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Performance Evaluation of 10 Indonesian Banks Using Data Envelopment Analysis (DEA) Tessa Vanina Soetanto,ST , M.Com International Business Management Program, Faculty of Economics Petra Christian University Siwalankerto 121-131 Surabaya, East Java-Indonesia 60236 tessa@peter.petra.ac.id Phone : 62-31-2983255 Fax : 62-31-2983257 Ricky, SE, MRE, CFP® International Business Management Program, Faculty of Economics Petra Christian University Siwalankerto 121-131 Surabaya, East Java-Indonesia 60236 ricky@peter.petra.ac.id Phone : 62-31-2983255 Fax : 62-31-2983257 Performance Evaluation of 10 Indonesian Banks Using Data Envelopment Analysis (DEA) Abstract The analysis of bank performance is important for creditors, investors and governments. Success in competitive markets demands achieving the highest levels of performance through continuous improvement and learning. Comparative analyses can alert institutions to new paradigms and new practices, leading to significant increases in bank efficiency and effectiveness. Bank Indonesia, Indonesian central bank, always issues the rank of 10 biggest banks in Indonesia based on the amount of total assets every year. The rank is not changing much from year to year and it is only different in term of position of each bank. The objective of this paper is to know how productively and economically efficient those biggest banks in doing their dual role as provider of the services (using production approach) and as intermediary function (using intermediation approach) compare to their peers in the industry. A non-parametric analytical technique, Data Envelopment Analysis (DEA), is used to analyze the relative performance of 10 biggest banks in 2009 during the period of 2003-2008. It is concluded that size cannot be the only factor to affirm the efficiency in productive and economical way. Overall most of the banks in the list has operated efficiently in both roles despite the fact of higher national expectation on bank"s intermediary role. Keyword : banks, DEA, technical efficiency, allocative efficiency, cost efficiency Introduction and Development of Indonesian Banking Industry The importance of Bank as the facilitator of economic development of a nation including Indonesia is getting more. Conservative economists believe that stable banking system is the pre-requisite for further development of a nation. In Indonesia, the asset of Bank relative to the total asset of finance company has reached 84.68% (Infobank Research Bureau, August 2007). This number has shown the trust given to the bank by Indonesian society. This reality must be enhanced by strong internal and external monitoring system.

Internal means self evaluation or internal audit performs by the bank to ensure the quality pursuance. External means evaluation from various parties starting from the government, customer and creditor. A reputable marketing research institution in collaboration with reputable banking periodical have been surveying the customer of banking industry since 2005 for Indonesian Banking Loyalty Index. The 2010 loyalty index shown that Bank Central Asia, Bank Mandiri and Bank BRI are in the top three spots. Learning from the history of Indonesia banking industry, customer‟s perception is a weak indicator in compare to the common financial ratio analysis namely CAMEL. CAMEL stands for Capital adequacy, Asset quality, Management, Earning and Liquidity. CAMEL rating system tends to be subjective, indecisive and inconsistent. As most bank analysts and examiners will acknowledge, there are instances when an examination of the accounting records cannot decide whether to give an average or below average score. The „good‟ and „bad‟ indicators are easy to spot, but not so the „in-betweens‟. This is a problem of indeterminacy. But when bank inspectors are forced to make a judgment, then it leads to the second problem of subjectivity. Where human minds are at work, they come with differing levels of expectations and perspectives. This is confirmed by Berger et al. (1993), that financial ratios including CAMEL are regarded as misleading indicators of efficiency because they do not control for product mix or input prices. Berger later stated that using the cost to asset ratio assumes that all assets are equally costly to produce and all locations have equal costs of doing business. Banking Industry in Indonesia has been under public scrutiny since the crash of financial sector in 1997. Learning from the financial disaster, the Bank of Indonesia (BI) has launched the grand design for banking industry namely Indonesian Banking Architecture (API). The policy direction for the future development of the banking industry set out in the API is based on the vision of building a sound, strong, and efficient banking industry in order to create financial system stability for promotion of national economic growth. In order to achieve the vision stated by BI, API believes in six major pillars: 1) Healthy banking structure, 2) Effective regulation system, 3) Effective and independent supervisory system, 4) Strong banking industry, 5) Adequate industry and 6) Robust consumer protection. Per August 2009, there are 121 commercial banks in Indonesia (including four state-own) (BI, 2010). BI believes that Banks are special and therefore must run business based on prudential principles. The functions of banks in Indonesia are basically as financial intermediary that take deposits from surplus units and channel financing to deficit units. In 2009, credit channeled through the bank raised 15.4% to Rp. 1.179 Trillion and Capital Adequacy is more than 17.6%. The same year also mark that liquidity hits Rp 307 Trillion (Bisnis Indonesia, “Arah Bisnis dan Politik 2010, page 68). The objective of this paper is to present a new method for estimating the technical efficiency (TE), alocative efficiency (AE) and cost efficiency (CE) of Indonesian domestic commercial banks in order to study the degree of productive performance of the Indonesia banking sector using the production and intermediation approach. The paper starts with introductory and brief explanation about recent development of banking industry in Indonesia. Then it continues with literature review about DEA application in banking industry worldwide and in Indonesia. The next section discusses DEA (methodology) and data also variables used in the research. Finally authors present the result along with the analysis and conclusion. Literature Review Over the last years, several papers have examined the efficiency of banks using Data Envelopment Analysis (DEA) combined with other methods such as Malmquist Index and Neural Networks. Barr et al. (2002) use a constrained multiplier, input-oriented, data envelopment analysis (DEA) model to evaluate the productive efficiency and performance of U.S. commercial banks from 1984 to 1998. They found strong and consistent relationships between efficiency and inputs and outputs, as well as independent measures of bank performance. Al-Tamimi (2006) used DEA to identify the relatively best-performing banks and relatively- worst-performing banks in the United Arab Emirates during the period 1997-2001. It also seeks to identify banks‟ efficiency scores and ranks.

Casu and Molyneux (2003) employed DEA to investigate whether the productivity efficiency of European banking systems had improved and converged towards a common European frontier between 1993 and 1997. 2

It covered

France, Germany, Italy, Spain and the United Kingdom. 2

Their results indicated relatively low average efficiency levels. Nevertheless, it was possible to detect a slight improvement in the average efficiency scores over the period of analysis for almost all banking systems in the sample, with the exception of Italy. Galagedera **and** Edirisuriya **(2004)** 2

investigate efficiency using

DEA and productivity growth using Malmquist index in a sample of Indian commercial banks over the period 1995- 2002. 1

The

rate of increase in technical efficiency though small is likely to be due to scale efficiency compared to managerial efficiency. In general, smaller banks are less efficient and highly DEA-efficient banks have a high equity to assets and high return to average equity ratios. There has been no growth in productivity in private sector banks where as the public sector banks appears to demonstrate a modest positive change through 1995-2002. 1

Angelidis and Lyroudi (2006)

examines the productivity of the 100 larger Italians banks for the period 2001-2002 using DEA **and** 2

Neural Networks.

> **There is rather an inverse relationship between size and productivity growth, in contrast to the literature. However, this relationship is not statistically significant for** the **sample firms.** **2**

Saad and Moussawi (2009) use

> **two approaches to assess the cost efficiency of Lebanese commercial banks: a nonparametric method, Data Envelopment Analysis, and a parametric method, Stochastic Frontier Analysis.** There are **43 commercial banks over a period from 1992 to 2005. The findings show that the average cost efficiency is quite high in both methods, and it is increasing over time. A test of convergence of the efficiency scores was done and indicates that there is convergence of efficiency levels of Lebanese banks between 1992 and 2005.** Later on, **an econometric model** was used **to investigate the determinants of the efficiency scores of Lebanese banks using financial and economic explanatory variables.** **3**

To date there has been relatively little research conducted in the efficiency of Indonesian banking system. The research were done by Permono dan Darmawan (2000), Hadad et al (2003), Putri dan Lukviarman (2008), Suseno (2008). Hadad et al (2003) is using non- parametric approach, DEA, to measure the efficiency of Indonesian banks from period of 1996-2003 and the merger affect on the bank performance. Input/output measurement was using asset approach in Altunbas, Yener, et. al. (2001). The conclusion is the non foreign- exchange private banks are the most efficient during year of 2001-2003 compare to other banks and merger does not always increase the bank‟s efficiency. Suseno (2008) measures the efficiency of Indonesian Islamic banking in the period 1999-2004 and uses DEA to analyze 10 banks as sample. It analyzes the relationship between efficiency score and the scale of banking industry using regression based on intermediation function. It found that first, Islamic banking in Indonesia is efficient enough during the period and reached an average of inefficiency about 7%. Second, there is no significant difference between Islamic bank and general bank that has Islamic banking unit. Last, there is an increasing efficiency about 2.3 percent per year in Islamic banking during the year of study. Methodology To examine the efficiency of the banks, there are some approaches that can be used from a methodological perspective, include the parametric and non-parametric approaches such as Stochastic Frontier Analysis (SFA), Thick Frontier Approach (TFA), Distribution Free Approach (DFA), Free Disposal Hull and Data Envelopment Analysis (DEA). These efficiency measurements differ primarily in how much shape is imposed on the frontier and the distributional assumptions imposed on the random error and inefficiency (Berger and Humphrey, 1997). In the research literature, both parametric and non-parametric approaches have been widely used but there is no consensus which of these approaches is superior (Berger and Humphrey, 1997). The main non-parametric approach is Data Envelopment Analysis. DEA is a mathematical programming approach for the development of production frontiers and the measurement of efficiency

relative to the development frontiers (Charnes et al., 1978). It is also able in handling multiple inputs as well as multiple outputs.

DEA is considered as a deterministic function of the observed variables, and no specific functional form is required. 3

Other main advantages of using DEA are that it performs well with only small number of observations and it does not require any assumption to be made about the distribution of inefficiency. On the other hand there are two shortcomings of DEA where it assumes data to be free of measurement error and is sensitive to outliers. DEA has proven to be a valuable tool for strategic, policy and operational problems, particularly in the service sector and nonprofit sectors. Its feature is adopted to provide an analytical, quantitative comparison tool for measuring relative efficiency (Barr, 2002). DEA uses the term Decision Making Unit (DMU) to refer to any entity that is to be evaluated in terms of its abilities to convert inputs into outputs. If there are n DMUs to be evaluated then each DMU consumes varying amounts of m different inputs to produce s different outputs. Specifically, DMU consumes amount x of input i and produces amount y of output r. We assume j ij rj that x ≥ 0 and y ≥ 0 and further assume that each DMU has at least one positive input and one ij rj positive output value. The original formulation of the DEA model introduced by Charnes, Cooper and Rhodes (1978), denoted CCR. The ratio of outputs to inputs is used to measure the relative efficiency of the DMUj = DMU0 to be evaluated relative to the rations of all of the j = 1,2,…,n DMU. This basic DEA model implied the assumption of Constant Returns to Scale (CRS). Using Charnes-Cooper transformation and dual formulation under CRS, then : θ* = Minimum θ Subject to ∑ (1) ∑ λj ≥0 The optimal solution, θ*, yields an efficiency score for a certain DMU. The process is repeated for each DMUj. DMUs for which θ* < 1 are inefficient, while DMUs for which θ*=1 are boundary points or efficient. This model is sometimes referred to as the “Farrell model” (Cooper et al., 2004). DMUj exhibits constant return to scale if a proportionate increase or decrease in inputs or outputs moves the bank along or above the frontier. The efficiency measure derived from the model reflects technical efficiency (TE). It refers to ability to produce the maximum outputs at a given level of inputs (output-oriented), or ability to use the minimum level of inputs at a given level of outputs (input-oriented). Generally DEA can be derived into technical efficiency (or productive efficiency) and cost efficiency (or economic efficiency). Cost efficiency (CE) is choosing the levels and mixes of inputs or outputs optimally based on the reaction from the market prices. In the light of business effectiveness and efficiency, a DMU must optimize some economic goal such as to minimize cost or to maximize profit (Barr, 2002). In banking, cost efficiency refers to the ability of a bank to use the optimum mix of inputs given their respective prices. It shows the ability of a bank in providing services without wasting resources as a result of technical or allocative inefficiency. Allocative efficiency (AE) can be referred as the ability in choosing the optimal mix of inputs in relation with given prices to produce certain level of given outputs. Cost efficiency (CE) is the product of technical efficiency (TE) and allocative efficiency (AE). All three measures can take values between 0 and 1 with higher values indicating higher efficiency. According to Yin (1999), the

type of efficiency measured depends on the data availability and appropriate behavioral **assumptions** 1

(in Galagedera et al., 2004). Data and Variables The data used for this research were collected from

various sources: Annual Reports from the website of banks, Bank Indonesia database and Indonesian Stock Exchange database. Ten biggest banks (of total assets) in Indonesia per December 2009 that was released by Bank Indonesia were observed. The list of the banks can be seen in the Table 1 which is arranged in order based on the biggest total assets to the least. The period of the study is starting from year of 2003 until 2008, totaling 60 observations. Berger and Mester (1997) concur with De Young (1997) that a six-year period reasonably adequate of not considered as too short or too long period (in Barry et al., 2008). Table 1. List of 10 biggest banks in Indonesia per December 2009 No. Name of Bank Total Assets (in Rp Trillion) 1 Bank Mandiri 2 Bank Rakyat Indonesia 3 Bank Central Asia 4 Bank Negara Indonesia 5 Bank CIMB Niaga 6 Bank Danamon Indonesia 7 Pan Indonesia Bank (PANIN) 8 Bank International Indonesia 9 Bank Tabungan Negara 10 Bank Permata 375.23 318.44 283.18 226.91 106.88 96.88 76.27 58.73 58.48 56.21 Source: Bank Indonesia

Berger and Humphrey (1997) commented on the difficulty of variable selection in performance of banks using DEA since **there is no perfect approach on the explicit definition and measurement of banks‟ input and outputs.** The primary approaches **in** 1

measuring banks‟ input and outputs are the production approach and intermediation approach (Barr, 2002; Paradi, 2003; Galagedera and Edirisuriya, 2004; Angelidis and Lyroudi, 2006; Hermes and Vu, 2008; Saad and Mousawi, 2009). As in Paradi (2003), the first approach assumes banks act as institutions providing fee based products and services to customers using various resources. While the second approach looks at the bank as financial intermediaries that collect funds in the form of deposits and lend them out as loans or other assets earning an income. This approach is used to know bank‟s organizational efficiency and economic viability. In this research, the two approaches mentioned are adopted to know the comparison of efficiency under each different perspective or function of a bank. In the production approach, four inputs (required for bank‟s operation) namely: interest expense, non-interest expense, fixed assets and number of employees. While the outputs that represent desired outcomes are deposits, loans, other earning assets (securities, government bonds, deposits with other banks, investments, etc) and non-interest income. The main difference of variables in the later approach is the deposits that act as input since bank as financial intermediations that collects funds and use fixed assets also labor to transform these funds to loans and other assets. Originally there are deposits and borrowings as funds collected by bank to be transferred but in the current study only deposits are used. Since the deposits is the biggest amount and as the primary source to be transferred to loans and other assets in the 10 banks observed. In the intermediation approach, we use three inputs: customer deposits, fixed assets, and number of employees and three outputs: loans, other earning assets (securities, government bonds, deposits with other banks, investments, etc) and non-interest income (Paradi, 2003; Pasiouras, 2007; Tahir and Haron, 2008; Saad and Mousawi, 2009). The data processing is performed using DEA Frontier program developed by Joe Zhu. Table 2 below presents the descriptive statistics of banks‟ inputs and outputs used in this study. Table 3 is showing the input prices under production approach and intermediation approach to calculate cost efficiency (CE). Table 2. 10 bank's input and output variables 2003-2008 (in Rp Million, except employees) Variable Var. (Approach) Mean Min. Max. St. Dev Interest Expense Input(P)* 4,664,186 891,833 15,776,751 3,241,621 Non Interest Expense Input(P) 3,307,114 455,829 9,019,611 2,309,804 Fixed Assets Input(P,I) 1,888,563 307,296 5,483,628 1,504,887 Number of Employees Input(P,I) 15,086 2,433 41,617 41,617 Deposits Output(P),Input(I) 83,989,687 11,046,145 289,112,052 70,511,803 Loans Output(P,I) 49,246,086 7,665,646

174,499,434 39,345,079 Other Earning Assets Output(P,I) 45,756,746 3,362,136 159,589,227 46,903,069 Non Interest Income Output(P,I) 1,343,369 138,209 4,653,007 1,098,270 *P: Production Approach, I: Intermediation Approach Source: Authors" own estimates Table 3. Input price under Production and Intermediation Approach Input Price Interest Expense Weight of unity Non Interest Expense Weight of unity Fixed Assets Depreciation expenses to fixed assets Number of Employees Personnel expenses to number of employees Deposits Interest expenses to deposits Source : Authors" own estimates Results and Analysis The discussion of the results on the efficiency of 10 biggest banks in Indonesia is structured in 3 parts. First, the efficiency of commercial banks in Indonesia are examined by applying DEA and using production (P) approach to calculate technical efficiency (TE), allocative efficiency (AE) and cost efficiency (CE) of 10 banks obtained through under CRS (input-oriented version of DEA). Second, we apply the intermediation (I) approach to have the same efficiency measurement as previously done. Then the analysis is continued to compare banks performance in both approaches, as the organization that provides services and act as intermediary function from year of 2003-2008. Table 4-6 presents the technical efficiency (TE), allocative efficiency (AE) and cost efficiency (CE) from the model that corresponds to input/outputs selected on the basis of production (P) approach. Table 4. Technical Efficiency (TE)-Production Approach No o. Bank DMU Name 2003 2004 2005 2006 2007 2008 Average 1 2 3 4 5 6 7 8 9 10 Mandiri BRI BCA BNI CIMB Niaga Danamon Panin BII BTN Permata Average 1.000 0.963 1.000 0.898 1.000 1.000 1.000 1.000 1.000 0.819 0.968 0.972 0.831 1.000 0.826 1.000 0.940 1.000 1.000 1.000 0.759 0.933 1.000 1.000 1.000 1.000 1.000 0.826 1.000 1.000 1.000 0.937 0.976 1.000 1.000 1.000 1.000 1.000 0.774 1.000 1.000 1.000 0.875 0.965 1.000 1.000 1.000 1.000 1.000 0.674 1.000 1.000 1.000 1.000 0.967 1.000 1.000 1.000 0.999 1.000 0.630 0.940 1.000 1.000 1.000 0.957 0.995 0.966 1.000 0.954 1.000 0.807 0.990 1.000 1.000 0.898 Source : Authors" own estimates As can be seen from the Table 4, in overall technical efficiency scores under production approach is high and ranges between 0.933 (2004) and 0.976 (2003) and there are 4 banks: BCA, CIMB Niaga, BII and BTN being technically efficient during 2003-2008, while the others are fluctuating. Most of the banks are showing good improvement by being efficient in the recent years except for Panin that is being inefficient in the year of 2008 and Danamon was being technically efficient only at the beginning of the study period and keep being inefficient during the rest of the time, in spite of its position as the 6th biggest bank. Table 5. Allocative Efficiency (AE)-Production Approach No Bank Name 2003 2004 2005 2006 2007 2008 Average 1 2 3 4 5 6 7 8 9 10 Mandiri BRI BCA BNI CIMB Niaga Danamon Panin BII BTN Permata Average 1.000 0.617 0.902 0.920 1.000 0.700 1.000 0.771 1.000 0.748 0.866 0.811 0.764 0.824 0.896 1.000 0.746 1.000 0.736 1.000 0.859 0.864 1.000 0.644 1.000 1.000 1.000 0.866 0.901 1.000 1.000 0.868 0.928 0.980 0.855 1.000 1.000 1.000 0.832 1.000 0.740 0.933 0.916 0.926 1.000 0.817 1.000 1.000 1.000 0.813 1.000 0.718 0.893 1.000 0.924 1.000 1.000 1.000 0.938 0.930 0.775 0.748 0.664 0.845 1.000 0.890 0.965 0.783 0.954 0.959 0.988 0.788 0.941 0.772 0.945 0.899 Source : Authors" own estimates Table 6 is showing that in overall allocative efficiency under production approach is not as high as technical efficiency and ranges between 0.864 (2004) and 0.928 (2005). There is no single bank can be allocatively efficient during the years except for CIMB Niaga maintains efficient from 2003-2007 although it decreases 7% in the year of 2008. BCA as the 3rd biggest bank is being technically efficient during the years but it fails to do the same for allocation efficiency primarily in the year of 2003 and 2004. Table 6. Cost Efficiency (CE)-Production Approach No DM Bank DMU me 2003 2004 2005 2006 2007 2008 Average 1 2 3 4 5 6 7 8 9 10 Mandiri BRI BCA BNI CIMB Niaga Danamon Panin BII BTN Permata Average 1.000 0.595 0.902 0.826 1.000 0.700 1.000 0.771 1.000 0.612 0.841 0.788 0.635 0.824 0.740 1.000 0.701 1.000 0.736 1.000 0.652 0.808 1.000 0.644 1.000 1.000 1.000 0.715 0.901 1.000 1.000 0.814 0.907 0.980 0.855 1.000 1.000 1.000 0.644 1.000 0.740 0.933 0.802 0.895 1.000 0.817 1.000 1.000 1.000 0.548 1.000 0.718 0.893 1.000 0.898 1.000 1.000 1.000 0.937 0.930 0.488 0.703 0.664 0.845 1.000 0.857 0.961 0.757 0.954 0.917 0.988 0.633 0.934 0.772 0.945 0.813 Source : Authors" own estimates In the following

discussion, 10 biggest banks will be divided into 2 groups as Group 1 consists of Mandiri, BRI, BCA, BNI and CIMB Niaga while Group 2 consists of Danamon, Panin, BII, BTN and Permata to help the analysis deeper and thorough. Table 6 is translated into Figure 1 and Figure 2 to give clear understanding about the condition of each bank during the years. Figure 1 is showing that there are not many different in the pattern of CE among 5 banks except CIMB Niaga that is showing outstanding improvement during the years. Figure 2 is showing many fluctuations in the CE experienced by each of banks in Group 2. Both Danamon and BTN are showing the same pattern and they are experiencing worse inefficiency through the years as well as BII. Permata is the only one that is having the same growth as in CIMB Niaga while the other banks in Group 2 are declining over the years. 1.00 0.80 R 0.60 Mandiri a BRI e t 0.40 BCA 0.20 BNI 0.00 CIMB Niaga 2003 2004 2005 2006 2007 2008 Year Figure 1. CE Comparison of Group 1 under P-Approach during 2003-2008 Source : Authors" own estimates 1.00 0.80 R 0.60 a e t 0.40 0.20 0.00 2003 2004 2005 2006 2007 2008 Year Danamon Panin BII BTN Permata Figure 2. CE Comparison of Group 2 under P-Approach during 2003-2008 Source : Authors" own estimates 1.00 0.80 R 0.60 a e t 0.40 0.20 0.00 2003 2004 2005 2006 2007 2008 Year Average TE Average CE Average AE Figure 3. Average TE,CE and AE Comparison under P-Approach during 2003-2008 Source : Authors" own estimates Figure 3 is showing the comparison between average TE, CE and AE for all banks under production (P) approach during the years. It clearly shows that the rate of allocative efficiency is always lower to the technical efficiency and it implies that the dominant source of cost inefficiency of banks is allocative rather than technical. As provider of the services, the banks were relatively good at using the minimum level of inputs at a given level of outputs but they were not that good at choosing the optimal mix of inputs given their prices. This result is along with Bauer et al. (1998) that it is quite plausible some productively efficient firms are economically inefficient and vice versa since it depends on how good the decision makers in utilizing the best technologies and responding to market signals (in Barr, 2002). Table 6-8 presents the technical efficiency (TE), allocative efficiency (AE) and cost efficiency (CE) results from the model that corresponds to input/outputs selected on the basis of Intermediation (I) approach. Table 6. Technical Efficiency (TE)-Intermediation Approach No Bank DMU Name 2003 2004 2005 2006 2007 2008 Average 1 2 3 4 5 6 7 8 9 10 Mandiri BRI BCA BNI CIMB Niaga Danamon Panin BII BTN Permata Average 1.000 0.934 0.541 0.697 1.000 1.000 1.000 1.000 1.000 0.523 0.869 0.974 0.853 0.637 0.948 1.000 0.773 1.000 1.000 1.000 0.622 0.881 1.000 0.905 0.929 0.913 1.000 1.000 1.000 1.000 1.000 0.956 0.970 1.000 0.748 1.000 1.000 1.000 0.774 1.000 1.000 1.000 0.875 0.940 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 0.999 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 0.996 0.907 0.851 0.926 1.000 0.925 1.000 1.000 1.000 0.830 Source : Authors" own estimates In overall, table 6 shows technical efficiency ranges under intermediation approach between 0.869 (2003) and 1 (2007,2008) and there are three banks, CIMB Niaga, Panin and BII are showing excellent technical efficiency during the years that are not experienced by other banks such as BRI and BCA. Mandiri as the biggest bank is considered technically efficient all the years although it was declining 2.6% in the year of 2004. Permata and BCA were having inefficiency in performing as intermediary in the year of 2003-2006 but they managed to be efficient in the later years. Table 7. Allocative Efficiency (AE)-Intermediation Approach No . Bank DMU Name 2003 2004 2005 2006 2007 2008 Average 1 2 3 4 5 6 7 8 9 10 Mandiri BRI BCA BNI CIMB Niaga Danamon Panin BII BTN Permata Average 0.553 0.681 0.665 0.856 1.000 0.805 1.000 0.577 1.000 0.953 0.809 0.705 0.774 0.784 0.949 1.000 0.783 0.931 1.000 1.000 0.952 0.888 0.776 0.699 0.781 0.940 1.000 0.827 0.812 1.000 1.000 0.903 0.874 0.848 0.417 0.674 1.000 1.000 0.987 1.000 0.913 1.000 1.000 0.884 0.826 0.651 0.672 1.000 1.000 0.734 1.000 0.977 0.956 1.000 0.882 1.000 0.857 0.995 1.000 0.924 0.702 1.000 1.000 1.000 1.000 0.948 0.785 0.680 0.762 0.958 0.987 0.807 0.957 0.911 0.993 0.968 Source : Authors" own estimates Table 7 is showing that in overall allocative efficiency under intermediation approach is lower compared to technical efficient and it only ranges between 0.809 (2003) and 0.948 (2008). CIMB Niaga and BTN is managed to maintain

allocative efficiency for 5 years although they also experienced inefficiency for a year (2007 or 2008) which declines for 7.6% (Niaga) and 4.4% (BTN). Mandiri is surprisingly inefficient from 2003-2007 and able to be efficient in the year of 2008. Table 8. Cost Efficiency (CE)-Intermediation Approach No DMU N Bank DMU Name 2003 2004 2005 2006 2007 2008 Average 1 2 3 4 5 6 7 8 9 10 Mandiri BRI BCA BNI CIMB Niaga Danamon Panin BII BTN Permata Average 0.553 0.636 0.360 0.596 1.000 0.805 1.000 0.577 1.000 0.499 0.703 0.687 0.660 0.500 0.900 1.000 0.605 0.931 1.000 1.000 0.593 0.788 0.776 0.632 0.725 0.858 1.000 0.827 0.812 1.000 1.000 0.863 0.849 0.848 0.312 0.674 1.000 1.000 0.765 1.000 0.913 1.000 0.876 0.839 0.826 0.651 0.672 1.000 1.000 0.734 1.000 0.977 0.955 1.000 0.881 1.000 0.857 0.995 1.000 0.924 0.702 1.000 1.000 1.000 1.000 0.948 0.782 0.625 0.654 0.892 0.987 0.740 0.957 0.911 0.993 0.805 Source : Authors" own estimates Same as the previous part, Table 8 is translated into Figure 4 (banks in Group 1) and Figure 5 (banks in Group 2) to see the condition clearly in cost efficiency (CE) among banks under intermediation approach. CIMB Niaga and BTN is able to stay cost efficient during the years and only have a slightly decline in 2007 (4.4% for BTN) and 2008 (7.6% for CIMB Niaga) which is exactly the same result for allocative efficiency. The reason is because both banks managed to be technical efficient in those years. Meanwhile Mandiri, BCA, BNI, and Permata are showing the same pattern that is being inefficient in the beginning of the years and manage to be efficient in the later years. BRI falls sharply in 2006 and able to rise up later though it is not cost efficient yet. Other banks in Group 2 perform fluctuation in cost efficiency and able to be efficient in 2008 except for Danamon. 1.00 0.80 R 0.60 Mandiri a BRI e t 0.40 BCA 0.20 BNI 0.00 CIMB Niaga 2003 2004 2005 2006 2007 2008 Year Figure 4. CE Comparison of Group 1 under I-Approach during 2003-2008 Source : Authors" own estimates 1.00 0.80 R 0.60 a e t 0.40 0.20 0.00 2003 2004 2005 2006 2007 2008 Year Danamon Panin BII BTN Permata Figure 5. CE Comparison of Group 2 under I-Approach during 2003-2008 Source : Authors" own estimates 1.00 0.90 0.80 0.70 R 0.60 a 0.50 e t 0.40 0.30 0.20 0.10 0.00 2003 2004 2005 2006 2007 2008 Year Average TE Average CE Average AE Figure 6. Average TE,CE and AE Comparison under I-Approach during 2003-2008 Source : Authors" own estimates In overall under intermediation approach as can be seen in Figure 6, the average TE, AE and CE is growing during 2003-2008. Mostly the technical efficiency is higher than allocative efficiency and the reason of cost inefficiency of banks in doing their intermediary role is the same with their role as services provider, being allocative inefficient. The interesting phenomenon is happening in 2004 which is average TE equal to average AE then it implies that economic inefficiency (CE) caused by both inability of decision makers" in prioritizing between idealistic role and the necessity of business survival. 1.00 0.80 R 0.60 a e t 0.40 0.20 0.00 2003 2004 2005 2006 2007 2008 Year P Approach I Approach Figure 7. Comparison Average of TE under P & I Approach Source : Authors" own estimates 1.00 0.90 0.80 0.70 R 0.60 a 0.50 e t 0.40 0.30 0.20 0.10 0.00 2003 2004 2005 2006 2007 2008 Year P Approach I Approach Figure 8. Comparison Average of CE under P & I Approach Source : Authors" own estimates Based on figure 7 and 8, it can be stated that the banking Industry has performed their intermediary role well from the both perspective of productive (TE) and economic efficiency (CE). In the result during the years of the study tells us that intermediary role is secondary compares to production role. The lessons from 1997 financial crisis have made the banks to change its priority from production to intermediary approach. This tells us as well that the government has played a nice role to ensure commercial banks performed their essential role of intermediation. Historical facts has stated how the relax government regulation has caused banks to be more effective in performing their intermediary role. As October 2006, Bank Indonesia issued a Policy Package that consisted of 14 Bank Indonesia Regulations and 11 out of them are giving room for banks to optimize its intermediary role. 1.000 D A,C,E,G,H,I 0.900 J B 0.800 P F A : Mandiri 0.700 B : BRI o r 0.600 C : BCA d D : BNI u 0.500 E : CIMB c t 0.400 Niaga F : Danamon o i 0.300 G :Panin n 0.200 H : BII I : BTN 0.100 J : Permata 0.000 0.000 0.200 0.400 0.600 0.800 1.000 Intermediation Figure 9. Average TE for Each Bank under P & I Approach Source : Authors" own estimates The figure above describes that the top

ten commercial banks perform very well both in doing their production role and intermediation role. This is also showing the nature of the Indonesia"s oligopolistic banking industry. The mergers post Asian Financial Crisis, ownership restructuring and foreign acquisition have shown an accumulative positive impact for these banks. 1.00 A E 0.90 C D G I P 0.70 B H 0.80 J o 0.60 r d F u 0.50 o 0.30 i c t 0.40 n 0.20 0.10 0.00 0.00 0.20 0.40 0.60 Intermediation 0.80 1.00 A : Mandiri B : BRI C : BCA D : BNI E : CIMB Niaga F : Danamon G :Panin H : BII I : BTN J : Permata Figure 10. Average CE for Each Bank under P & I Approach Source : Authors" own estimates The figure above shown how Mandiri as the biggest bank can be outperformed by CIMB Niaga that clearly describe that size in a bank is not the only factor, but proper management and wise corporate strategy execution can be the factor to achieve cost efficiency in doing the idealistic role and business profit role. This is strengthened by the situation of Danamon where the corporate strategy decision can result a negative performance. Conclusion This paper is trying to describe the importance of more comprehensive approach in measuring bank"s performance. The weaknesses of the available measurement system namely IBLI index and CAMEL caused DEA to be extraordinary. DEA will let us know the important efficiencies in banking performance; the productive efficiency, allocative efficiency and cost efficiency. Using two approaches of production and intermediation, the authors have discovered that CIMB Niaga is showing an excellent performance in both approaches (dual role) during 2003-2008 compared to Mandiri as the biggest bank. On the other hand, Danamon as the 6th biggest bank kept experiencing lower efficiency. It can be stated that the size of a bank is not the only factor to affirm that the bank is productively and economically efficient. Moreover, cost efficiency is lower due to allocative inefficiency rather technical. Overall, the biggest 10 commercial banks have performed quite well in both as institution that provides services and act as intermediary role. This clearly explained the national"s banking performance. In terms of Credit to Gross Domestic Production, Indonesia"s banking sector is experiencing growth from 2006 (23.73%), 2007 (25.36%) and 2008 (26.42%) (Bisnis Indonesia, 12 May 2010, page 4)). Despite the positive news, the various government initiative and the lessons learnt from the previous crisis must be used to increase the intermediary role of Banks in Indonesia. The ten banks have done their part well, but government restructuring initiative on the industry, bank"s intermediary role" creativity and competitive government regulations are the necessities for Indonesia"s Banking sector to reach the ideal performance that is 50% of the gross domestic product. In one hand, banks always need to improve in serving the customers and perform their intermediary role “instructed by the government” but in the same time must survive the imperative of business efficiency. These challenges are so strong due to the fact of many uncertainties happenings in Indonesia from 2003-2008. Those uncertainties are the national political and economic agendas, competitive banking industry; opportunities arise from the advancement of information technology, global crisis on energy and food and last but not least the massive global financial crisis. Reference Al-Tamimi, Hussein A. H. 2006. The Determinants of the UAE Commercial Banks' Performance: A Comparison of the National and Foreign Banks. Journal of Transnational Management, Volume 10, Issue 4, pp. 35 - 47 Angelidis, D. and Lyroudi, K. 2006. Efficiency in the Italian Banking Industry: Data Envelopment Analysis and Neural Networks. International Research Journal of Finance and Economics, Issue 5. Banker R.D, Charnes A, Cooper W.W. 1984. Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis. Management Science,30 ,pp. 1078-1092. Barr, R.S. et al. 2002. Evaluating the productive efficiency and performance of U.S. commercial banks. Managerial Finance, 28-8, pp.3-25. Barry, T.A. et al. 2008. Ownership Structure and Bank Efficiency in the Asia Pacific Region. Berger, A.N. 1993. Distribution-Free Estimates of Efficiency in the US Banking Industry and Tests of the Standard Distributional Assumptions. The Journal of Productivity Analysis 4, 261- 292. Berger, A.N., Humphrey, D.B. 1997. Efficiency of Financial Institutions: International Survey and directions for future research, European Journal of Operational Research, 98, 175-212. Berger, Allen N. and Mester, Lorreta J. 2003. Explaining the Dramatic Changes in Performance of U.S. Banks: Technological Change,

Deregulation and Dynamic Changes in Competition. Journal of Financial Intermediation, Elsevier, 12-1, pp.57-95 Casu B. and Molyneux P. 2003. A Comparative Study of Efficiency in European Banking. Applied Economics, 35: pp. 1865-76. Charnes, A., Cooper, W.W. and Rhodes, E. 1978. Measuring the efficiency of decision making units, European Journal of Operational Research, 2, 429-444. Cooper, W.W., Seiford, L.M. and Zhu, Joe. 2004. Data envelopment analysis: History, Models and Interpretations, in Handbook on Data Envelopment Analysis, eds W.W. Cooper, L.M. Seiford and J. Zhu, Chapter 1, 1-39, Kluwer Academic Publishers, Boston. Drake, Leigh M., Hall, M.J.B. and Simper, Richard. 2006. The Impact of Macroeconomic and Regulatory Factors on Bank Efficiency : A Non-Parametric Analysis of Hong Kong"s Banking System. Journal of Banking and Finance, 30, 1443-1466 Duygun-Fethi, Meryem and Pasioras, Fotios. 2009. Assessing Bank Performance with Operational Research and Artificial Intelligence Techniques : A Survey. European Journal of Operational Research, 204-2, pp. 189-198 Galagedera, Don U.A and Edirisuriya, P. 2004. Performance of Indian commercial banks (1995-2002): an application of data envelopment analysis and Malmquist productivity index. South Asian Journal Management, 12-4, pp. 52-74 Hermes, Niels and Vu, Thi Hong Nhung. 2008. The Impact of Financial Liberalization on Bank Efficiency: Evidence from Latin America and Asia. Applied Economics, 1466-4283. Havrylchyk O. 2006. Efficiency of the Polish banking industry: Foreign versus Domestic Banks. Journal of Banking and Finance, 30, pp. 1975-1996. Infobank Magazine. November 2007. Volume XXIX, no 344 Infobank Magazine. Januari 2009. Volume XXX, no 538 Infobank Magazine. Januari 2010. Volume XXXII, no 370 J. Zhu. 2009. Quantitative Models for Performance Evaluation and Benchmarking: Data Envelopment Analysis with Spreadsheets. 2nd edition. International Series in Operations Research & Management Science. Springer Science and Business Media. Pasiouras F. 2008. Estimating The Technical and Scale Efficiency of Greek Commercial Banks: The Impact of Credit Risk, Off-Balance Sheet Activities, and International Operations. Research in International Business and Finance, 22, 301-318. Putri, V.R. and Lukviarman, N. 2008. Performance Measurement of Commercial Banks Using Efficiency Approach : A study to Publicly Listed Banks in Indonesia. JAAI 12-1, pp. 37-52. Saad, W. and Mousawi, C.E. 2009. Evaluating the Productive Efficiency of Lebanese Commercial Banks: Parametric and Non-Parametric Approaches. International Management Review. 5-1 Sidik, Fajar (2010), “Rasio kredit ke PDB Rendah” Bisnis Indonesia 12 Mei 2010, page 4. Sufian, F. and Majid, M.Z.A. 2009. Bank efficiency and share prices in China: empirical evidence from a three-stage banking model Int. J. Computational Economics and Econometrics, 1-1. Suseno, Priyonggo. 2008. Analisi Efisiensi Dan Skala Ekonomi Pada Industri Perbankan Syariah di Indonesia. Journal of Islamic and Economics, 2-1. Tahir, Izah M., and Haron, Sudin. 2008. Technical efficiency of the Malaysian commercial banks: a stochastic frontier approach. Banks and Bank Systems, 3-4. Tahir, Izah M., Abu Bakar, Nor M., and Haron, Sudin. 2009. Estimating Technical and Scale Efficiency of Malaysian Commercial Banks : A Non-Parametric Approach. International Review of Business Research Papers, 5-1, pp. 113- 123.