affect the structural cost of it and then can affect its efficiency rate.

Besides, a high inflation rate might cause a decrease towards consumers' buying power which is followed by a degression of their ability to save their funds within the bank. The decrease of the fund amount saved in a bank as an impact of a high inflation is very influential for the bank performances burdened by high operational costs, in contrast their salary from the bank interest decreases so that the bank becomes unefficient within its operational activity. Whereas along with a high rate of the bank interest, it becomes an interesting place for bank customers to save their money in order to get fixed benefits. Meanwhile on the other side, the credit distribution gets less so that the bank is burdened with higher operational expenses in running its intermediation function and might cause an inefficient bank condition.

The flaming of macroeconomics condition has been proven to stun the national banking system.The financial crisishappened in the middle of the year 1997, which is in line with Rupiah money-exchange depresiation, two-digit inflation rate and a high interest rate, has given a valuable experience for any Indonesian banking

Industries.That crisis has caused poor performances for Indonesian banks, mainly concerning about the worst financial distress. Furthermore, many banks that have experienced 'negative spread' within its operational activities, namely interest revenue from a smaller credit compared with the duty of interest payment to the depositors. This condition has been getting worse due to the government's action of liquidating 54 banks between the period of 1997-1999, as a result it affects the degradation of people's trust towards the banking services. The main factor that affects this matter is due to the inefficient operational services of the national banking.

Empiricalresearcheswhich estimates the relevance of macroeconomics variable towards banking efficiency performances are still limited.Empirical studies that are mostly developed, still focus on the efficiency performance measurement which use either parametric or non-parametric, not only within financially developed countries but also within developing countries (among others; Resti (1997), andBonin, Hasan, and Watchtel (2005)).In Indonesia, the banking efficiency study was proceeded by; Radam *et.al*, (2002), Hadad et al (2003), Mardanugraha (2005), dan Astiyah dan Husman (2006).

Several studies had investigated the relevance of macroeconomics factor towards bank efficiency, among others; Berger and Mester (2003); Drake et al. (2006); and Chan and Karim (2010),whose results had shown that the relevance of macroeconomics factor with banking efficiency differ among countries. For instance, the study of Drake et al. (2006) found out that the financial crisis of Asia in 1997/1998 was not significantly affecting the banking efficiency. Meantime the study of Chan and Karim (2010) found out that macroeconomics factor affected the rate of commercial banking efficiency in Asia, Middle-East / North Africa, and Africa. Within the context of nasional banking, this article aims to proceed an investigatioon towards banking efficiency through two steps. The first step is assessing the banking technical efficiency, whilst the second step is estimating the relevance of macroeconomics factor towards technical efficiency.

LITERATURE REVIEW

Hassand and Sanchez (2007) did a research concerning about efficiency determinant within a banking industry in South-America. The result showed that the rate of capitalisation, profitability ratios, interest rate difference and PDB growth affected positively towards a bigger banking efficiency. Whereas, the loan loss reserve, the traded stock-exchange, and the rate of inflation influenced the banking efficiency negatively.

Delis and Papanikolaou (2009) conducted a research concerning about banking efficiency determinant within ten European Countries. This research used two-sequence semi-parametric arranged to assess the specific relevance of a bank, industry and macroeconomics variable towards banking efficiency. The important findings of this research were foreign ownership, market interest rates and the development of PDB by which overall influenced positively towards the banking efficiency. Meanwhile credit risk and industrial concentration affected the banking efficiency negatively.

Naceur et al. (2009) evaluated the rate of banking efficiency of among banks in MENA countries by using estimated Meta line through DEA. Afterwards, the research applied Tobit regression in attempt to investigate the relevance of institutions, financial specific and banks as banking efficiency determinant. Their findings figured out that the banking efficiency scores within MENA countries ranged 67 percent. For the efficiency determinant, it showed that the bank whose capital is estimated to be plentiful, with substantial liquidity as well as with stock-exchange market development increased the banking efficiency. Meanwhile big amount of credit supply and market concentration to private sectors had caused low banking efficiency.

RESEARCH METHODOLOGY

This research conducted estimation between the relevance of macroeconomics factor towards the technical efficiency of the banks registered in Indonesian Stock Exchange during the periods of 2008-2012. The population within this research was the banks registered in Indonesian Stock Exchange during the

periods of 2008-2012, as estimated totally 31 banks.Meanwhile the method of choosing the samples within this research was purposive sampling, namely a method through which it uses certain criteria in order to adjust the samples. The criteria of choosing the samples within this research are: (1).the bank which has been registered since the year of 2008, and has been listed until the year of 2012,(2). the bank which has complete financial reports and available for public, and (3) the bank which has no problems that can disturb financial performances and abnormal stock exchange rates during the research period. Based on those criteria of sample selection, hereby chosen 22 banks which became the samples for this research to be analyzed further more.

The assessment of technical efficiency performances towards 22 banks which became this research samples was measured by using Data Envelopment Analysis (DEA) method with intermediation approach, in which the output consisted of Total Funding (Y1) and Total Operational Revenue (Y2), whereas the input variable consisted of Total Saving (X1), Labor Cost (X2), and Fixed Assets (X3). Afterwards, in order to estimate the relevance of macroeconomics variable towards banking efficiency performance the researcher applied Tobit regression.

Data Envelopment Analysis* (DEA)*Method

DEA method is a frontier non-parametric methodthrough whichit uses linear program model for counting the ratio between output and input for the whole unit compared within a population. The purpose of DEA method is to measure the relative efficiency rate of a bank towards another similar bank whilst the overall units remain on or under its frontier efficiency curve. Thus, this method is used in order to evaluate the relative efficiency of some objects (benchmarking performance).

CCR Model

$$Max\ h_c = \frac{\sum_{r=1}^{s} u_r y_{rc}}{\sum_{i=1}^{m} v_i x_{ic}}$$

$$Subject\ to \frac{\sum_{r=1}^{s} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \leq 1 \qquad (1)$$

r = 1,…,s; i =1,...m and j = 1,…,n

where:

c = Evaluated General Bank
y_{rj} = The output amount (r) of the General Bank (j)
x_{ij} = The input amount (i) for the General Bank (j)
u_r = The selected weight for output (r)
v_i = The selected weight for output (i)
n = The amount of General Bank
s = The amount of Output
m = The amount of Input

The objective function is defined as $h_c$which has a purpose to maximize the ratio of weighted outputs towards the weighted input of a thoroughly analyzed bank.This function is problematic by the other bank within the sample by which it cannot exceed the efficiency unit through similar weight. This matter is necessarily noted through which it is assumed that the weight is unknown, but gained through optimization. Optimization is done separately for each of unit in order to easily count the weight and the efficiency h_c.

TOBIT REGRESSION MODEL

The usage of Tobit regression model is due to the value of its dependent variable, namely the technical efficiency valued between 0 and 1. In other words, its dependent variable is censored or limited, meanwhile its independent variables have unlimited value (non-censored). Tobit regression model is one of categorical variable regression models which uses Maximum Likelihood (ML) method for estimating the model by maximizing the value of likelihood function through searching regression parameters giving the highest value for the likelihood function.

Tobit standardized-model can be defined for bank with certain (i) value as follows:

$$y_i^* = \beta x_i' + \sigma\varepsilon_i, \qquad (4)$$

where :

$$y_i = y_i^* \text{ if } y_i^* > 0$$

$y_i = 0$ if $y_i^* \leq 0$

Within Tobit model, there is anadditional scale-coefficients information (SCALE), namely the scale factor that will be estimated σ. This scale factor can be used to estimate the standard deviation of residual.

The Likelihood function (L) is maximized (Maximum Likelihood) in attempt to estimate parameter β and σ which are based on observation (bank) y_i dan x_i:

$$L = \prod_{yi=0}(1-Fi)\prod_{yi>0}\frac{1}{(2\Pi\sigma^2)^{1/2}}x\, e^{-[1/2\sigma^2)](y_i-\beta_i)^2} \quad (5)$$

Where:

$$F_i = \int_{-\infty}^{\beta x_i/\sigma}\frac{1}{(2\Pi)^{1/2}}e^{-t^2/2}dt$$

The first product is over the observations for which the banks are 100% efficient (y = 0) and the second product is over the observations for which banks are inefficient (y >0). Fi is the distribution function of the standard normal evaluated at = $\beta x_i'/\sigma$.

RESULT AND DISCUSSION

The measurement result of DEA efficiency for 22 banks registered in BEI or Indonesian Stock Exchange during the periods of 2008-2012 is displayed within tabel 1. In average, the banking technical efficiency rate has not achieved its optimal 100% efficiency rate. During the periods of 2008-2012, the technical efficiency score underwent a fluctuation. In the year of 2008, the average banking efficiency rate reached its DEA efficiency score 96.78% and considered as the highest during the periods of 2008-2012, and during the two following years continuously remained a decrease, namely in the year of 2009 in which its efficiency score ranged 91.06% and in 2010 ranged 88.28%. Within the periodical years of 2011-2012, the banking efficiency score raised an improvement, in which in the year of 2011 it increased to be 94.98%.

During the periods of 2008-2012, there were five banks consistently reached their optimal scores 100%, namely Bank Central Asia, Bank Rakyat Indonesia, Bank Danamon Indonesia, Bank Mandiri, and Bank of India Indonesia. Whereas the bank which never reached its optimal score 1 during the periods of 2008-2012 was Bank ICB Bumi Putera, Bank Negara Indonesia, Bank QNB Kesawan, and Bank International Indonesia.

The measurement result of the technical efficiency score owned by the 22 banks registered in BEI or Indonesian Stock Exchange during 2008-2012, furthermore was estimated by using Tobit regression model in order to determine whether the macroeconomics factors, namely interest rate, inflation rate, and currency affected the banking technical efficiency or not. The estimation result of Tobit regression model analysis is displayed within table 2, in which it shows that the overall macroeconomics variables, namely interest rate, inflation rate, and currency affected the banking technical efficiency significantly with its confidence level 99% (α = 1%).

Table 1.
The Technical Efficiency of 22 Banks Registered in BEI, Periods of 2008-2012

No	*Name of Bank*	*2008*	*2009*	*2010*	*2011*	*2012*
1	*Bank Central Asia Tbk*	*1*	*1*	*1*	*1*	*1*
2	*Bank ICB Bumiputera Tbk*	*0,8328*	*0,9345*	*0,9321*	*0,9183*	*0,8847*
3	*Bank Bukopin Tbk*	*0,9716*	*0,9244*	*0,7946*	*0,9081*	*1*
4	*Bank Negara Indonesia Tbk*	*0,8247*	*0,8665*	*0,8770*	*0,9208*	*0,9589*
5	*Bank Nusantara Parahyangan Tbk*	*0,9506*	*0,9048*	*0,8098*	*1*	*0,9591*
6	*Bank Rakyat Indonesia (Persero) Tbk*	*1*	*1*	*1*	*1*	*1*
7	*Bank Danamon Indonesia Tbk*	*1*	*1*	*1*	*1*	*1*
8	*Bank Pundi Indonesia Tbk*	*1*	*0,8788*	*1*	*1*	*0,8421*
9	*Bank QNB Kesawan Tbk*	*0,8327*	*0,8386*	*0,8249*	*0,9086*	*0,8572*
10	*Bank Mandiri (Persero) Tbk*	*1*	*1*	*1*	*1*	*1*
11	*Bank Bumi Arta Tbk*	*0,9739*	*0,9717*	*1*	*0,8880*	*0,9006*
12	*Bank CIMB Niaga Tbk*	*1*	*1*	*1*	*1*	*1*
13	*Bank Internasional Indonesia Tbk*	*0,9638*	*0,9995*	*0,9336*	*0,9750*	*0,9943*
14	*Bank Permata Tbk*	*1*	*0,9560*	*0,9361*	*0,9920*	*0,9185*
15	*Bank of India Indonesia Tbk*	*1*	*1*	*1*	*1*	*1*
16	*Bank Victoria International Tbk*	*1*	*1*	*1*	*0,8322*	*1*
17	*Bank Artha Graha Internasional Tbk*	*1*	*1*	*0,8730*	*1*	*0,9793*
18	*Bank Mayapada Internasional Tbk*	*1*	*1*	*0,8791*	*0,8803*	*0,9817*
19	*Bank Mega Tbk*	*1*	*0,9118*	*0,7854*	*0,7969*	*0,8880*
20	*Bank OCBC NISP Tbk*	*0,9403*	*0,9102*	*0,8244*	*0,9910*	*1*
21	*Bank Pan Indonesia Tbk*	*1*	*0,9359*	*0,8300*	*0,8842*	*0,9832*
22	*Bank Himpunan Saudara 1906 Tbk*	*1*	*1*	*1*	*1*	*0,9849*
	Average	***0,9678***	***0,9106***	***0,8828***	***0,9498***	***0,9606***

The interest rate affected the banking efficiency performance negatively with regression coefficients 0.088649, which means if the interest rate is raised up approximately 10%, so the banking technical efficiency will undergo a decrease

approximately 0.088649%. The inflation rate influenced the banking technical efficiency positively with its coefficients approximately 0.011115, which means every 10% of its increase will have a rising impact towards the banking technical efficiency approximately 0.11%. Currency also affected the banking technical efficiency positively with its coefficients 0.000166, which means if the currency of rupiah undergoes depresiation towards US Dollar approximately 10%, then the banking technical efficiency will be raised 0.00166%.

CONCLUSION

This research purposively aims to investigate the banking technical efficiency performance of the banks registered within BEI or Indonesian Stock Exchange during the periods of 2008-2012. This research applied two steps approach, firstly doing estimation towards banking technical efficiency by using Data Development Analysis (DEA) method. Secondly, estimation to the relevance of macroeconomics factors, namely interest rate, inflation rate, and currency through Tobit regression model, was applied. Based on the result of technical efficiency of the 22 banks using DEA method, in average, the banking technical efficiency rate had not achieved its optimal efficiency score 100%, but it remained above 90% during the periods of 2008-2012. The result of the relevance of macroeconomics factors using Tobit regression showed that the variable of interest rate affected the banking technical efficiency negatively, meanwhile the rate of inflation as well as currency affected it positively. These empirical findings gives an implication towards national banking industry, particularly for those registered in BEI or Indonesian Stock Exchange: (1) the bank must improve its technical efficiency in its operational activities in attempt to achieve its optimal efficiency score 100 percent, and (2) with a better technical efficiency, the bank can face fluctuating changes occurring within macroeconomics factors, mainly interest rate, inflation rate, and currency.Thus, a bank must keep alert and actively anticipating every change of macroeconomics variables, so that the bank operational activities can run normally and create sustainable performances.

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