THE DETERMINANTS EFFICIENCY OF DOMESTIC AND FOREIGN BANK IN INDONESIA

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DECLARATION OF AUTHENTICITY

Hereby I declare the originality of the thesis; I have not presented someone else's work to obtain my university degree, nor I have presented someone else's words, ideas or expressions without any of the acknowledgements. All quotations are cited and listed in the bibliography of the thesis. If in the future this statement is proven to be false, I am willing to accept any sanction complying with the determined regulation or its consequence.

Yogyakarta, March 12th, 2018

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ABSTRACT

The aim of this research first, is to know the level of efficiency of domestic and foreign banks in Indonesia and second is to see whether the internal factors such as ROA, SIZE and CAR can give positive influence to the efficiency of banks in Indonesia or not. Because nowadays the condition of banking industry in Indonesia is very well develop with the important role of domestic and foreign banks that participate to improve the efficiency and effective performance of banking industry for the economic development in this nation. This research data is taken from 5 of each sample on domestic and foreign banks that exist in Indonesia in the period 2014-2016. So, to generating the result for this study, researcher is using Data Envelopment Analysis (DEA) method for first phase to get the result for efficiency level of domestic and foreign bank in Indonesia and also second phase using data panel regression method by EVIEWS software to get the result about the influences of the internal factor toward the efficiency of banking industry in Indonesia. The results of the study indicate that domestic banks in Indonesia are more efficient than foreign banks because the average level of efficiency close to the maximum value (E = 1) is from the domestic banks. The last result obtained from the data panel regression shows that ROA and CAR are not affect the efficiency while SIZE have a negative effect on bank efficiency in Indonesia.

***Keywords**: DEA, Bank Efficiency, domestic, foreign, Indonesia.*

ABSTRAK

Tujuan penelitian ini adalah pertama untuk mengetahui tingkat efisiensi bank domestik dan asing di Indonesia dan kedua untuk melihat apakah faktor internal seperti ROA, SIZE dan CAR dapat memberikan pengaruh positif terhadap efisiensi bank di Indonesia atau tidak. Karena saat ini kondisi industri perbankan di Indonesia berkembang sangat baik dengan peran penting bank domestik dan asing yang berpartisipasi untuk meningkatkan efisiensi dan efektifitas kinerja industri perbankan bagi perkembangan ekonomi bangsa ini. Dalam penelitian ini diambil data masing-masing 5 sample dari bank domestik dan bank foreign yang ada di Indonesia pada tahun 2014-2016. Dalam proses mendapatkan hasil untuk penelitian ini, peneliti menggunakan metode Data Envelopment Analysis (DEA) pada tahap pertama untuk mendapatkan hasil dari tingkat efisiensi bank domestik dan asing di Indonesia dan juga tahap kedua menggunakan metode regresi data panel oleh EVIEWS software untuk mendapatkan hasil tentang pengaruh faktor-faktor internal terhadap efisiensi industry perbankan di Indonesia. Hasil penelitian menunjukkan bahwa bank domestik di Indonesia lebih efisien daripada bank asing karena tingkat efisiensi rata-rata dekat dengan nilai maksimum (E = 1) adalah dari bank-bank domestik. Hasil terakhir yang diperoleh dari regresi panel data menunjukkan bahwa ROA dan CAR tidak mempengaruhi efisiensi sementara SIZE memiliki efek negatif pada efisiensi bank di Indonesia.

Kata Kunci: DEA, Bank Efisiensi, domestik, foreign, Indonesia.

CHAPTER I
INTRODUCTION

1.1 The Background of Study

The banking industry is one of the factors of economic development in every nation as well as in the developing country as Indonesia. Commercial banks as the main component of banking system also have to be efficient otherwise they can create maladjustment in the process of economic development. The banking industry also has an important role in the economic development of Indonesia. Because banks are an intermediary institution for Indonesia, therefore banking institutions need better attention.

The Indonesian economic is in unstable situation as well as the government is pursuing a policy of deregulation and de-bureaucratization that is being implemented gradually in the financial and economic sectors. Since De Pakto 27 October 1988 economic development in Indonesia has significant improvement. One of the factors is the increasing of the banking industry. Deregulation can improve the role of the banking industry as an intermediary institution and service providers. The regulation became easier than banking industry expanded at that time. Until 9th January 2004 Bank Indonesia created API (**Arsitektur Perbankan Indonesia**) as a comprehensive framework for future policy direction of banking industry development. The aim of government to create this regulation is to improve the efficiency of the banking industry and to create a business climate that can encourage this business with fair and good competition.

According to the data from Financial Service Authority (OJK), financial service in Indonesia consist of the bank financial institution and non-bank financial institution such as the insurance company, securities company, and other financial services company. The bank's health and performance in Indonesia financial sector is really concern about the performance of the company, whether the company is achieving efficient and healthy in the system of banking procedure

and process or not, as well as to achieve the sustainable economic growth in Indonesia through the safety of financial condition, secure of the financial performance and have affordable financing to develop the prosperity and pubic welfare in Indonesia.

To assess performance of banking industry, company management is not only looking on the company's ability to manage it to become more profitable but also to look how the way these industries manage all the resources with effectively and efficiently. Any form of business course has a competitor as well as in the field of banking. With the inception of the globalization era of the bank in this country is required to continue and try to compete with foreign banks that operate in Indonesia. Domestic banks are trying hard to attract the sympathy of depositors to be interested in placing funds in domestic banks. Foreign banks that enter Indonesia's banking industry are includes HSBC (Hong Kong and Shanghai Banking Corporation), City Bank (United States), Commonwealth, DBS (Singapore), RBS (Scotland), ANZ (Australia New Zealand), Deutsche Bank (German), Standard Chatered Bank, and many others. Foreign banks also seek to attract the attention of the depositors in Indonesia, therefore, the domestic banks must be good at managing the strategies used compare with foreign banks in Indonesia.

Most of foreign banks are applying a different system with the domestic banks. Foreign banks tend to be the priority banking, where customers are selected. However, the global crisis that occurred in 2008 caused a banking crisis that disrupted the intermediary function which organized the payment of transactions and the monetary policy transmission tool that shows that how vulnerable national banking resistance to various upheavals arises. The occurrence of the Indonesian banking crisis is inseparable from the weakness that found in the national banking system itself, including the performance of foreign banks that took part in the Indonesian market, and disturbed even the impact is also quite large, especially on the public confidence in the foreign bank itself because the country of origin of foreign banks experienced a high crisis fluctuation in the

intermediary function that disguises increasingly the performance of foreign banks.

The operational continuity of the Indonesian banking sector will be depending on the ability of each banking institution within the company to maintain high competitiveness. Such competitiveness can reflect the level of operational efficiency as well as the capability of the bank facing any disturbance that arises nowadays, either in internal or external situation.

External challenges are becoming increase significantly, especially, in the effect of the ASEAN Economic Community (AEC) in 2015. Every regional bank has challenge to compete with the foreign bank that already operate in Indonesia which is already has a relatively higher level of operational efficiency. Failure in this competition can be potentially causing national banks to be marginalized from their own markets, temporarily the existence of a national banking institution has a very important meaning in carrying out the function of national economic development.

To conclude from some problems that explained above, the important thing is, the researcher wants to know how the performance of the domestic and foreign bank in Indonesia which is the way that how well company serve the society because financial institution as the intermediary for society as well as to look for the ability of company maintaining the input to generating effective output. Banking performance is generally measured using CAMEL (Capital, Asset Quality, Management, Earnings, and Liquidity) techniques. The measurement of efficiency is one of the performance parameters based on the total overall performance of a company. Low quality of the bank can be seen from the weak internal condition, management, and the human resources, and also because the changes of banking supervisor in Indonesia that before is from Central Bank Indonesia but now become Financial Service Authority (FSA).

Banks can be said to be good or not when it can be seen from the financial performance, especially from the performance of profitability in a banking industry.

In addition to the measurement of efficiency can be analyzed more clearly by using determinant of bank profitability, so the researcher can know what the most dominant variables influence banking efficiency level in Indonesia. In Indonesia, the research to measure banking efficiency has grown more or less 16 years ago. One of them is by using non-parametric approach of Data Envelopment Analysis (DEA) to measure banking efficiency level after merger (Hadad, Santoso, Ilyas, & Mardanugraha, 2003)

The performance of banking efficiency can be influenced by both internal and external determinants. Internal determinants are variables derived from bank accounts such as the performance of the statement of financial position and income statement, while the external determinant is a determinant not related to bank management but may reflect economic and regulatory conditions that may affect the performance of financial institutions (Delis & Papanikolao, 2009)

Some of the research discuss same topic which are about the determinants of efficiency and also the impact that happen on the profitability in banking industry, it has been conducted in several countries in the world. The research about banking efficiency has been conducting in developed and developing countries and also several internal factors have been analyzed by another researcher. For example, the research about efficiency in the banking industry is in Tunisia, Malaysia, and India. They have different result based on what factors that the researcher identifies.

Referring to the several types of research about bank efficiency, it is important to look again the other impact of some internal factors that can influence the efficiency of conventional banks within the three years. This study aims to determine the level of efficient and inefficient banking performance and to know what internal factors affect the efficiency of banks. Banks that have not been efficient proven by not effective to improve its performance and manage the company's resources such as using a minimum level of input to produce a certain level of output or to produce the maximum level of output with the existing input level. Banks that is operating more efficiently will be able to gain the sustainable profitability and also heathy condition of the performance in banking industry in

Indonesia. Internal factors that used as the independent variable is also used to measure the level of bank's health in Indonesia, such as the profitability of banks that represented by *return on asset* (ROA), bank *size,* and capital represented by *Capital Adequacy Ratio* (CAR).

Research problem is aimed to measure the efficiency level on the banking industry in Indonesia. And also, this research will be analyzing whether the efficiency level using non-parametric approach which is measured by DEA score and bank's internal factors have the significant impact on performance and efficiency of banking industry in Indonesia or not. Because, some of the existence efficiency analysis in the banking industry based on the various groups especially in domestic and foreign banking will be able to provide information on which groups of banks are efficient and inefficient.

The purpose of this research is expecting to be beneficial to provide the theoretical implication in developing theory of efficiency and the financial performance in banking industry of over the world especially in Indonesia, to create better management policy for the company to make improvement in increasing efficiency and profitability performance especially for the domestic bank in Indonesia, and the last is to compete better in facing the AEC. Moreover, this research is also can be useful for the public or society to make the decision about which banks that they consider to save their excess fund and to be the source of financing for their life.

1.2 Problem formulation

1. How the level of efficiency on the domestic and foreign bank in Indonesia?
2. What the impact of internal factors (ROA, SIZE, and CAR) on bank efficiency in Indonesia?

1.3 Study Objective

1. To analyze the level of efficiency on domestic and foreign bank in Indonesia
2. To measure the internal factors (ROA, SIZE and CAR) on bank efficiency in Indonesia.

1.4 Research Contribution

1. Researcher

This research is expected to enriching knowledge of researcher and improving the ability of the research writing in term of financial concern.

2. Future researcher

It is expected to give a contribution to knowledge development especially in the same scientific field and enriching the empirical facts and knowledge especially about bank efficiency in Indonesia.

3. Investor

For the investor, this study expected to be one of the references for decision making to choose what banks that compatible to be invest based on the bank efficiency in Indonesia.

1.5 Systematics of Writing

CHAPTER I: INTRODUCTION

This chapter contains about the background that will be discussed in the thesis and also about the problem identification, problem formulation, research contribution and systematics of writing.

CHAPTER II: LITERATURE REVIEW

This chapter is showing the foundation of theory and the theoretical basis of this study and finish with the framework and formation of hypotheses.

CHAPTER III: RESEARCH DESIGN AND METHOD

This chapter is showing the population and the study sample, the type and sources of data, methods of data collection and the methods of data analysis and research data.

CHAPTER IV: DATA ANALYSIS AND DISCUSSIONS

This chapter analyzes the general description and information of the findings about Domestic and Foreign Bank Efficiency, test data, research results discussion.

CHAPTER V: CONCLUSIONS AND RECOMMENDATIONS

This chapter explained the conclusions that can be drawn based on the results of data processing and suggestions related to similar studies in the future.

REFERENCES

It contains the resources or references for supporting the argument in this study.

CHAPTER II
LITERATURE REVIEW

2.1 Banking Industry

2.1.1 Bank roles and function

The word bank comes from Italian, means *table*. According to Act Number 10 of 1998 concerning Banking, the term bank is a business entity that collects funds from the public in the form of deposits and it can be distributed again to the community in the form of credit and or other forms in order to improve the standard of living of many people.

Banking is all aspects regarding bank including institution, business activities, and process in doing all its business activities. The banking industry in Indonesia run its operation based democratic economy using prudent principles that aim to elevate national development in order to improve equality, economic growth, and national stability to achieve prosperity for the public.

According to data from Bank Indonesia (www.bi.go.id), the classification of commercial banks of 120 banks is divided into 4 State-Owned Banks, 35 Domestic Private Foreign Exchange Banks, 30 Domestic Private Non-Foreign Exchange Banks, 26 Local Banks, 15 Mixed Banks, and 10 Foreign Banks. Out of 119 banks, there are 108 conventional banks. Based on the ownership, banks are divided into 3 groups which are national banks, foreign banks, and mixed banks. The national banks consist of State-Owned Banks, Domestic Private Foreign Exchange Banks, Domestic Private Non-Foreign Exchange Banks, Local Banks, while foreign banks are Foreign Banks Office Branch (Kantor Cabang Bank Asing – KCBA).

Definition of foreign bank branch office from SK DIR No.32/37/KEP/DIR on The Requirements and Procedures of Opening Branch Office, Supporting Branch Office, and Bank's Representative Overseas is branch office of a bank located in overseas and subject to foreign constitution in which the head office is

located overseas that is directly and indirectly responsible to the head office and is located in Indonesia.

Figure 2.1 explain that the roles and functions of a banking firm. Recently, the role of banking institution is as a financial intermediary for the public. In addition, a bank is a money creator in the macro-economic system, this role distinguishes a banking firm from other financial intermediaries such as insurance companies or mutual funds.

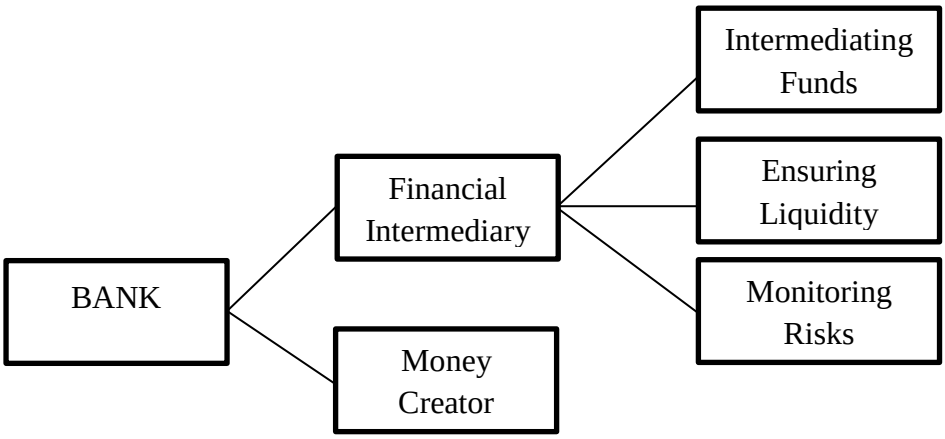

Figure 2.1 Roles and function of bank

A bank as a financial intermediary means that the core function of a financial intermediary was traditionally discussed as securing funds from surplus units and transmitting to deficit units (Tobin 1963; Klein 1971; Fama 1980). For this, a bank intermediates funds from savers to investors and can also increasing economic efficiency by promoting a better allocation of resources (Levine, 1992). On executing this core function, a bank must fulfill secondary functions in order to simultaneously satisfy the depositors/lenders and creditors/borrowers. From the perspective of a risk-oriented approach, these secondary functions are to ensure liquidity and to monitor credit risks. The liquidity risk relates to the mismatch in size and maturity of loans between depositors/lenders and creditors/borrowers. Depositors are usually willing to lend a smaller amount of money for a shorter period of time than the ones required by the borrowers. As the intermediary between depositors and borrowers, a bank acts as a liquidity insurer providing households with insurance against the shocks that affect their consumption needs

(Diamond & Dybvig, 1983). To solve the size conflict, a bank transforms the size of funds by collecting funds in small-sized deposits and granting larger size of loans. Banks enjoy economic of scale since they have access to a large number of lenders. To solve the maturity conflict, a bank can invest a sufficient amount of resources in highly liquid assets to satisfy short-run liquidity demand (Levine, 1992). Together with such liquidity insurer role, banks allow small depositor funds to be accumulated and lent to entities for investing in efficient projects and enabling to raise the productivity of an economic system.

The credit risk refers to the possibility that borrowers cannot duly the return that they have borrowed. A bank can minimize the risk of individual loans by verifying and monitoring borrowers, diversifying portfolios and holding loan loss reserves. In this case, a bank acts as a delegated monitor (Diamond, 1984). To sum up, when channeling funds to execute the core function of intermediary, a bank also holds other secondary functions which are liquidity insurer and credit risk monitor. In the review of Bhattacharya & Thakor (1993), these functions were referred to as qualitative asset transformation. In recent literature, the risk concern challenges the financial intermediation theories. Mester (1996) describe about the miscalculation of bank efficiency if risk concern is neglected. Allen & Santomero (1998) proved that risk management becomes more and more central in banking activities. Hakenes (2004) also emphasized that risk management can be seen as a core competence of a bank. It is suggested that risk management should be given more attention in current financial intermediation theories, i.e. the secondary functions of a bank are actually not of secondary importance.

A bank as money creator, the bank is distinguishing from other financial intermediaries in that it holds an important role as money creator in the economic system (Tobin 1963; Klein 1971; Towey 1974). The difference is visible on the balance sheet. As a financial intermediary, a bank's main assets are the obligations of borrowers, and a bank's main liabilities are the assets of the lenders. However, on the asset side, only the bank can make loans by "writing up" its deposit liabilities while other financial intermediaries must physically transfer means of payments to borrowers. The money paid out from a loan signed by a

bank can be used to make a deposit in another bank, allowing that bank to issue more loans. This is called the "fountain pen money" (Tobin, 1963). On the liability side, a bank is solely granted the right to issue liquid liabilities. Bank liabilities like demand deposits are generally acceptable medium of exchange which is even superior to currency in a wide variety of transactions (Klein, 1971). Therefore, they are also counted as "money". This is the reason why a bank is called a "money creator".

In principle, banks possess the key to the unlimited expansion of funds while other financial intermediaries have their asset scale limited by liabilities or the savings that the public entrusts to them. Governments thus impose reserve requirements on banks in order to restrain the expansion. They determine which portion of deposits banks are not allowed to use for issuing loans but must keep in their account with central banks. Such requirements constraint the intermediating activities of the banks and their money creating possibilities with a view to these consequences, reserve requirements can also be interpreted as a kind of income tax on banks (Fama, 1985).

From another point of view, despite the title "money creator", banking firms in fact merely increase the velocity of money circulation, which is restricted by reserve requirements (Heise, 1992). The total money available to the economy is determined by the fractional reserve requirements and the money base controlled by the central banks. From a government's perspective, banks help save costs by issuing bank notes through reducing the money base needed for the economy. In addition, banks can be named as administrators of the national payment mechanism as they provide a unique access to liquidity and means of payment to the public (Freixas & Rochet, 2008).

In summary, banks are special and complex firms in nature and hold a crucial role in the economy. Banks do not only solve the information between borrowers and lenders but also affect the money supply and circulation for the whole nation. It was asserted that banking services are vital for the well-functioning of a modern society and influential in the growing of an economy (Levine 1992; Swank 1996).

Banking performance is one of the important pillars in developing a country. The intermediary function of a bank determines the flow of fund which is vital for economic competitiveness. According to Bank Indonesia (BI), banks in Indonesia must perform four important functions such as performing as financial intermediary, payment system support, setting and implementing monetary policy, and ensuring financial stability. It is believed that the transparent and prudent banking system is the pre-requisite for the further economic development of a nation (Indonesia Banking Booklet, 2010).

2.1.2 Brief History of Indonesian Banking Market

In 1983, the early stages of banking deregulation began with the elimination of credit ceilings, the banks were free to set lending rates, savings and time deposits, and to stop granting Bank Indonesia Liquidity Credit (KLBI) to all banks except for certain types of credit related to cooperative and export development. The initial phase of deregulation has succeeded in fostering competition between banks. Many banks, especially private banks, began to rise to take the initiative in determining the direction of business development. Along with that, BI strengthens the bank supervision system, among which through the preparation and maintenance of blacklist which is officially named the List of Degrading People (DOT) in the banking field. Those on this list should no longer be involved in the banking world.

In 1988, the government together with BI went further in the deregulation of banking by issuing the 1988 Banking Deregulation Policy Package (Pakto 88) which became the turning point of various policies of 1971-1972 banking control. The granting of a new business license for a new bank that had been terminated in 1971 was reopened by Pakto 88. Likewise, the opening permit of a branch office or establishment of the banks becomes more facilitated under the terms of light capital. Entering the 1990s, BI issued the February 1991 Policy Pack which contains provisions requiring banks to be cautious in their management. In the period 1992-1993, the national banking began to face the problem of rising bad

loans that cause the burden of losses in banks and the impact of reluctance banks to expand credit.

2.2 Bank Performance and Efficiency

2.2.1 Performance

Performance is defined as the ability possessed in applying a strategy for achieving results over a certain level of achievement. In the banking industry, performance is generally associated with competition, concentration, efficiency, productivity and the ability to generate profits, which we usually get with Return On Assets (ROA), Return On Equity (ROE), Net Interest Margin (NIM), Ratio Operational Costs and Operating Income (BOPO) (Bikker & Bos, 2008). Performance appraisal on a company can be known from financial statements owned by the company. The intended financial statements are those which can provide information on the potential, performance, and cash flows of the companies that benefit to the users in order to make economic decisions and may indicate the form of accountability for the use of resources. In the financial statements there are items such as balance sheet, profit, and loss, and cash flow that can be an indicator of performance in a company, in the balance sheet indicated a business state in certain circumstances which are also a picture that must be analyzed with reference to comparative balance past and other operational reports. Just as described as one of the performance parameters based on the total overall performance of a company called efficiency, namely the ability to get maximum output with existing inputs or by getting a very low level of input to produce a certain level of output.

To measure the performance of banking industry, usually, some researcher used some methods, such as CAMELS method. The common technique is used by the researcher to know how well the performance of the company and how health the company it is.

CAMELS as an early warning system were introduced in the US in the 80s of the 20th century. It is a management system for rating the supervised

institutions based on a group of quantitative and qualitative criteria. Their cumulative assessment is a basis for a discussion between the supervising officer and the board of the financial institution and for the informal assessment of its actual situation. CAMELS is an acronym for a group of indicators, by means of which the financial standing of the banking sector is examined. Initially, the system evaluated the situation of an institution on the basis of parameters relating to its capital (Capital), quality of assets (Asset quality), management (Management), profitability (Earnings) and liquidity (Liquidity). Later, after adding the market risk sensitivity (Sensitivity to market risk), it was converted into CAMELS.

2.2.2 Efficiency

Efficiency in the banking world as one of the well-known performance parameters and widely used because it is considered as an answer to the difficulties to calculate the performance measures. Often on the calculation of the rate of return can show good performance and which are not included in the criteria healthy or achievement when viewed from the side of the regulation.

Efficiency in the banking system is closely linked to the efficiency of the banking market and the efficiency of the intermediation process as well as the efficiency in implementing monetary policy through regulation of bank loans (Matthews & Ismail, 2006), banking industry as the industry that is most regulated by regulations in the banking world (Hadad, Santoso, Ilyas, & Mardanugraha, 2003)

According to Sherman & Zhu (2006), the overall productivity of a bank depends on four components of efficiency classification such as:

1. Technical efficiency: Also known as global efficiency measures the ability of banks to produce actual outputs with fewer inputs, or fewer resources used indicate higher efficiency.
2. Scale efficiency: Refers to the optimal activity volume level whereby inefficiency may arise if goods or services are produced above or below the optimal level that resulted in added fixed cost.

3. Price efficiency: Bank could increase its efficiency if it could purchase the inputs (human capital and material) at a lower price without sacrificing the quality.
4. Allocative efficiency: Measure the optimal mix of several inputs in order to produce products or services, such as banks incorporate automatic teller machines (ATM) and Internet banking for capital labor tradeoffs to increase efficiency.

In addition, by definition, technical efficiency refers to the firm ability to maximize output with the given inputs or produce the same level of outputs with minimization of inputs, while allocate efficiency refers to the optimum arrangement of inputs and output at a specific price (Cooper, Seiford, & Tone, 2006). Technical inefficiency may arise in the conditions where banks produce more outputs with the actual inputs or when bank produce actual output with fewer inputs (Sherman & Zhu, 2006), or generally technical inefficiency exists when banks are wasting some of the inputs (Mester L. J., 2003).

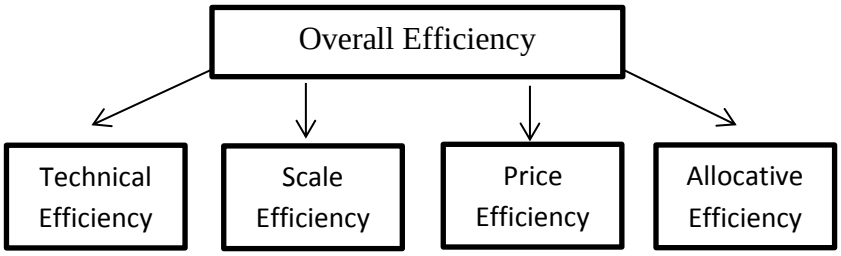

Figure 2.2 General classification of bank efficiency
(Adapted from Sherman and Zhu, 2006)

2.3 Bank Efficiency Measurement

Measurement of banking efficiency can be done using various methods. It can be grouped into two main factors which are parametric and non-parametric methods. Both of these methods are aimed to estimate the frontiers representing best practices from a system. The frontiers estimated are used as a benchmark to compare a company to others. In parametric approach, measurement is conducted

using stochastic econometric modeling and try to omit any effect of inefficiency. There are three econometric parametric approaches which are (*1) Stochastic Frontier Approach (SFA), 2) Thick Frontier Approach (TFA) and 3) Distribution-Free Approach (DFA).*

Meanwhile, non-parametric approach with Non-Parametric Linear Programming Approach conducts non-parametric using no stochastic approach and tends to "combine" disturbance and inefficiency. This argument is constructed based on findings and observations from the population and evaluated relative efficiency on the observed units. This approach is known as *Data Envelopment Analysis (DEA).*

The measurement of bank efficiency consists of two approaches, namely production and intermediation. Production approach emphasized banks as a firm delivering services in the form of transactions, while in intermediation approach, banks assumed intermediating funds between savers and investors (Mostafa, 2011). Production approach assumed banks as the producers of loan and deposit for borrowers and depositors using a traditional factor of production, capital, land, and labor (Taufiq, Shamser, & Bader, 2009). Intermediation approach is more appropriate in evaluating banking sectors as bank collect funds and transforms them into loans and other earning assets (Mokhtar, Abdullah, & Alhabshi, 2008).

According to Hadad, et al. (2003), the Data Envelopment Approach does not using more information, so a little data is needed, fewer assumptions are required and fewer samples of data are needed. However, a statistical inference cannot be drawn if using nonparametric methods. Another major difference is that parametric approaches include a random error in the frontier, while DEA approach does not include random error. As a consequence, the DEA approach cannot take into account factors such as price differences across regions, regulatory differences, good data degradation behavior, extreme observations, and so on as factors of inefficiency. Thus, nonparametric approaches can be used to measure efficiency more generally.

2.3.1 Parametric Approach

2.3.1.1 Stochastic frontier approach (SFA)

The stochastic frontier approach (SFA) was developed by Aigner, Lovell, and Schmidt (1977) and Meeusen and van den Broeck (1977) and, later, by Jondrow, Materov, and Schmidt (1982) as cited in (Molyneux & Iqbal, 2005). This approach is also known as the econometric frontier approach. According to Berger & Humphrey (1997), the SFA specifies a functional form for the cost, profit, or production relationship among inputs, outputs, and environmental factors, and allows for random error. In response to the weaknesses of the deterministic frontier or non-parametric approach, especially the no consideration of random noise, an estimation of a frontier comprising both inefficiency and stochastic (random noise) terms was developed by Aigner et al. (1977), and Meeusen and van den Broeck (Molyneux & Iqbal, 2005). The stochastic term is included because it can consider random noise which raises or reduce the frontier due to fate or other measurement error factors (Berger & Humphrey, Measurement and efficiency issues in commercial banking, 1992).

Furthermore, it is presumed that the frontier moves from one observation to another. At this point, the inefficiency term means increasing costs above the minimum estimated cost frontier (in cost efficiency) or reducing profit below the profit frontier (in profit efficiency). The distributional assumption for the stochastic term components is depicted by two-sided normal distribution, while the inefficiency term is assumed to be one-sided distribution. One problem of SFA is the non-existence of consensus on the type of distribution to be selected in order to arrive at the inefficiency measure. Examples of studies based on SFA are Yildrim & Philippatos (2007), Drake & Hall (2003) and others.

2.3.1.2 Distribution-free approach (DFA)

Distribution-free approach (DFA) was introduced by Berger (1993) following his criticism of the stochastic frontier approach. DFA specifies a functional form for the frontier but separates the inefficiencies in a different way.

The DFA assumes that the efficiency of each firm is stable and does not change over time, whereas random errors will average out to zero in the end (Berger, Hunter, & Timme, 1993). Thus, in contrast to the SFA, this approach sets no specific type of distribution to the inefficiency term. Generally, it needs a panel data set so that the cancellation of the error terms finds enough time to retain a zero value. Studies using this approach include the work of Noor Saliza Zainal & Mahadzir Ismail, Prateanu-Podpiera, Weill, & Schobert (2008), Hardy & di Patti (2001), Maudos, Pastor, Perez, & Quesada (1999), Berger & Mester (1997) and others.

2.3.1.3 Thick frontier approach (TFA)

The Thick frontier approach (TFA) was proposed by Berger and Humphrey in 1992. The TFA estimates the cost function of banks in the lowest average cost quartile (thick-frontier) and compares it with the highest average cost quartile (Molyneux & Iqbal, 2005). Then, it decomposes the deviations into random noise and inefficiency residual. This approach assumes that the deviations from the predicted costs of each quartile represent a random error. Meanwhile, the differences between the lowest and the highest average cost quartiles denote inefficiencies. TFA does not enforce any distributional assumptions on inefficiency as well as random error and does not provide exact estimates of efficiency for individual firms (Berger & Humphrey, 1997). Generally, this method is less popular amongst researchers. A few researchers who employed this method are Bauer, Berger, Ferrier, and Humphrey (1998) & Lozano-Vivas (1997).

The drawback of the parametric approaches lies in imposing a specified functional form that assumes the shape of the frontier. If it is miss-specified, the calculated efficiency may be confounded with the error specification.

2.3.2 Non-parametric Approach

2.3.2.1 Data Envelopment Analysis

DEA was first developed by Farrel in 1957, which later been modified by Charnes-Cooper-and Rhodes (CCR) in 1978 (Klimberg et al., 2009). It is a non-parametric method that utilizes linear programming to measure the level of efficiency of comparable decision-making units (DMU) by employing multiple inputs and outputs (Klimberg et al., 2009). This technique of measuring efficiency was first introduced by Farrel in 1957 based on the basic theory of production on a single input and single output such as "output per work hour" in a form of a ratio (Ayadi et al, 1998; Cooper et al., 2006; Sherman & Zhu, 2006).

$$Efficiency = \frac{Output}{Input}$$

(1)

However, this measurement does not entirely represent efficiency as commonly multiple inputs are used to produce single or more outputs, which lead to the modification of original equation to include measurement of multiple inputs and multiple outputs (Sherman & Zhu, 2006). This concept was further extended into basic CCR DEA model developed by CCR in 1978 by altering the original equation to (Ayadi, 1998; Sherman & Zhu, 2006; Cooper et al., 2006).

$$Efficiency = \frac{Weight\ sum\ of\ output}{Weight\ sum\ of\ input}$$

(2)

In DEA, methods to measure the efficiency of DMUs are referred to a group of firms under study such as banks, hospital etc. DEA is a most accurate technique to measure efficiency given a limited number of DMUs (i.e., banks) (Cooper et al., 2006; Klimberg et al., 2009; Taufiq et al., 2009; Ahmad & Luo, 2010).

The DEA model was first modified by Sherman to measure banks performance in 1984, and since then, was extensively used by banking industry around the world to measure banks operational efficiency (Sherman & Zhu, 2006). DEA allows measurement of efficiency from multiple inputs and multiple outputs within multiple DMUs (Sherman & Zhu, 2006).

Accordingly, the mathematical equation to find the maximum efficiency of DMUs using weighted input-output efficiency measure can be expressed as Model 1 (Cooper et al., 2006; Sherman and Zhu, 2006; Ramanathan, 2007; Chen et al., 2008):

$$max \frac{\sum_{j=1}^{J} v_{mj} y_{mj}}{\sum_{i=1}^{I} u_{mi} x_{mi}}$$

Such that

$$\frac{\sum_{j=1}^{J} v_{mj} y_{nj}}{\sum_{i=1}^{I} u_{mi} x_{ni}}$$

$$v_{mj} u_{mi} \geq 0; i = 1,2, \dots, I; J = 1,2 \dots, J$$

(Model 1)

Where:

N: Total number of DMUs

J: Weighted sum of outputs

I: Weighted sum of inputs

M: The base DMU (calculating *m*th DMU)

N: DMUs

I: Inputs

J: Outputs

vmj: Weights for output

umi: Weights for input.

Since the above equation is in the fractional function, it is difficult to compute, thus, CCR (1978) transform the equation into linear programming equation by setting the denominator of the ratio to one or unity to form a linear programming equation Model 2 or equally known as output-maximization CCR

model (Cooper et al., 2006; Sherman and Zhu, 2006; Ramanathan, 2007; Chen et al., 2008):

$$max \sum_{J=1}^{J} v_{mj}\, y_{mj}$$

Such that

$$\sum_{i=1}^{I} u_{mi} x_{mi=1};$$

$$\sum_{j=1}^{J} v_{mj}\, y_{nj} - \sum_{i=1}^{I} u_{mi}\, x_{ni\leq 0;} \qquad n=1,2,\ldots,N$$

$$v_{mj} u_{mi} \geq 0; i = 1,2, \ldots, I; j = 1,2, \ldots, J$$

(Model 2)

When DEA is employed to measure banks efficiency for a set of DMUs, the linear programming algorithm will calculate the efficiency of each DMU given the identical inputs and outputs variables to find the maximum ratio of weighted sum of output to the weighted sum of input (most efficient DMU) and to be used as benchmark against other DMUs, causing the best-practice DMUs to lie on the efficient frontier line. It means the best-practice units are relatively efficient and identified by DEA efficiency score as 100% (efficiency = 1).

Charnes et al. (1979) imposed non-negativity restrictions to ensure inputs and outputs have positive weight values, so as the efficiency score assigned will be between 1 and 0, and no efficiency index greater than one. The less productive units or inefficiency are identified with an efficiency score of <100% (efficiency <1). The relative units to this frontier represent the degree of inefficiency. Graphically, the Figure 2.3 below illustrates the production frontier of the CCR Model, where it calculates most efficient DMUs on a diagonal line across the area where frontier and other DMUs lies (production possibility sets).

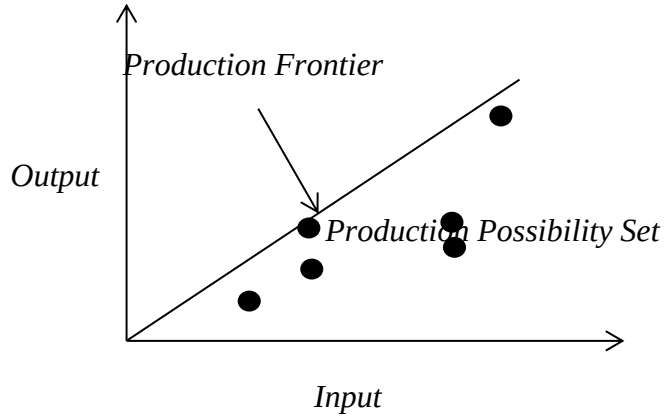

Figure 2.3 Production frontier of the Charnes-Cooper-and Rhodes model (Adopted from Cooper et al., 2006)

a. The basic DEA CCR model

According to Cooper et al. (2006), there are basically two version of CCR model, one is known as the output-oriented model that attempts to maximize outputs with the given input level (represented as Model 2). The second is called the input-oriented model, which target to minimize inputs while adequately satisfying the given output level (Cooper et al., 2006; Ramanathan, 2007). The linear programming equation of input-minimization DEA CCR model is also known as dual model is represented in Model 3 (Cooper et al., 2006; Ramanathan, 2007):

$$\min \theta$$

Such that

$$\sum_{n=1}^{N} y_{nj}\lambda_n \geq y_{mj}; j = 1,2 \dots, J$$

$$\sum_{n=1}^{N} x_{ni}\lambda_n \leq \theta_m x_{mi}; i = 1,2 \dots,$$

$$\lambda_n \geq 0; \mathrm{n} = 1,2, \dots \mathrm{I}; \mathrm{j} = 1,2, \dots, \mathrm{J}$$

(Model 3)

Where, $\theta_{\mathrm{m}} = \text{Efficiency ratio of } \mathrm{m}^{\mathrm{th}} \text{ DMU}$

In input-minimization DEA CCR model which also referred to dual model in DEA literature, the DMU is comparatively efficient if the optimal values of its efficiency ratio (score), θ_m is equals one or unity (Cooper et al., 2006; Ramanathan, 2007); Wu & Wu, 2010).

According to Sherman and Zhu (2006), the basic CCR model is developed by CCR assuming a constant return to scale (CRS). Efficient frontier in DEA can be derived using five alternatives of a return to scale assumption, which each describes the rate of substitution between inputs and outputs either to be increasing, constant, or decreasing within each segment of the frontier (Sherman & Zhu, 2006).

The five alternatives are:

1. Increasing return to scale: A condition when there is proportionate increase of output and input causing DMU to be inside the frontier
2. CRS: A condition when there is proportionate increase or decrease of input or output causing the DMU to be moved along the frontier line or above it and provide meaningful measurement of technical and scale efficiency without having data on input price or cost.
3. Variable return to scale (VRS): Is used when CRS assumption is not satisfied or there are no economies of scale, and efficiency of DMU on efficient frontier is interpreted as pure technically efficient.
4. Non-increasing return to scale: A condition of DMU not being on the frontier line
5. Non-decreasing return to scale: A condition of DMU not being on the frontier line (Ong et al, 2003; Sherman and Zhu, 2006; Ramanathan, 2007; Tahir & Haron, 2008).

According to Charnes et al. (1994), when DEA efficiency scores were calculated using both CRS and VRS model, CRS efficiency scores are less than or equal to the corresponding VRS efficiency score, due to the difference scale size of each DMUs.

b. The DEA Banker-Charnes-Cooper (BCC) model

The first extension of basic CCR model is called the DEA BCC model developed by BCC in 1984, with other criteria are the same as CCR except it complement the equation to measure input excesses and output shortfalls (Cooper et al., 2006; Ong et al., 2003). BCC model includes convexity condition with non-negative element constraints. The DEA BCC model equation, Model 4 (Cooper et al., 2006; Chen et al, 2008):

$$\underset{u_j v_i}{Max}\ E_k = \frac{\sum_{j=1}^{q} uY_{kj} - u_0}{\sum_{i=I}^{p} v\,X_{ki}}$$

Subject to,

$$\frac{\sum_{j=1}^{q} uY_{kj} - u_0}{\sum_{i=I}^{p} v\,X_{ki}}$$

(Model 4)

Is <1,

Where,

E_k: Efficiency of k^{th} DMU

Q: Output

P: Inputs

u_j: Weights of output (virtual value)

V: Weights of input (virtual value)

u_o: Scalar free in sign (positive or negative or 0).

Basically, in BCC model, the formula calculates the efficiency of DMUs and most efficient DMUs that lie on the convex line creating efficient frontier after passing through the area of DMUs (production possibility set). Figure 2.3 graphically illustrates production frontier of BCC model.

In the DEA approach, the measured efficiency is technical rather than economical, meaning that DEA only takes into account the absolute value of a

variable. The basis of measurement reflects the economic value of one variable such as unit weight, length, content, and the other is not taken into consideration. Therefore, it is possible to calculate the combination of variables with different units (Nugroho, 1995).

2.3.2.2 Free disposal approach (FDA)

Free disposal approach (FDA) was introduced in 1984 by Deprins, Simar, and Tulkens as cited in (Molyneux & Iqbal, 2005). It differs from DEA as it does not take into account the convexity assumption. In referring to Tulkens (1993), Berger and Humphrey (1997) describe that "the points on lines connecting the DEA vertices are not included in the frontier. Instead, the FDA production possibilities set is composed of only the DEA vertices and the free disposal hull points interior to these vertices because the FDH frontier is either congruent with or interior to the DEA frontier, FDA will typically generate larger estimates of average efficiency than DEA" (p. 17). The major disadvantage of FDA is similar to that of DEA, i.e ignoring the random error. Nevertheless, "it considers the variation of efficiency over time and makes no assumption as to the type of the distribution of the inefficiency component, and thus the measured distance between the estimated observation and the frontier is wholly considered as inefficiency" (Molyneux & Iqbal, 2005, p. 202). Amongst the researchers who employed FDA in their studies are Cummins and Zi (1998), Borger and Kerstens (1996) and others.

Unlike the parametric approaches, the disadvantage of the non-parametric approaches is due to the fact that they enforce less structure on the frontier but do not allow for random error due to luck, data problems, or other errors measurement. If random error presents, then the calculated efficiency may be perplexed with these random deviations from the right efficiency frontier.

2.3.2.3 Advantage of Data Envelopment Analysis (DEA)

According to Putra (2003) the advantages of DEA to traditional methods are:

1. The possibility for an error in the specification of the production function is zero.
2. Non-parametric measurement methods.
3. The weakness of this DEA method is that it is very sensitive to error occurrence.

Meanwhile, according to Trick (1996) the advantages of the DEA method are:

1. DEA is very appropriate for models that have many inputs and outputs.
2. The function of the equation or the inequality function of the DEA method does not require assumptions relating to its input and output.
3. The units measured will be compared directly with the units being evaluated.
4. The units between input and output are different

The same characteristics that make DEA a powerful tool can also create problems. An analyst should keep these limitations in mind when choosing whether or not to use DEA.

1. Since DEA is an extreme point technique, noise (even symmetrical noise with zero means) such as error measurement can cause significant problems.
2. DEA is good at estimating "relative" efficiency of a DMU but it converging very slowly to "absolute" efficiency.
3. Since DEA is a non-parametric technique, statistical hypothesis tests are difficult and are the focus of ongoing research.
4. Since a standard formulation of DEA creates a separate linear program for each DMU, large problems can be computationally intensive.

2.4 Input and Output Factor of Efficiency

The definition and measurement of inputs and outputs in the banking function remain a confusing issue among the researcher. There is a long-standing dispute over what banks produce and what resources banks consumed (Berger & Humphrey, 1992). Based on this issue, there are two main approaches in the banking theory literature, namely the production and intermediation approaches (Klein 1971; Sealey & Lindley 1977).

2.4.1 Production approach

This approach was pioneered by Benston (1965). The study was based on a cost analysis done by the employees of the banks in the First Federal Reserve District in the US in 1957. Therefore, it adopts the view of employees in describing the banking operation. Under the production approach, banking firms are characterized as service producers aiming at minimizing operating costs. From the perspective of employees, banking operations are associated with performing transactions, processing financial documents and providing advisory services.

Inputs under the production approach thus include only physical variables such as labor, premises and fixed assets, space or information systems and the associated costs. Interest expenses are excluded from this approach since the main focus is on operating processes. Outputs are defined in terms of what a bank that incurs operating costs, referring to all banking services. A bank's output factors could be categorized into six groups including demand deposits, time deposits, mortgage loans, installment loans, business loans and securities.

The measures of input and output factors contribute to contrast the production approach from the intermediation approach. While the latter typically uses the monetary value of deposit and loan accounts, the production approach tends to employ the number of transactions or documents. Humphrey (1985) & Benston (1972) argued that most of banks' operating costs are incurred through the processing of loan and deposit documents as well as transactions. The monetary value of the documents may somewhat affect the operating costs, but not primarily. In case that a bank is processing large volume accounts, the measures in terms of monetary value can miss-capture the lower cost per monetary unit as operating efficiency.

Following technical production theory, it is suggested that a bank's output factors should be measured by the flow of service that it produces, not by the stock value. Therefore, output factors are best measured by the number of transactions or loan and deposit documents processed over a given period of time. However, such detailed flow data are usually only available in the context of an

internal evaluation. The stock variables such as the average number of accounts are thus often used with the assumption that flows are proportional to stocks (Berger & Humphrey 1997; Sealey & Lindley 1977).

The production approach gains credit in justifying the significance of deposits in the banking industry when placing deposits on the output side. Benston (1965) and Longbrake (1974) argued that deposit customers benefit from the banking services such as security, safekeeping, and liquidity and are willing to pay for these services in form of interest spread. Furthermore, deposit related activities absorb considerable capital, labor, and other physical resources

Therefore, the production aspects of a bank should not be treated as of secondary importance, especially because the banking industry is a resource intensive one. The main criticism for production approach is not capture the intermediation function which is considered as the primaries function of a bank. The production approach does not directly describe more about interest expenses and the largest part of total banking costs. Therefore, it is not very useful for examining the profitability and viability of an entire banking firm. Last but not least, with the focus on how banks incur operating costs, this approach is argued to be more suitable for evaluating the efficiency of bank branches. Berger & Humphrey (1997) reasoned that branches primarily process customer documents for the whole institution and have little influence over a bank's funding and investment decisions.

2.4.2 Intermediation approach

The intermediation approach is employed by most DEA studies due to concerns on the financial intermediary role of banks. Sealey & Lindley (1977) are considered as the founders of this approach. They aimed at modeling bank behaviors within the context of a profit-maximizing firm. Input and output factors are explicitly specified inconsistence with a positive theory of price and output decisions of firms. Banking firms are characterized as financial intermediaries.

Sealey & Lindley (1977) attempted to capture both technical and economic aspects of a financial intermediary's production process. The technical

aspect focuses on the transformation process from inputs to outputs. Inputs are defined as objects which enter the process and cease to exist in their original form and outputs are objects which emerge from the process (Frisch, 1965). The transformation process for a financial intermediary is equated with securing funds from surplus units and transmitting to deficit units. In the economic sense, the purpose of the process is to create outputs of higher value than the original inputs. As required by the positive theory of firm behavior, a firm aiming at profit maximization should make a decision based on its own private costs and revenue which are explicitly measured in term of market value. In the specific case of a bank, in order to be characterized as an output, a service must have higher market value than original inputs.

Therefore, services provided to debtors are considered as outputs. In turn, services provided to depositors are considered as inputs since they incur positive costs without yielding any direct revenue. These positive costs refer to the banking services such as safekeeping, check clearing and bookkeeping, which can also be viewed as the partial payment for the use of funds.

In conclusion, this approach specifies inputs and outputs based upon both the transformation process and the preference in term of the market value of intermediary services. Regarding the measures of input and output factors, the intermediation approach tends to use the monetary value of deposit and loan accounts instead of the number of deposit and loan accounts. Kolari & Zardkoohi (1987) demonstrated that banks compete to gain market share in term of the monetary value rather than in terms of the number of accounts. Additionally, Humphrey (1985) argued that the monetary value of funds being intermediated is more important than the number of accounts for a financial intermediary and that the intermediation costs also incur in relation with the monetary value of deposits and loans.

Compared with other approaches, the intermediation approach gains the widest application in bank efficiency studies, as proved in the comprehensive reviews by Berger & Humphrey (1997) and Fethi & Pasiouras (2010). The primary support for this approach comes from the fact that it is explicitly and

effectively takes into account the interest related activities which distinguish banks from other kinds of firms. It is also broadly agreed that this approach can better evaluate the competitive viability of banks since any competitive bank would minimize the sum of both interest expenses and operate expenses for any given outputs (Berger et al. 1987; Wheelock and Wilson 1995).

Therefore, Berger & Humphrey (1997) suggested that the intermediation approach can be superior to other approaches in evaluating the bank performance at the institutional level. Besides, Cook et al. (2005) argued that the intermediation approach constitutes a better instrument to study efficiency and gives more accurate image of how efficiently a bank is using its resources to generate profit than other approaches. Another important reason for the widespread use of the intermediation approach is the accessibility to the data required for performance measurement. The stock data in terms of monetary value of bank liabilities and assets are mostly readily available in published financial statements.

Despite such broad application in bank efficiency studies, the intermediation approach has several shortcomings. Firstly, and most clearly seen, the treatment of deposits as inputs fails to justify the importance of deposit services that a bank provides to customers as well as the considerable operating costs incurred with the deposit issuing process. Deposits are just regarded as normal inputs for producing loanable funds. Their output functions in providing liquidity, payments, and safekeeping services to depositors in the intermediation process are ignored. Berger and Humphrey (1992) attributed this failure to the fact that explicit revenues of deposits are relatively small and being dominated by implicit revenues. Furthermore, the proportional relation between deposits and earning assets is not counted. Secondly, the intermediation approach does not address the unique characteristics of a bank but takes it as a normal financial intermediary only. While channeling funds between depositors and borrowers, a bank also participates in the national payment mechanism system and increases the money supply for the economy. This aspect is disregarded in the intermediation approach. Finally, it neglects risk management aspects and non

interest related activities. A bank is not simply a broker. Referring to the discussion on roles and functions of a bank above, a bank is also a liquidity insurer and credit risk monitor.

These secondary functions are of emergent importance nowadays. According to Allen & Santomero (1998) and Hakenes (2004), risk management has become a key area of intermediary activity. Allen & Santomero (2001) also proved the decreasing significance of interest related activities and the increasing significance of non-interest related activities in banking today. However, the intermediation approach mainly concentrates on modeling deposit issuing and loan granting activities while neglecting risk indicators and non-interest related services.

The literature on the subject presents a lot of arguments for and against the approaches or models. However, there are no explicit conclusions about which approach is the best (Wozniewska, 2008). As the purpose of this research is to evaluate the efficiency of banks, with banks act as financial intermediaries, this research employs the intermediation approach, like many studies into banking efficiency, it also more relevant for financial institutions, as the cost of funds to be intermediated (interest expenses) often account for one-half to two-thirds of their total costs (Berger & Humphrey, 1997). This approach also is very good at evaluating the importance of frontier efficiency, as the minimization of the total cost (besides production cost) is needed to maximize profits.

2.5 Research Evidence of Bank Efficiency

A research about banking industry in Tunisia is employing factors of overhead cost to total asset ratio, capital to total asset ratio, banks loan to total asset ratio, idle asset to total asset ratio (size), and macroeconomic factors such as inflation, interest rate, and GDP per capita argued that banks with higher capital and NIM had positive and significant impact on profitability while macro indicators such as inflation and FDP per capita growth did not have significant impact on interest rate margin and profitability (Naceur, 2003)

Research about the banking industry in Malaysia of Omar et al. (2006) observed productivity of Syari'ah banking industry using non-parametric Data Envelopment Analysis (DEA). The research does not matter in improving bank's efficiency. Nevertheless, improvement from the technical aspects through technology utilization supported by employees' knowledge and skills, it will drive the more rapid growth of productivity. Syari'ah banks are considered to be less-efficient compared to commercial conventional banks. Furthermore, Muda et al. (2013) observed determinants of profitability between domestic Syari'ah banks and foreign banks using DEA approach. It is concluded that determinants of domestic bank profitability are different from foreign banks. Significant factors for domestic banks are not relevant to foreign banks (they may be insignificant to foreign banks). Overhead cost ratio, loan ratio, technical efficiency, GDP growth rate, and bank's size have a significant effect on determining the level of domestic bank's profitability while these factors are not influencing significantly on foreign banks.

(Sok-Gee, 2011) argue that his research on the banking industry in China using DEA approach concluded that foreign commercial banks are relatively more efficient followed by state-owned banks (BUMN) and private domestic banks.

Research on determinant efficiency and the impact on profitability were also conducted in Indonesia. Independent variables that had a significant impact on profitability (represented by ROA) are bank size, bank type, NPL, CAR, LDR, Operating Cost, and NIM (Subandi & Ghozali, 2013). They were subsequently added with variables of BOPO, the growth of operating income (PLO), and credit growth (PK) by (Suyono, 2005). The research discussed the comparison of financial performance among domestic banks, foreign banks, and mixed-banks using financial ratio proxies. Performance of foreign banks based on financial ratio proxies does not always outperform mixed banks and domestic banks, vice versa. It is indicating that each of public banks has the equal opportunity to outperform other public banks disregarding those banks are domestic banks, foreign banks, or mixed banks (Handayani, 2005).

2.6 Hypothesis Development

According to Delis & Papanikolao (2009), the performance of banking efficiency can be influenced by both internal and external determinants. Internal determinants are variables derived from bank accounts such as the performance of the statement of financial position and income statement, while the external determinant is a determinant that's not related to bank management but may reflect economic and regulatory conditions and also may affect the performance of financial institutions.

So, factors that can influences bank efficiency is from external such as government regulation and the condition of economic market and also internal factor that influence efficiency is from the inside of the company that can be seen from the report on the financial statement of each company and also from the condition of the bank itself. For the internal factors that influence bank efficiency is based on the profitability, size, capital, third party's fund, non-performing loan, also from the type of bank, etc. Therefore, in this research, the internal factor classified by 3 factors such as profitability that represented by ROA, an asset of the company that represents by the Size and also the Capital that represented by Capital Adequacy Ratio (CAR).

In order to investigate whether the internal factors can influence the efficiency of the domestic and foreign bank in Indonesia, the researcher proposed the hypothesis as follows:

2.6.1 The Domestic Bank Efficiency compare with the Foreign Bank Efficiency level in Indonesia

Based on some of the research evidence of efficiency, there are some researchers that explain that foreign bank is more efficicient than domestic bank, this research observed by Muda et al. (2013) that compare the domestic and foreign bank in Malaysia, they conclude that some significant factors for domestic banks are not relevant to foreign banks (they may be insignificant to foreign banks). (Sok-Gee, 2011) the research that he observed conclude that banking

industry in China that compare the efficiency of domestic and foreign bank are relatively more efficient followed by state-owned banks (BUMN) and private domestic banks.

The researcher from Indonesia discussed also the comparison of performance on domestic bank, mixed-bank, foreign bank and the result is performance of foreign banks based on financial ratio proxies does not always outperform mixed banks and domestic banks, vice versa (Handayani, 2005).

So, based on some researches result from the other researcher above, the researcher in this research want to know whether there is some different performance of efficiency of the foreign bank compare with domestic bank in Indonesia in period of 2014 until 2016 and the researcher generate the hypothesis as follows:

H1: The Efficiency of Domestic Bank is more efficient compared with Foreign Bank in Indonesia

2.6.2 The Influence of Return on Asset (ROA) toward bank's efficiency level in Indonesia

Return on Asset or better known as ROA is one of bank profitability ratio. ROA is said to be the ability of the capital invested in all of the company's assets to generate the profits (Hamdi & Lestari, 2010). This profitability analysis uses ratio calculation i.e. ROA. According to Meythi (2015) reason ROA used in this profitability analysis because the role of BI is the supervisor and supervisor of the banking industry who are more concerned with the assets of funds originating from the community. In previous research, Fathony (2012) explains that efficient banks have higher ROA / ROE. So, it is proven that the higher level of profitability of a bank, the level of efficiency is also better or closer to 100% efficiency level.

In line with Firdaus & Hosen (2013) research which states that ROA as a proxy of profitability of a bank has a positive and significant influence because banks that generate greater profit rate are indicated as efficient banks.

So, researcher generate scond hypothesis as follows:

H2: There is positive impact of profitability toward bank efficiency level in Indonesia

2.6.3 The Influence of Bank SIZE (Asset) toward bank's efficiency level in Indonesia

Bank size becomes one of the specific characteristics of banks that generally become the determinant efficiency of banking. Previous research explains that banks that have large sizes generally also have advantages than banks that have medium or small size. For example, such as large amounts of capital, better employment and reputation, and the ability to generate non-interest income from other sources, such as banking investment services, money transfer services, foreign exchange services and insurance services (Masita, 2014). The research that has been done by Rangan, et al. (1988) states that bank size has a positive influence on efficiency, which means that the bigger a bank, the more efficient this is due to the bank can maximize economies of scale. (Ismail, et al, 2013) argue that banks with larger sizes are more likely to achieve higher efficiencies. This may be due to adopting new technologies that can increase profits and minimize costs. It can be concluded that bank size has a positive effect on efficiency.

So, the third hypothesis that researcher generate is:

H3: There is positive impact of Size of the bank toward bank efficiency level in Indonesia

2.6.4 The Influence of Capital Adequacy Ratio (CAR) toward bank's efficiency level in Indonesia

Bank health is measured using CAMELS ratio (Capital, Assets, management, earnings, and liquidity). One of the CAMELS' capital ratios (modeling) is an important factor for banks to run their operations. In the aspect of capital is not only necessary to create a healthy banking system but also necessary for banks to be more efficient. Widyatmoko (2014) explains that the soundness of a bank which is proxies with the capital aspect (CAR) has an influence on bank

efficiency. The higher the CAR value the stronger the bank's ability to bear the risk of any credit. The Capital Adequacy Ratio (CAR) is a measure of bank that can be measured through capital compared to risk-weighted assets (RWA).

So, researcher generates the last hypothesis as follows:

H4: There is positive impact of Capital Adequacy Ratio toward bank efficiency level in Indonesia

CHAPTER III
RESEARCH DESIGN AND METHODS

3.1 Population and Sample

3.1.1 Population

Population in this research is conventional banks in Indonesia which consist of 120 banks. Those banks are respectively grouped into 4 State-owned Banks, 35 Foreign Exchange Domestic Banks, 30 Non-Foreign Exchange Domestic Banks, 26 Local Banks, 15 Mixed Banks, and 10 KCBA (branch offices of foreign banks).

3.1.2 Sample

In this research, the researcher uses of two types of banks as a sample which are a domestic and foreign bank (from KCBA), and also sampling in this research is using purposive sampling technique. The criteria used as the basis for sample selection are as follows:

1. A Domestic and Foreign Bank operating in Indonesia and having a license to run its business in the period 2014 to 2016. The researcher took 5 random sample of domestic bank based on the bank that already go public and register their IPO in IDX in period 2014 until now.

   The researcher chooses 5 of a foreign bank based on the availability and completeness of the annual report in each bank because to make it easy to analyze and the other reason the researcher just took random sample from the population.
2. Banks that have input variables and complete output in the period 2014 to 2016

Table 3.1 List of sample domestic and foreign bank

No	Bank's Name (Domestic)	No	Bank's Name (Foreign)
1	BNI	1	Standard Chatered Bank
2	MANDIRI	2	Bank Of America, N.A
3	BCA	3	Citibank N.A
4	BRI	4	The Bank Of Tokyo-Mitsubishi UFJ LTD
5	CIMB NIAGA	5	Deutsche Bank

3.2 Type and Source of data

The object of this research is a company in the banking industry that is commercial bank registered in Bank Indonesia (BI) and the data are from the annual report of each sample bank domestic and foreign. This research is using secondary data and quantitative research approach in a year period of 2014-2016. So, to get the data researcher took from IDX, Bank Indonesia and website of the company.

3.3 Research Variable and Operational Definition

3.3.1 Efficiency

Efficiency in the banking world as one of the well-known performance parameters and widely used because it is considered as an answer to the difficulties to calculate the performance measures.

Efficiency in the banking system is closely linked to the efficiency of the banking market and the efficiency of the intermediation process as well as the efficiency in implementing monetary policy through regulation of bank loans (Matthews & Ismail, 2006),

In assessing the efficiency of banking industry researcher need to compare some of input and output that explained in the Table 3.2, the definition of output

and input variables are defined based on PBI No.2/21/PBI/2000 dated 19 September 2000 on Monthly Report of Commercial Banks as follows:

3.3.1.1 Output Variables Definition

- *Credit* is the distribution of funds or claims that agreed upon a few borrowings between banks and other parties that requires the debtor settle the debt at maturity with interest rate imposed.
- *Operating interest income* is defined as the interest income in Rupiah and foreign exchange from the investment of a bank upon citizen or non-citizen.
- *Non-interest income* is all income in Rupiah and foreign exchange obtained from non-interest operational activities, for instance, the increase in fair value of credit and securities, gains from sales of securities, and gains from the derivative transactions.

3.3.1.2 Input Variables Definition

- *Fixed Asset* is an asset of a bank, actually long-term asset that is used to support bank's operating activities.
- *Labor cost* includes wages, salaries, and other allowances paid to management and employee (both permanent and non-permanent) of bank before being subtracted from income tax and other cost cuts payment to commissioner/supervisory council of bank and all labor costs excluding wages, salaries, and allowances such as over-time wage and health insurance.
- *Third party's fund* that consists of time deposit, savings that is collected funds from the public.

3.3.2 Return on Asset (ROA)

Profitability is a specific measurement of the bank performance, where the objective of management is to maximizing shareholder value, the optimization of the various levels of return, and minimizes the risks that will exist (Adyani, 2011). Profitability is used as an indicator of management effectiveness in a company. Return on Assets (ROA) is a financial ratio which best to reflect bank's

profitability because it describes how banks obtain or optimize earnings by utilizing its assets. In addition, Bank Indonesia prioritize ROA rather than ROE to measure the performance of the bank because of the priority value of a bank profitability measured by assets which fund most by public deposits (Dendawijaya, 2005).

When the company have more profitability, it can be said that the company can manage well the operation and it's more efficient rather than the company that have less profitability.

Formula:

$$\boldsymbol{ROA = \frac{Net\ Income}{Total\ Asset}\ x\ 100\%}$$

3.3.3 SIZE (Asset)

According to PBI No. 14/15/PBI/2012 dated 24 October 2012 on Asset Assessment of Commercial Banks, it is mentioned that asset consists of productive asset and non-productive asset. The productive asset is allocation fund of banks to gain return in the form of credit and other securities, inter-bank placements of claim acceptance, securities claim for purchased and commitment of reselling the securities, derivative claim, inclusion, the transaction of the administrative account, etc.

Meanwhile, the non-productive asset is those that have potentially lost in the form of taking over collateral, abandoned property, inter-office account, and *suspense account*.

Formula:

$$\boldsymbol{SIZE = Log\ n\ Total\ Asset}$$

3.3.4 Capital Adequacy Ratio (CAR)

According to PBI No.15/12/PBI/2013 dated 12 December 2013 CAR is the Minimum Required Capital of Commercial Banks. In order to create health banking system and be able to develop as well as competing for both domestically and internationally, banks need to improve the ability to mitigate risks caused by the crisis and/or high growth of banking's credit. In order to improve the ability to mitigate risks, it is needed improvement on quality and quantity of bank's capital based on international standard mentioning that improvement of capital quality is conducted through some adjustments on components requirements and bank's capital instrument, as well as adjustments on capital ratios.

In order to enhance the quantity of capital, banks need to provide additional capital above the minimum required capital adjusted to the risk profile that serves as a buffer when an economic and financial crisis occurs which negatively affects financial system stability.

Formula:

$$\boldsymbol{CAR = \frac{Total\ Asset}{RWA}\ x\ 100\%}$$

3.4 Data Analysis Tools

The research consists of 2 stages which are:

1. Efficiency measurement using intermediation approach
2. Estimation of factor model that has a significant impact which are internal factors of the bank on efficiency.

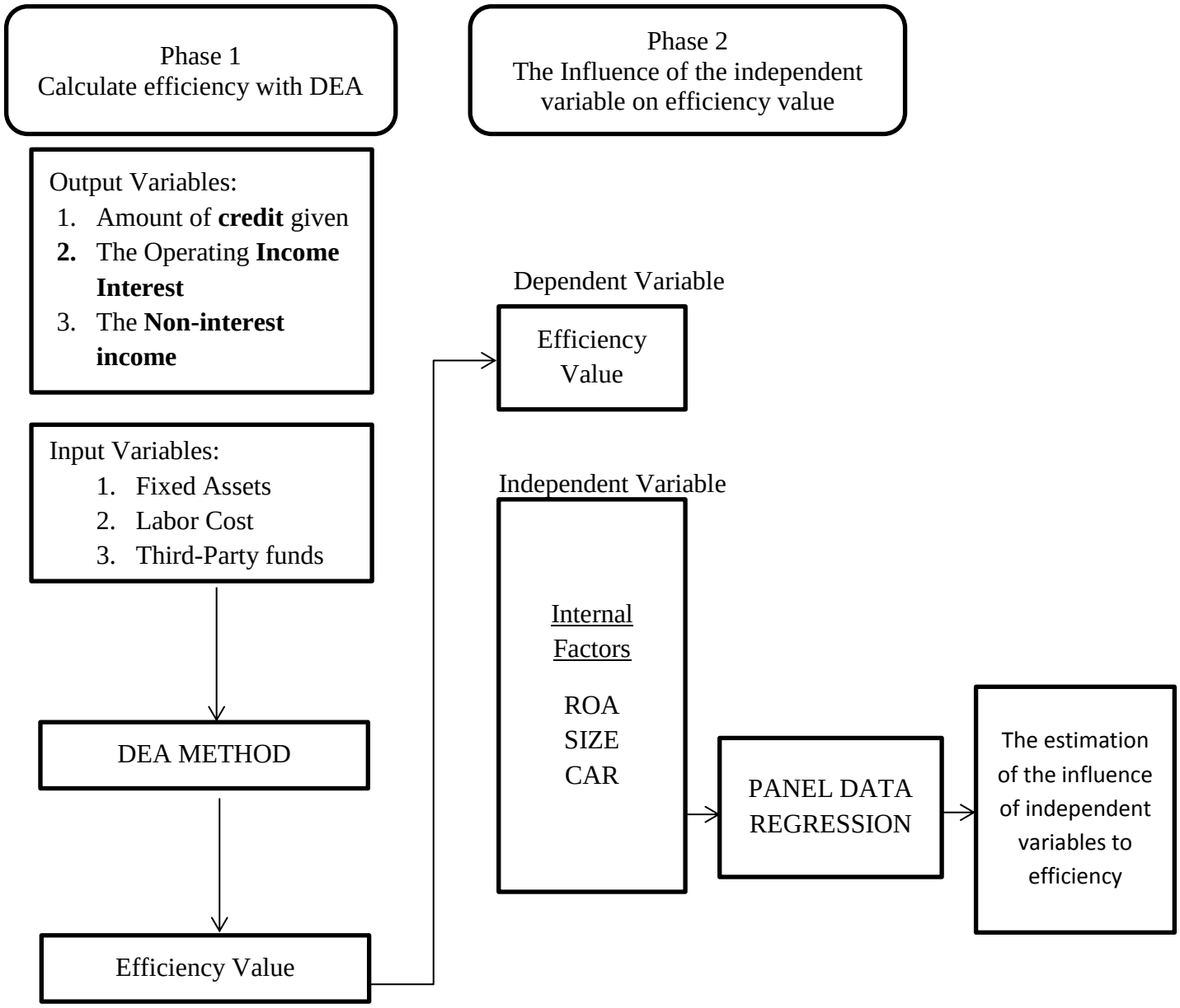

Figure 2.4 Research Framework

3.4.1 Measurement of Domestic and Foreign Bank Efficiency

The first stage of this research is to measure efficiency using DEA method which is to compare input and output variables using intermediation approach. Considering that the banking is intermediation institution that distributes funds from surplus units to deficit units in the form of credit to drive domestic economic

growth. DEA consists of output (O) and input (I), which is respectively the total of the following accounts:

Table 3.2

Input-Output Variables

	Definition	Source
O	Total of:	
	Credit	Balance Sheet
	Interest Income	Income Statement
	Non-Interest Income	Income Statement
I	Total of	
	Fixed Asset	Balance Sheet
	Labor Expenditure	Income Statement
	Third Party's Fund	Balance Sheet

Data will be analyzed on a time-series and cross-section basis using 3 input variables (Third Party Funds, Labor Expenditure, and Fixed Asset) and 3 output variables (size of Credit, Interest Income, and Non-Interest Income). Measurement efficiency using DEA is relative, meaning relative that depends on the best unit. The unit with the best efficiency will get 1,000 or 100%. While other units will give the variation of the level of efficiency is between 0 - 100% depending on the unit that have the best level of efficiency.

The aim of this technique is to measure how efficiently a bank uses resources in generating outputs. In addition, DEA can help to provide the targets that a bank must achieve in order to be more efficient. All data processing is done with DEAP 2.1 and WINDEAP software.

Technical efficiency of banking is measured using the ratio between output and input of banking. DEA calculates banks that use input *n* to generate different output *m* (Miller & Noulas, 1996 in Etty Puji Lestari, 2001). Bank's efficiency is measured using the following formula (Lestari, 2001):

$$Maximization\ h_t = \frac{\sum_{r=1}^{m} \mu_{rk}\, y_{rk}}{\sum_{i=1}^{n} v_{rk} x_{rk}}$$

where *ht* is the bank's technical efficiency; *m* is bank's output (O1, O2, O3); *n* is bank's input (I1, I2, I3); *yrk* is the number of output *r* produced by banks; *xrk* the

number of input *r* used by banks; *μrk* is the weight of input *r* of bank *k*; and *r* is calculated from 1 to *m* while *i* is calculated from 1 to *n*.

From the results of DEA calculations for banks also generated an efficient DMU composition as a reference (benchmark), with different weights. An efficient DMU is used as a reference to determine the input and output targets to be achieved by an inefficient DMU. The target of DEA's results is the minimum target that a bank must achieve. If the bank is efficient then the target input and output are equal to the value of the input or actual output of the bank.

In evaluating with the DEA method, please note:

1. Need for input value and the output value for each DMU.
2. DMU has the same process that uses the same input type and input type
3. Define the relative efficiency value of each DMU through the ratio between the output weighting and the sum of the input weights.
4. The efficiency values range between 0 and 1
5. The weight value obtained from the programming results can be used to maximize the value of relative efficiency.

In DEA Multi-stage there is two scale approaches: constant returns to scale (CRS) and variable returns to scale (VRS). The authors chose the CRS approach to assist the calculation of efficiency level analysis performed because the bank is considered to operate optimally in a growing economic condition in the period 2014-2016. The efficiency level ranges between 0 and 1, where banks are called efficient if get a value of 1 which also means the slack is worth 0. In DEA data processing is not done manually but using software DEAP 2.1 or Windows for DEA (WINDEAP) (Coelli, 1996).

DEAP is a computer program using DOS but can be run with Windows Operating System. This software user must enter input and output value in the form of text in notepad. Then create the instruction file to run the program containing information about the data file name, the output, the number of units examined, the number of periods, the number of output and input variables, the selected approach. The econometric calculation performed is to assume that if

there is an optimum combination between each input to produce the expected output the highest value of efficiency is 1.

The distance between the highest limit of efficiency value 1 is inefficiency. The resulting efficiency calculation is the relative efficiency number of all calculations. Based on the above calculations, the banks that have the highest efficiency score for each category are banks that can manage input well and combine it optimally.

So, the process of calculating the DEA, first is by collecting all information data of each domestic and foreign bank which the input and output of each companies. Then, researcher can calculate with WINDEAP software by input all the data that researcher already gets from the annual report. After this, the researcher can get the result by look the efficiency value of each bank. Banks can call efficient where the value of efficiency score is 1, but banks are inefficient if the value of efficiency score is less than 1. Researcher can also calculate the average of all the data that given by the company, by calculate the average level of efficiency per bank and per year, and in the last of the calculation researcher can know whether all of the sample of banking industry is efficient or not. Then after getting the level of relative efficiency, researcher also can look for the target input and output for the banks that have not been efficient by the formula below:

- Target Input = actual input Bank reference (*peer)* x Weight (*lamda weights*).
- Target Output = Output Actual Bank reference *(peer)* x Weight *(lamda weights)*

but beside this formula, using WINDEAP software researcher will directly get all of the result of target input and output for the banks that have already efficient or inefficient.

3.4.2 Measurement of Internal Factor that influence Bank's Efficiency in Indonesia

The second stage in this stage is explained and estimate about the impact of bank's internal factors such as ROA, SIZE and CAR that serve as independent variables to the dependent variable of efficiency (the result of DEA measurement or Efficiency result) using data panel regression processed by EVIEWS software, that the step are choose first the best model between common effects, fixed effect or random effect model with the Chow Test, Hausman Test and Langgerman Test (if needed).

a. Chow Test is used to compare whether researcher choose common effect or fixed effect.

   H0: Common Effect

   H1: Fixed Effect

   Criteria for decision making:

   If P-value < α (5%) = Ho rejected

   P-value > α (5%) = Ho accepted

   If the result is to choose to fixed effect in Chow Test, researcher need to used Hausman Test in the next step to compare whether the fixed effect or random effect that is better but if the result is choose common effect, researcher need to use Langrangge Test to compare between common effect and random effect.

b. Hausman Test is used to compare fixed effect and random effect

   H0: Random Effect

   H1: Fixed Effect

   Criteria for decision making:

   P-value < α (5%) = Ho rejected

   P-value > α (5%) = Ho accepted

c. Langrangge Multiplier (LM) Test is used to compare Common Effect and Random Effect (if needed)

   The value of LM will be compared with the value of Chi Squared Table with degrees of freedom as many independent variables (free or X) and alpha or significance level of 5% (0.05) determined from the beginning of the study. Taking the conclusion as follows:

   If LMvalue > Chi Squared Table, then the best model is RE,

   If LMvalue < Chi Squared Table, then the best model is CE.

After this researcher already get the best estimation model for data panel regression test, and from the result of this test will investigate significant value, R and R2 value which describe whether those three factors give influence to the domestic and foreign bank or not.

The assumption that a and β will be equal (constant) for each *time series* and *cross-section* data, then a and β are estimated using the following model

$$EFFit = \alpha 1 + \beta 1\ ROAit + \beta 2\ SIZEit + \beta 3\ CARLit;\ i = 1,2,....,N;\ t = 1,2,.....,$$

Dependent variable is efficiency (EFFit); meanwhile independent variables include Profitability (ROA), Total Asset (Size) and Capital Adequacy Ratio (CAR).

3.4.3 Hypothesis Testing

The hypothesis testing is focus on defining the influence of the variables used in this research as well as to know whether foreign or domestic bank that more efficient by examining the hypotheses themselves. Test is a significant test of independent variables (ROA, SIZE and CAR) and dependent variable (EFF).

The hypotheses are divided into H0, H1, H2 and H3, such as:

H0: There is no influence of Internal Factor toward efficiency of domestic and foreign bank in Indonesia

H1: The Efficiency of Domestic Bank is more efficient compared with Foreign Bank Indonesia

H2: There is positive impact of Profitability toward bank's efficiency level in Indonesia

H3: There is positive impact of SIZE (Asset) toward bank's efficiency level in Indonesia

H4: There is positive impact of Capital Adequacy Ratio (CAR) toward bank's efficiency level in Indonesia

Define criteria for decision making for H1:

If average of Eff-value is closer to 1 or 1 = domestic bank is more efficient than foreign bank

If average of Eff-value is less than or far to 1 = domestic bank is inefficient than foreign bank

Define significant level (α) = 5%

Define criteria for decision making for H2-H4:

If $P \leq \alpha$ = H0 accepted or H2; H3; H4; rejected

If $P > \alpha$ = H0 rejected or H2; H3; H4; accepted

The coefficient of determination (R2) is used to describe the percentage of the change of dependent variable (EFF) caused by independent variables (ROA, SIZE and CAR). The higher the R2 means the higher the changing of dependent variable caused by independent variables. R-squared serves to show how much the sample can represent the total population

The value of C shows the overall relationship of all independent variables to the dependent variable. There are two main things that need to be seen from the value of C, which is on the 'Coefficient' and 'Prob'. Coefficient indicates whether the overall relationship of the independent variable and the dependent variable is the positive / negative relationship. If the value is negative, then it can be interpreted that the relationship between the independent variable and the dependent variable is a negative relationship, and also vice versa.

CHAPTER IV
DATA ANALYSIS AND DISCUSSIONS

4.1 Statistic Descriptive of Research Variable

The descriptive statistics analysis will explain about the description of the variable which is efficiency of domestic bank and foreign bank in Indonesia and also discuss the internal factor such as ROA, SIZE and CAR that can influence the efficiency of banking industry. Based on the criteria that researcher decide in previous chapter, researcher use 5 sample for domestic bank which are BNI, MANDIRI, BCA, BRI and CIMB NIAGA and 5 sample from foreign bank in Indonesian which are SCHATERED BANK, BANK OF AMERICA, CITIBANK, BANK OF TOKYO and DEUTSCHE BANK in period 2014-2016.

Researcher using method of Data Envelopment Analysis (DEA) which is the tool to calculate the Bank efficiency and with assumption of Variable Return to Scale (VRS) that use input oriented. The unit with the best efficiency will get the number of 1.000 or 100% and the other units will have different number of result based on the best level of efficiency. This DEA technique is to measure how efficiently a bank uses resources to generating the outputs and also help the company know about information of the target that company must achieve in order to be more efficient in allocating the input to become suitable outputs. The inputs that researcher analysis is consist of Fixed Asset, Labor Expenditure and Third Party's Fund, and the outputs are Credit, Interest Income and Non-Interest Income. All the calculation process is done with WIN4DEAP and DEAP 2.1 software. And after that researcher calculates using EVIEWS software to know the result of internal factor that influences the efficiency.

Table 4.1 The statistic of research variable

VARIABLE	MEAN			ST DEV			MIN			MAX		
	D	F	ALL	D	F	ALL	D	F	ALL	D	F	ALL
INPUT												
FIXED ASSET	12,562,701.53	3,426,730.00	7,994,715.77	3,066,830.22	1,012,824.50	2,911,565.67	2,485,028.00	1,117,740.00	1,117,740.00	35,663,290.00	8,944,600.00	35,663,290.00
LABOR COST	9,942,228.53	4,212,847.40	7,077,537.97	372,928.35	1,164,139.70	829,584.93	3,281,221.00	1,003,391.00	1,003,391.00	18,485,014.00	9,511,660.00	18,485,014.00
THIRD PARTY'S FUND	470,471,816.00	27,557,356.07	249,014,586.03	15,028,754.56	1,336,446.87	16,496,446.66	174,723,234.00	10,663,119.00	10,663,119.00	754,526,374.00	49,977,555.00	754,526,374.00
OUTPUT												
CREDIT	397,792,128.40	869,407.63	215,498,091.47	15,710,483.55	717,581.24	16,599,567.50	169,380,619.00	2,026,891.67	1,873,985.00	621,286,679.00	93,279,697.00	621,286,679.00
OPERATING INTEREST INCOM	38,362,627.47	3,266,698.40	20,814,662.93	1,645,776.23	661,867.56	1,586,679.87	10,689,495.00	1,030,550.00	1,030,550.00	67,576,014.00	6,317,000.00	67,576,014.00
NON-INTEREST INCOME	10,783,787.07	5,434,842.53	8,109,314.80	823,403.55	1,418,100.16	1,093,517.97	1,686,149.00	1,050,960.00	1,050,960.00	19,286,425.00	16,636,000.00	19,286,425.00
EFFICIENCY	1.00	0.94	0.97	0.00	0.08	0.06	0.97	0.54	0.54	1.00	1.00	1.00
ROA	0.03	0.02	0.03	0.00	0.00	0.00	0.00	-0.01	-0.01	0.04	0.05	0.05
SIZE	20.16	17.54	18.85	0.03	0.18	0.12	19.27	15.29	15.29	20.76	18.77	20.76
CAR	0.19	0.45	0.32	0.00	0.03	0.02	0.16	0.16	0.16	0.23	0.85	0.85

From the table 4.1 above explain each item of the variable in this research the data obtained the mean, standard deviation, minimum and maximum value of each item based on the D for domestic, F for Foreign and ALL form comparison of both of them.

For the input variable there are fixed asset with the value for bank domestic mean is 12,562,701.53, standard deviation 3,006,830.22, minimum 2,485,028 and maximum value 35,663,290, for foreign mean is 3,426,730, standard deviation 1,012,824.50, minimum 1,117,740 and maximum value 8,994,600, for the comparison of mean is 7,994,715.77, standard deviation 2,911,565.67, minimum value 1,117,740 and maximum 35,663,290.

Another input variable there are labor cost with the value for bank domestic mean is 9,942,228.53, standard deviation 372,928.35, minimum 3,281,221 and maximum value 18,845,014, for foreign mean is 4,212,847.40, standard deviation 1,164,139.70, minimum 1,003,391 and maximum value 9,511,660, for the comparison of mean is 7,077,537.97, standard deviation 829,584.93, minimum value 1,003,391 and maximum 18,485,014.

The last input variables are third party’s fund with the value for bank domestic mean is 470,471,816, standard deviation 15,028,754.56, minimum 174,723,234 and maximum value 754,526,374, for foreign mean is 27,557,356.07,

standard deviation 1,336,446.87, minimum 10,663,119 and maximum value 49,977,555, for the comparison of mean is 249,014,586.03, standard deviation 16,496,446.66, minimum value 10,663,119 and maximum 754,526,374.

For the output variable there are credit with the value for bank domestic mean is 397,792,128.40, standard deviation 15,710,483.55, minimum 16,380,619 and maximum value 621,286,679, for foreign mean is 869,407.63, standard deviation 717,581.24, minimum 2,026,891.67 and maximum value 93,279,697, for the comparison of mean is 215,498,091.47, standard deviation 16,599,567.50, minimum value 1,873,985 and maximum 621,286,679.

Another output variable is operating interest income with the value for bank domestic mean is 38,362,627.47, standard deviation 1,645,776.23, minimum 10,689,495 and maximum value 67,576,014, for foreign mean is 3,226,68.40, standard deviation 661,867.56, minimum 1,030,550 and maximum value 6,317,000, for the comparison of mean is 20,814,662, standard deviation 1,586,697.97, minimum value 1,030,550 and maximum 67,576,014.

For the efficiency level of domestic bank, the mean value is 1.00, standard deviation 0.00, minimum 0.97 and maximum value 1.00 for the efficiency level of foreign bank, the mean value is 0.94, standard deviation 0.08, minimum 0.54 and maximum value 1.00, for the comparison mean is 0.97, standard deviation 0.06 minimum 0.54 and the maximum value 1.00.

The first internal factor is ROA that influence efficiency of domestic bank, mean for this factor is 0.03, standard deviation 0.00, minimum 0.00 and maximum value 0.04. ROA that influence efficiency of foreign bank have mean at 0.02, standard deviation 0.00, minimum -0.01 and maximum value 0.05. The comparison of mean value is 0.03, standard deviation 0.00, minimum -0.01 and maximum value at 0.05.

The second internal factor is SIZE that influence efficiency of domestic bank, mean for this factor is 20.16, standard deviation 0.03, minimum 19.27 and maximum value 20.76. SIZE that influence efficiency of foreign bank have mean at 17.54, standard deviation 0.18, minimum 15.29 and maximum value 18.77. The

comparison of mean value is 18.85, standard deviation 0.12, minimum 15.29 and maximum value at 20.76.

The third internal factor is CAR that influenced efficiency of domestic bank, mean for this factor is 0.19, standard deviation 0.00, minimum 0.16 and maximum value 0.23. CAR that influence efficiency of foreign bank have mean at 0.45, standard deviation 0.03, minimum 0.16 and maximum value 0.85. The comparison of mean value is 0.32, standard deviation 0.02, minimum 0.16 and maximum value at 0.85.

4.2 Research Findings

4.2.1 The Efficiency Level of Domestic and Foreign Bank in Indonesia

In finding the result, first stage is researcher using DEA analysis to get the result which domestic and foreign bank that already efficient in allocating the portion of input to generating some output. In table explanation below there is some information about the table. In the table consist of information about efficiency, decimal efficiency, percentage of efficiency, information and the condition. If the company pass the number of efficiency of 100 or 1.00 or 100% the company can be classified as efficient, vice versa, if the companies have the number of efficiency less than 100 or 1.00 or 100% the company is inefficient.

For the condition of the company the green range is 100%, the range for amber is 90% -99.99% and the range for red is 0% -89.99%. *Green* means the project is safe and is on track to be achieved. For *amber* describe that company project may be at risk if the problem is not addressed and attention is needed here. And the last *red* means the project is at risk because it is far from the track to be achieved or out of scope. Here the immediate management action is required. So, based on some explanation before, the result that researcher get is explained in some table below.

4.2.1.1 The Efficiency Level of Domestic Bank in Indonesia

The level of efficiency of domestic bank in Indonesia can researcher describe from the result of DEA calculation with 5 sample of the domestic bank with 3 years of performance activities. Based on the calculation, researcher can get some detail information which domestic banks that can reach maximum level of efficiency which is 1 and what banks that only reach the level of efficiency less than one. The better the efficiency level is when the banks can reach maximum level of efficiency.

Table 4.2 The level of efficiency of Domestic Bank in Indonesia
Period 2014 -2016

Bank's Name	Year	Efficiency	Efficiency (decimal)	Percentage of Efficiency	Information	Condition
BNI	2014	100	1	100%	Efficient	Green
	2015	97.1	0.971	97%	Inefficient	Amber
	2016	100	1	100%	Efficient	Green
MANDIRI	2014	100	1	100%	Efficient	Green
	2015	100	1	100%	Efficient	Green
	2016	100	1	100%	Efficient	Green
BCA	2014	100	1	100%	Efficient	Green
	2015	100	1	100%	Efficient	Green
	2016	100	1	100%	Efficient	Green
BRI	2014	100	1	100%	Efficient	Green
	2015	100	1	100%	Efficient	Green
	2016	100	1	100%	Efficient	Green
CIMB NIAGA	2014	100	1	100%	Efficient	Green
	2015	100	1	100%	Efficient	Green
	2016	100	1	100%	Efficient	Green

Based on the table 4.2 describe that in year 2014 and 2016, all the domestic bank reach 100% efficiency or (E=1.00) and in green condition, means that those companies are efficient and can generating great performance in managing between their input and output.

In year 2015, only four of the domestic bank (MANDIRI, BCA, BRI, and CIMB NIAGA) reach 100% efficiency or (E=1.000) and in green condition, means that those companies are efficient and can generating great performance in managing between their input and output, but for BNI is in amber condition which is the percentage of efficiency is reach 97% or E<1 means that BNI is in inefficient condition.

4.2.1.2 The level of efficiency of Foreign Bank in Indonesia

The level of efficiency of foreign bank in Indonesia can researcher describe from the result of DEA calculation with 5 sample of the foreign bank with 3 years of performance activities. Based on the calculation, researcher can get some detail information which foreign banks that can reach maximum level of efficiency which is 1 and what banks that only reach the level of efficiency less than one. The better the efficiency level is when the banks can reach maximum level of efficiency.

Table 4.3 The level of efficiency of Foreign Bank in Indonesia
Period 2014 -2016

Bank's Name	Year	Efficiency	Efficiency (decimal)	Percentage of Efficiency	Information	Condition
SCHATERED	2014	100	1	100%	Efficient	Green
	2015	100	1	100%	Efficient	Green
	2016	57	0.57	57%	Inefficient	Red
AMERICA	2014	100	1	100%	Efficient	Green
	2015	33.4	0.334	33%	Inefficient	Red
	2016	53.9	0.539	54%	Inefficient	Red
CITIBANK	2014	100	1	100%	Efficient	Green
	2015	100	1	100%	Efficient	Green
	2016	100	1	100%	Efficient	Green
TOKYO	2014	100	1	100%	Efficient	Green
	2015	100	1	100%	Efficient	Green
	2016	100	1	100%	Efficient	Green
DEUTSCHE	2014	100	1	100%	Efficient	Green
	2015	100	1	100%	Efficient	Green
	2016	100	1	100%	Efficient	Green

In the table 4.3 describe that in year 2014, all the foreign bank can reach 100% efficiency or (E=1.000) and in green condition, means that those companies are efficient and can generating great performance in managing between their input and output. But in year 2015 only one bank which is BANK OF AMERICA that can't reach 100% efficiency because the level of efficiency is 33% which is in red condition.

In year 2016, only three of the foreign bank (CITIBANK, BANK OF TOKYO, and DEUTSCHE BANK) reach 100% efficiency or (E=1.000) and in green condition, means that those companies is efficient and can generating great performance in managing between their input and output, but two of foreign bank such as STANDARD CHATERED BANK and BANK OF AMERICA is in red condition because the percentage of efficiency is only 57% and 54% or E<1 means that those companies are in inefficient condition.

4.2.1.3 The Comparison of efficiency level on Domestic and Foreign Bank in Indonesia

After the researcher knows the result of each efficiency level of domestic and foreign bank in Indonesia, the next information is about the comparison of both level of efficiency on domestic and foreign bank in Indonesia. This information below describe and compare all the result from domestic and foreign bank level of efficiency and also there is a total average level of each bank as well as the total average that researcher divide based on the type of banks which is domestic and foreign bank, from the comparison result researcher can know which bank's type that more efficient.

Table 4.4 describe that the average level of efficiency per year of domestic bank are stable in year 2014 and 2016 which can reach the average 1.000 per year, but in year 2015 the average level of efficiency slightly decreases become 0.9942. Based on the result above, in 2014 and 2016 all companies can maintain their performance in allocating between the input and output but in 2015 there is a company that can't survive and managing well their input and output proportion.

Table 4.4 Comparison of Total Average Level on domestic and foreign bank efficiency in Indonesia

Bank's Name	Year			Average Level of Efficiency (Per Bank)	Total Average Level of Efficiency (Per Bank's Type)
	2014	2015	2016		
DOMESTIC					
BNI	1.000	0.971	1.000	0.9903	0.9981
MANDIRI	1.000	1.000	1.000	1.000	
BCA	1.000	1.000	1.000	1.000	
BRI	1.000	1.000	1.000	1.000	
CIMB NIAGA	1.000	1.000	1.000	1.000	
Average Per Year	1.000	0.9942	1.000		
FOREIGN					
SCHATERED	1.000	1.000	0.57	0.857	0.8962
AMERICA	1.000	0.334	0.539	0.624	
CITIBANK	1.000	1.000	1.000	1.000	
TOKYO	1.000	1.000	1.000	1.000	
DEUTSCHE	1.000	1.000	1.000	1.000	
Average Per Year	1.000	0.867	0.8218		

The average level of efficiency per domestic bank in period 2015 – 2016 above describe that just only BNI that have average level of efficiency below 1.000 which is 0.9903. But the rest of four banks have level of efficiency 1.000 means those banks already efficient. To conclude that overall average level of efficiency for domestic bank is 0.9981.

Based on the table above also describe that the average level of efficiency per year of foreign bank are stable on 2014 which can reach the average 1.000 per year, but in year 2015 and 2016 the average level of efficiency decreases significantly become 0.867 in 2015 and 0.8218 in 2016. Based on the result above, in 2014-2015 all companies can maintain their performance in allocating between the input and output but in 2015 and 2016 there some companies that can’t survive and managing well their input and output proportion.

The average level of efficiency per foreign bank in period 2015 – 2016 above describe that there are two banks that have average level of efficiency below 1.000 which are STANDARD CHATERED BANK with 0.857 and BANK OF AMERICA with 0.642. But the rest of three banks have level of efficiency 1.000 means those banks already efficient. To conclude that overall average level of efficiency for foreign bank is 0.8962.

4.2.1.4 The Inefficiency Level Result of Domestic and Foreign Bank in Indonesia

Based on the result of the efficiency level on domestic and foreign bank, researcher found 3 banks that are in the inefficient condition which are BNI from domestic bank and Standard Chatered Bank and Bank of America from Foreign bank in Indonesia. In the table below explain about the target value that each of the inefficient bank should achieve with explanation how much percentage (to target %) that those banks not achieve the optimal result for input and output proportion.

a. Target value for unit BNI efficiency

BNI is the only one of domestic bank that reach inefficient condition which is only reach the efficiency level less than one, especially in year 2015. The target value for unit BNI efficiency describes which input and output that not in optimal condition. If the percentages of the target reach 0.0% means that BNI input and output is in optimal condition which is the bank have good proportion of the input that can generate the optimal output. But if the banks not reach 0.0% of the target percentage (to target %), the values of percentage below are describing the number of how much input that BNI must decrease or how much output that bank must increase.

Table 4.5 Target output and input of BNI
Period 2014 - 2016

Bank's Name	Year	Input & Output	Actual	Target	To Target (%)
BNI	2014	(-) Input			
		Fixed Asset	6222050	6222050	0.0%
		Labor Cost	6781041	6781041	0.0%
		Third Party's Fund	313893430	313893430	0.0%
		(+) Output			
		Credit	277622681	277622681	0.0%
		Operating Interest Income	22376301	22376301	0.0%
		Non- Interest Income	10715356	10715356	0.0%
	2015	(-) Input			
		Fixed Asset	20756595	5640277.9	**72.8%**
		Labor Cost	7365834	7151199	**2.9%**
		Third Party's Fund	370420785	359581999.7	**2.9%**
		(+) Output			
		Credit	326105149	326105149	0.0%
		Operating Interest Income	25560196	28023273.6	**9.6%**
		Non- Interest Income	8872380	10619152.3	**19.7%**
	2016	(-) Input			
		Fixed Asset	16990835	16990835	0.0%
		Labor Cost	10629884	10629884	0.0%
		Third Party's Fund	530133625	530133625	0.0%
		(+) Output			
		Credit	403391221	403391221	0.0%
		Operating Interest Income	50425826	50425826	0.0%
		Non- Interest Income	13700330	13700330	0.0%

Source: processed by WINDEAP software

b. Target Value for unit Standard Chatered Bank efficiency

Standard Chatared Bank is one of foreign bank that reach inefficient condition which is only reach the efficiency level less than one, especially in year 2016. The target value for unit Standard Chatered Bank efficiency describes which input and output that's not in optimal condition. If the percentages of the target reach 0.0% means that Standard Chatered Bank input and output is in optimal condition which is the bank have good proportion of the input that can generate the optimal output.

But if the banks not reach 0.0% of the target percentage (to target %), the values of percentage below are describing the number of how much input that Standard Chatered bank must decrease or how much output that bank must increase

Table 4.6 Target output and input of Standard Chatered Bank
Period 2014 - 2016

Bank's Name	Year	Input & Output	Actual	Target	To Target (%)
STANDARD CHATERED BANK	2014	(-) Input			
		Fixed Asset	1388760	1388760	0.0%
		Labor Cost	9511660	9511660	0.0%
		Third Party's Fund	28137592	28137592	0.0%
		(+) Output			
		Credit	29966238	29966238	0.0%
		Operating Interest Income	2418706	2418706	0.0%
		Non- Interest Income	7892960	7892960	0.0%
	2015	(-) Input			
		Fixed Asset	1117740	1117740	0.0%
		Labor Cost	1003391	1003391	0.0%
		Third Party's Fund	25391058	25391058	0.0%
		(+) Output			
		Credit	26278098	26278098	0.0%

		Operating Interest Income	2475650	2475650	0.0%
		Non- Interest Income	8308190	8308190	0.0%
	2016	(-) Input			
		Fixed Asset	8944600	3116771.3	65.2%
		Labor Cost	9422550	3278266.4	65.2%
		Third Party's Fund	28961551	16510773.9	43.0%
		(+) Output			
		Credit	24518789	24518789	0.0%
		Operating Interest Income	2492336	3306445.2	32.7%
		Non- Interest Income	8187630	8187630	0.0%

Source: processed by WINDEAP software

c. Target value for unit Bank of America efficiency

Bank of America is the other foreign bank that reach inefficient condition which is only reach the efficiency level less than one, especially in year 2015 and 2016. The target value for unit Bank of America efficiency describes which input and output that not in optimal condition. If the percentages of the target reach 0.0% means that Bank of America input and output is in optimal condition which is the bank have good proportion of the input that can generate the optimal output.

But if the banks not reach 0.0% of the target percentage (to target %), the values of percentage below are describing the number of how much input that Bank of America must decrease or how much output that bank must increase

Table 4.7 Target output and input of Bank of America
Period 2014 - 2016

Bank's Name	Year	Input & Output	Actual	Target	To Target (%)
BANK OF AMERICA	2014	(-) Input			
		Fixed Asset	1412100	1412100	0.0%
		Labor Cost	3197600	3197600	0.0%
		Third Party's Fund	23627790	23627790	0.0%
		(+) Output			
		Credit	1873985	1873985	0.0%
		Operating Interest Income	6317000	6317000	0.0%
		Non- Interest Income	9982300	9982300	0.0%
	2015	(-) Input			
		Fixed Asset	1224900	414923.4	**66.1%**
		Labor Cost	4183800	540558.2	**87.1%**
		Third Party's Fund	16471000	2922883.7	**82.3%**
		(+) Output			
		Credit	2069282	2069282	0.0%
		Operating Interest Income	1030550	1030550	0.0%
		Non- Interest Income	1050960	3579097.6	**240.6%**
	2016	(-) Input			
		Fixed Asset	1516300	817028	**46.1%**
		Labor Cost	7900600	1125485	**85.8%**
		Third Party's Fund	26781910	5278121	**80.3%**
		(+) Output			
		Credit	2137408	3254517.1	**52.3%**
		Operating Interest Income	1432660	1432660	0.0%
		Non- Interest Income	2126800	4587058.2	**115.7%**

Source: processed by WINDEAP software

Based on the table 4.2 – 4.7 above describe that there is a gap between the actual value and the target value. The three banks above must increase the output

factors as well as decreasing the input factors to achieve the level of efficiency which is E=1.000.

From six factors of each banks above is not describe that all the factor has a gap between the actual and the target value. It can be seen that there's some factor that have 0.00 % in the percentage of the target, means that the proportion of input and output factors already optimal, but for some factor that not already achieve the optimal proportion of value, it can be seen from the percentage of the target (To Target %) that describe how much percentage of both factors for each banks that must be develop to achieve the optimal level of efficiency.

4.2.2 The impact of internal factors toward bank efficiency level in Indonesia

For the second phase, the researcher observed the internal factor such as ROA, SIZE and CAR that might be influence the efficiency by calculating the data panel regression using EVIEWS software. The result can researcher directly compares with the requirement or criteria for decision making for the hypothesis that if $P > \alpha$ = H0 accepted and $P \leq \alpha$ = H0 rejected, and also researcher observed the comparison of foreign and domestic bank efficiency by look the value, If average of efficiency-value is closer to 1 or 1 = domestic bank is more efficient than foreign bank and if average of efficiency-value is less than or far to 1 = domestic bank is inefficient than foreign bank

4.2.2.1 Model Selection

As the data are the panel data, researcher first must process 3 kinds of model, common effect, fixed effect and random effect in EVIEWS software. After this researcher must to specify the common effect estimation or fixed effects using Chow test, and also estimated using Hausman Test to compare between the fixed effect and random effect estimation.

a. Chow Test

Table 4.8 Result of Chow-Test

Redundant Fixed Effects Tests
Equation: FE
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	2.487141	(9,17)	0.0505
Cross-section Chi-square	25.204597	9	0.0028

Source: processed by EVIEWS 10 software

This test is to measure whether researcher chooses common effect model estimation or fixed effect model estimation.

H0: Common Effect

H1: Fixed Effect

Criteria for decision making are when:

P-value < α (5%) = Ho rejected

P-value > α (5%) = Ho accepted

Based on the Table 4.8, the probability value of cross-section Chi-square is 0.0028. It means that 0.0028 < 0.005 and to interpret the chow test result, researcher better to choose the Fixed Effect Model because is rejected the Ho.

After this, researcher compare between the Fixed Effect estimation with the Random Effect using Hausman test to make sure which the best model to use in the panel data regression.

b. Hausman Test

Table 4.9 Result of Hausman Test

Correlated Random Effects - Hausman Test
Equation: RE
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	18.681313	3	0.0003

Source: processed by EVIEWS 10 software

This test is to measure whether researcher chooses random effect model estimation or fixed effect model estimation.

H0: Random Effect

H1: Fixed Effect

Criteria for decision making are when:

P-value < α (5%) = Ho rejected

P-value > α (5%) = Ho accepted

Based on the Table 4.9, the probability value of cross-section random is 0.0003. It means that 0.0003 < 0.005 and to interpret the Hausman test result, researcher better to choose the Fixed Effect Model because is rejected the Ho.

After researcher compare between 2 models which is Chow Test and Hausman test, the result of both of the test is describe that Fixed Effect estimation model is better to use for the researcher in the data panel regression.

4.2.2.2 Hypothesis Testing Result

To test first hypothesis researcher, look the result from the table 4.4 above about the average level of efficiency of bank in Indonesia, researcher compared the result of average level of efficiency of domestic and foreign bank that will give the final result. The average level of efficiency in domestic bank is higher rather than the foreign bank which is 0.9981 for domestic and 0.8962 for foreign bank. It also explains that two of foreign bank is less efficient which are Standard Chatered and Bank of America, and for domestic bank only one bank that inefficient which is BNI. Which mean researcher can conclude that the average value that closer to 1 is more efficient, from the result above the domestic bank is more efficient compare with the foreign bank in term of generating the output from the input that the company have in period of 2014 - 2016. *So,* ***H1 is should be accepted.***

To test the hypothesis 2 until 4, the researcher choosing the result from fixed effect model and also to knowing from three kinds of variables such as ROA

SIZE and CAR, which are that influence the efficiency of bank in Indonesia in period of 2014 until 2016.

Table 4.10 Result of Fixed Effect Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	-2.169137	3.141235	-0.690536	0.4992
SIZE	-0.287056	0.093508	-3.069835	0.0069
CAR	0.186909	0.461796	0.404743	0.6907
C	6.377829	1.862809	3.423769	0.0032
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.629405	Mean dependent var		0.969333
Adjusted R-squared	0.367808	S.D. dependent var		0.112961
S.E. of regression	0.089816	Akaike info criterion		-1.683420
Sum squared resid	0.137138	Schwarz criterion		-1.076234
Log likelihood	38.25129	Hannan-Quinn criter.		-1.489176
F-statistic	2.406014	Durbin-Watson stat		1.959228
Prob(F-statistic)	0.048011			

Source: processed by EVIEWS 10 software

The important things of the result of the researcher get from the model selection above which is from Fixed Effect models are by looking the result value of Coefficient, Prob and the R-squared.

The value of C shows the overall relationship of all independent variables to the dependent variable. There are two main things that need to be seen from the value of C, which is on the 'Coefficient' and on 'Prob'. Coefficient indicates whether the overall relationship of the independent variable and the dependent variable is the positive / negative relationship. If the value is negative, then it can be interpreted that the relationship between the independent variable and the dependent variable is a negative relationship, and also vice versa.

Based on the table 4.10, X1 is the column "prob" is representing significant levels for each variable. The figure shows that only SIZE that significant because p-value is less than 0.05. And the two of the others variable are insignificant because p-value is larger than 0.05. Conversely, a bigger

(insignificant) p-value describes that ROA and CAR is not influencing the efficiency of bank in Indonesia. Then after this researcher looking to the coefficient value of each variable, there is negative influence on ROA and SIZE toward the dependent variable which is the EFF.

In the other hand, those three factors still give influences toward the efficiency of bank in Indonesia. Based on the table 4.10, the result of R^2 value indicates how much the total variation of dependent variable (EFF) can be explained by independent variables (ROA, SIZE and CAR). A good R-squared is more than 50%, because it means the sample used for the regression can represent half the total population and be able to explain more relevantly. The result can be seen from the results of regression, that there is a value of R-squared worth 0.629. So, it can be interpreted that the sample in this regression can represent the total population of approximately 63%. It can be said that the sample can well represent the total population.

Therefore, based on table 4.10 that ROA has Prob 0.4992 > 0.05 and Coefficient -2.169137. So, ROA is insignificant and give negative influence to the EFF, which means H0 is accepted or ***H2 should be rejected***

Table 4.10 also describe that SIZE has Prob 0.0069 < 0.05 and Coefficient -0.0287056. So, SIZE is significant influence and give negative influence to the EFF, which means H0 is accepted or ***H3 should be rejected.***

Based on the Table 4.10, that CAR has Prob 0.6907 > 0.05 and Coefficient 0.186909 and. So, CAR is insignificant and give positive influence to the EFF, which means H0 is accepted or ***H4 should be rejected.***

4.3 Discussion

4.3.1 The Efficiency Level of Domestic and Foreign Bank in Indonesia

Based on the findings, first the researcher looks to the average level of efficiency of domestic and foreign bank per year, for domestic bank, the better condition or efficient is in year 2014 and 2016 because the level of efficiency achieve 1 (E=1), but in year 2015 the average level of efficiency is only reach

0.9942 means that the condition is inefficient. If the researcher compares with foreign bank, the average level of efficiency of foreign bank is only efficient in year 2014 but in year 2015 and 2016 the value of efficiency is below 1 which is 0.867 and 0.8218 means that the condition is not efficient.

If researcher compare based on the type of bank, which is between domestic and foreign bank, the average level result is higher on the efficiency in domestic rather than in foreign bank. The total average value efficiency of domestic bank is 0.9981 higher than the average value efficiency of foreign bank that only reach 0.8962.

In this research result, one of the domestic bank is not reach the level of efficiency 1 which is BNI, because the average level of efficiency is 0.9903. For the foreign bank, there are two banks that not reach the perfect level of efficiency which are Standard Chatered Bank with the value of efficiency at 0.857 and 0.624 for Bank of America.

The efficiency value obtained by Bank of America in 2016 based on the DEA calculation showing that the banking operation in Bank of America experienced inefficiency in the managing proportion of some input and output. Bank of America should reduce some input such as the Fixed Asset at 46.1 %, Labor Cost at 85.8 % and also reduce Third Party's Fund at 80.3% to become more efficient as well as Bank of America should be adding more amounts in term of issuing the Credit from 52.3% become at least 34.3 % to achieve the efficiency and for Non-Interest Income the company must gain at least at 53.6% before set too huge at 115.7%.

The efficiency value obtained by Schatered in 2016 based on the DEA calculation showing that the banking operation in Scaheterd Bank experienced inefficiency in the managing proportion of some input and output. Schatered Bank should reduce some input such as the Fixed Asset at 65.2 %, Labor Cost at 65.2 % and also reduce Third Party's Fund at 43% to become more efficient as well as

Schatered Bank should be adding more amounts in Operating Interest Income at least 24.6% to achieve efficiency before set too high at 32.7%.

The efficiency value obtained by BNI in 2015 based on the DEA calculation showing that the banking operation in BNI experienced inefficiency in the managing proportion of some input and output. BNI should reduce some input such as the Fixed Asset at 72.8 % or at least at 65.2% from actual value, Labor Cost at 2.9 % or 62.3% from the actual value that company must reduce and also reduce Third Party's Fund at 2.9% or 40.1% from the actual value to become more efficient as well as BNI should adding more amounts in Operating Interest Income at 9.6 % or better to adding more at 10.4% and also adding in Non-Interest Income at 19.7%. Or decreasing the target become 80.3%.

From this research result, it is also proving by the past research by the Widiarti et al. (2014) that explain some commercial bank is efficient but not fully efficient and based on the Wardana 2013, Permono and Darmawan (2000), Ratnasari (2012) also stated that the domestic bank such as BUMN is more efficient rather than some of foreign bank. That's all describe that domestic bank is more efficient rather than foreign bank. But, in other hand, it is different with the research from Putra (2013), Fathony (2012) and Hadad, et al (2003) stated that forein bank is more efficient than domestic bank.

But if researcher look to this result research that describe domestic is more efficient, is it can prove because the condition of economic in Indonesia in year 2014 – 2016 is fluctuate. Based on the data from Badan Pusat Statistik, showing that condtion of Indonesian economic is decreasing from year 2010-2015 (from 6.81% become 4.79%), although the economic condition is decreasing but the condition of bankng industry still safe, because the economic condition still reach around 4% not below that point like in the past on year 2008.

From the result above, also researcher look that domestic bank tends to evaluate better when the proportion of input and output is not optimal. Different with the research of some researcher from the other nation such as from Ayadi

(2013) that describe the foreign bank in Tunisian Bank is more efficient than domestic bank in that nation, in addition because the condition of every nation is also different, there are some considerations why the domestic bank in Indonesia can reach more efficiency compare with the foreign bank. First, because the trust of society also more for the domestic rather than foreign bank, all financing activities will be more in domestic bank rather than foreign bank. Second, about the technology that domestic bank used, although foreign bank lastly is better in the technology, but domestic bank now can develop more in term of technology to satisfy the better performance in the banking industry, for example in previous year BRI can spread the new satellite, the purpose is also to develop the performance of the bank as well as to make easiest in doing all financing activities. So, all the effort that domestic bank do is to compete with the foreign in every situation and condition of the nation can we see from the performance that domestic industry can reach the higher level of efficiency compared with the foreign bank in Indonesia, which means that domestic bank already better to achieve proportional and optimal value between the input and output factors of the banks.

4.3.2 The impact of internal factors toward bank efficiency level in Indonesia

4.3.2.1 The influence of ROA to efficiency of Bank in Indonesia

Based on the findings result, ROA or bank's profitability is insignificantly and negatively influence the efficiency of Bank in Indonesia, from findings results shows p- value is in insignificant value because Prob is more than 5 % (0.4992 > 0.05) and the coefficient is having negative value of -2.169137 which means that when the independent variable (ROA) rises, the dependent variable (EFF) can be decreases but the ROA is not influence the efficiency of bank in Indonesia. While based on Pasiouras (2008), and Saad and Moussawi (2009) efficiency is being influenced by bank profitability.

ROA have important role to the banking industry, based on the annual report of each bank domestic as well as foreign, the percentage of ROA in period 2014 – 2016 of each bank is fluctuate, not always increasing but sometime the value slightly decreases from year to year. The condition of economic global also influence the banking industry in Indonesia, in here because the condition of economic tend to decreasing and also ROA from each bank also tend to be fluctuate, means that there some confusing whether ROA can directly influence efficiency of bank industry or not. Researcher consider macroeconomic condition in that year, if the banking industry as well as the condition of nation is in good condition it might be consider ROA can influence the efficiency, because according to Fathorny (2012) the higher the ROA from year to year it can be lead to the efficiency of bank industry. But in this case, because the condition is fluctuated means that ROA not always influence the efficiency of the bank industry.

However, the result of this research is explainable in the context of Indonesia's banking industry since during the years of 2009 until now is being fulfilled with fact than Bank Indonesia trying to increase the Loan to Deposit Ratio by develop the regulation that stated that banks with LDR lower than 90% must add certain Reserve Requirement (RR) equal to 1% of the third-party funds (ICRA Indonesia, 2010). It is make strong indicator that return earned by bank in Indonesia not just coming from intermediary role to the business for the sake of economic growth but acquiring the return from the other activities such put the fund to some financial market investment and credit for consumption.

4.3.2.2 The influence of SIZE to efficiency of Bank in Indonesia

Based on the findings, the influence of size toward efficiency level on bank in Indonesia is significantly and give negatively influence. From findings result shows p-value show significant value because Prob is less than 5% (0.0069 < 0.05) and the coefficient size value is in a negative of -0.287056 which means that when the independent variable (SIZE) value rises, the dependent variable (EFF) value can be decreases and also the SIZE is influence the efficiency of bank

in Indonesia. Which also little bit similar with the research result from Pasiouras et al. (2007), Saad and Moussawi (2009).

If consider the total asset that each bank has to generating the financing activities, from time to time the total asset that domestic as well as foreign bank is increasing, it means that the company can expand more in term of adding more asset to increase the value of the company. When the company getting bigger, they also tend to have opportunity to get more profit in the future because the more the asset that company have the more value that company will get if they can control well their operation and financing activities with better strategies.

In other hand SIZE can significantly influence the efficiency of bank in Indonesia because the fact that Indonesian bank experienced more in merger and acquisition which make them become bigger and also being driven to be efficient by the acquiring bank. Acquiring bank like OCBC (NISP), CIMB (Niaga) Maybank (BII), Mandiri, etc already implemented the specific banking practices including the technology that forces the bank to be more efficient. Berger et al. (1999) also have explained that bank mergers may lead to changes in efficiency. As one of the samples in this research is CIMB NIAGA that already implement an expansion strategy which is acquisition. This bank can improve the performance value better rather than in the previously when CIMB not acquired by NIAGA. The case of merger and acquisition also can lead to efficiency in banking industry, when the company can develop the new strategies it leads to new condition which is become efficient condition.

Based on the findings result, if the researcher relates with the case of bank that merger and acquisition in Indonesia, it is not always give positive impact, there are some banks that the bigger the banks when do merger but if the acquired bank is not having level efficiency better with initial bank it can be give the negative influence of efficiency in the company. It is proving with the research of Rudi (2009) shows that only Bank Mandiri that has efficient and stable performance after the merger. The result of his efficiency test shows that only

Bank Mandiri that is able to demonstrate the stability of its financial efficiency performance, so compared with the result of efficiency of Bank Mandiri now is in level of efficient (E=1). To know more deeply about the factors that determine the success of Bank Mandiri's efficiency performance needs to be done further research on qualitative aspects of managerial that support the financial efficiency and effectiveness of the company's organization. Thus, it can be concluded that mergers and acquisitions will not necessarily lead to efficiency if the bank cannot control the burden of interest costs and labor in its internal environment and make bank assets more productive by providing loans to qualified external parties and reduce lending to related parties bank.

The banks that are resulting from the formation of a merger of its efficiency performance are highly dependent on the initial performance of the bank's builders and against the performance of its forming banks. A strong bank performance scores its efficient if join-bank that has a strong efficiency performance will result in a bank with efficient performance. Conversely, if the joint-bank has weak efficiency performance will cause the merged bank decline its efficiency performance. Banks with poor efficiency performance when joining similar banks will result in weak banks condition as well as their efficiency scores. While banks with strong efficiency scores if joining a bank with medium efficiency scores will result in merged banks initially with strong efficiency but in the following year tends to decrease to middle efficiency scores (e.g Bank CIMB Niaga). A middle-efficiency bank if joining a middle-performing bank will result in a lower-performing bank tending to decline in subsequent years (eg Bank Danamon Indonesia). If the bank joins a bank with a strong efficiency score then the merged bank will have performance efficiency tends to increase.

So, to conclude that result the researcher shows the SIZE of car is influence the efficiency but it is can negatively influence when the banks cannot controlling well the performance of the company, while the bigger the company when doing merger is better because it can increasing the total asset or size of the company and it can lead to the efficiency of banks but the value of efficiency it is

not always give maximum value, because if both company that is in the same level which is they have same range of the total asset or type and they do merger or acquisition in some period that is not always can lead to the maximum level of efficiency, it can might to the lower efficiency when compared with the condition before merger. But if the initial banks can do merger with the different level of the company which for example the banks with the lower level of total asset do merger with the bank that have higher total asset it can lead to the better value which is there some consideration that the efficiency can achieve maximum value.

4.3.2.3 The influence of CAR to efficiency level of Domestic and Foreign Bank in Indonesia

Based on the findings result, CAR is insignificantly and influence the efficiency of Bank in Indonesia in period 2014 - 2016, from findings result shows p-value is in insignificant condition because Prob is more than 5% (0.6907 > 0.05) and coefficient value is having a positive value of 0.186909 (coefficient CAR) which means that when the independent variable (CAR) rises, the dependent variable (EFF) can be increase but the CAR is not influence the efficiency of bank in Indonesia.

This result is same with the research from Purworoko and Sudiyatno (2013) than explained that the ability of bank to keep the operation it can lead to some risk as well in term of controlling the capital in the banks, in other hand the bank is business industry that give the priority to the society, so that as long as society believe in the credibility of the company, the health of the bank at least 8% in accordance with the provisions of BI will not affect the efficiency of banking.

The researcher looks to the percentage of CAR of each domestic and foreign bank, the result is there are increasing from time to time in term of percentage of CAR. Means that the ability of the firm can researcher prove that company is able to see the opportunities to make society believe with the credibility of the firm and also it is not lead whether the company is in efficient condition or not in exact calculation but when the society see that the company or

bank can reach at least 8% in car, they will be safe for the company because this reason not affect the efficiency of banking. Because the society follow the regulation, they are trust to the credibility of the banks which means society doesn't need to look at efficiency level value of each bank, they only look to the CAR value of the banks. Based on the data of the research, average value of the CAR for domestic and foreign bank is 32%, means that from CAR data shows an inconsistency between the efficiency level and the CAR value that is why CAR not always influence efficiency of the banks.

Therefore, management must be able to keep and build public confidence to the bank for the future bank's performance to be more efficient. While looking the management activities to control the public confidence, is also task for the management to try develop the efficiency level using some other factor, because proportion of capital not only one of the factor that can lead the efficiency of the bank but also some other factor might become the reason that can lead the banking industry to be more efficient. So, CAR not always influence efficiency of bank industry especially in Indonesian condition, some other researcher can see this factor can be influence efficiency, but from this research result CAR is not influence the efficiency of banks because of the reason that researcher already explain above.

CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

According to the previous section, that stated about findings and discussion of the level of efficiency and the internal factor that can influence the efficiency of domestic and foreign bank in Indonesia. Researcher can conclude that:

1. The level of efficiency of domestic and foreign bank in period 2014 until 2016 is having different value of the efficiency. Based on the sample that researcher analysis describes that in year 2014 both domestic and foreign company have reaching the highest level of efficiency which is 1 value. The difference is only in year 2015 domestic bank have less efficient than foreign bank, in year 2016 for foreign bank is less efficient rather than domestic bank.

   The overall calculation describes that domestic bank is have high level of efficiency in term of proportioning the input to generate some output, compare with the foreign bank in Indonesia that have a little bit lower level of efficiency than the domestic bank. It proves that the only one company from domestic bank such as BNI have the level of efficiency less than 1, and for the foreign bank is have 2 companies that have level of efficiency less than 1 such as Bank of America and Standard Chatered Bank.

   This condition is explainable because the economic condition in Indonesia tends to fluctuate and reach the local department or companies to develop more rather than foreign, and also if researcher looks to the trust of society toward the bank, they will tend to go to a domestic bank rather than foreign bank in Indonesia. The domestic bank also has more effort to establish the technology and the process of financing activities rather than foreign bank in Indonesia to serve the society better and develop the trust of the society.

2. The impact of internal factors such as ROA, SIZE and CAR toward the efficiency of domestic and foreign bank is also having different result which is not always three internal factors above are influencing positively to efficiency level of Bank in Indonesia.

Based on the analysis above is only SIZE that negatively influence on efficiency of bank in Indonesia and the result is also contradict with the hypothesis, because the size can easily influence the efficiency of bank with Indonesian bank that have experience merger and acquisition but if the initial bank didn't have enough asset to cover and increasing the result after do merger or acquisition it can be lead to negative influence to the bank efficiency.

The ROA and CAR that also contradict with the hypothesis because these internal factors are not influencing the efficiency on bank in Indonesia. For ROA, because the return earned by bank in Indonesia not only coming from intermediary role but also the bank can get from other activities such as some financial market investment or for credit consumption and for CAR, because the society more believe by looking to the credibility of the company, when the bank's health have at least 8% in accordance with the provision of BI it prove that CAR will not affect the efficiency of banking industry and also average value of the car in this research show the inconsistency value compared with the efficiency level so its prove that CAR not always influence the efficiency.

5.2 Research Limitations

This study has the following limitations, such as:

1. The sample is only 5 sample of domestic and 5 sample for foreign bank
2. The period is only 3 years period which in from 2014 – 2016
3. The internal factors that researcher use is only 3 factors which are ROA, SIZE and CAR.

5.3 Recommendations

After generating the conclusion and research limitation of this study, researcher proposed some suggestion for management of the company, investor as well as for further research as follows:

1. For the manager of bank that reach inefficiency level (E < 1), better to look for the input and output of the company and also controlling as well as maintaining the proportion of input and output that will lead the company reach efficiency level (E=1).
2. For the Investors should always be careful in making investment decisions by looking the condition of efficiency level of company.
3. For government also important to decide better regulation for the future activities of banking industry that will lead to better economic condition. Because bank is having intermediary role in the nation. So, the role of government is really important to increase the efficiency performance of banking sector in the future activities.
4. Based on the limitation of the study, for the further research the researcher can conduct with more sample and more period as well as more internal factors to know make better decision in the future research and know also what other factors that can influence efficiency of banking industry in Indonesia.

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APPENDICES

Appendix 1: Data Input and Output Domestic Bank 2014

No	Bank (Domestic)	Input (2014)			Output (2014)		
		I1	I2	I3	O1	O2	O3
		Fixed Asset	Labor Expenditure	Third Party's Fund	Credit	Interest Income	Non-Interest Income
1	BNI	6,222,050	6,781,041	313,893,430	277,622,681	22,376,301	10,715,356
2	MANDIRI	8,928,856	10,848,031	583,448,911	505,394,870	41,812,994	14,687,815
3	BCA	8,844,930	8,670,906	447,905,756	339,859,068	43,771,256	9,023,976
4	BRI	5,917,470	14,111,461	622,321,846	479,211,143	51,442,410	9,299,140
5	CIMB NIAGA	2,485,028	3,281,221	174,723,234	169,380,619	10,689,495	2,129,884

Appendix 2 : Data Input and Output Domestic Bank 2015

No	Bank (Domestic)	Input (2015)			Output (2015)		
		I1	I2	I3	O1	O2	O3
		Fixed Asset	Labor Expenditure	Third Party's Fund	Credit	Interest Income	Non-Interest Income
1	BNI	20,756,595	7,365,834	370,420,785	326,105,149	25,560,196	8,872,380
2	MANDIRI	9,761,688	12,376,655	622,332,331	564,393,595	48,500,173	18,378,678

3	BCA	9,712,021	9,728,509	473,666,215	378,616,292	47,081,728	12,007,376
4	BRI	8,039,280	16,599,158	668,995,379	547,318,355	58,279,767	12,409,041
5	CIMB NIAGA	3,361,851	4,156,096	178,533,077	170,732,978	11,386,360	1,686,149

Appendix 3: Data Input and Output Domestic Bank 2016

No	Bank (Domestic)	Input (2016)			Output (2016)		
		I1	I2	I3	O1	O2	O3
		Fixed Asset	Labor Expenditure	Third Party's Fund	Credit	Interest Income	Non-Interest Income
1	BNI	21,972,223	8,833,954	433,544,913	393,275,392	29,995,062	9,962,683
2	MANDIRI	35,663,290	13,618,745	702,060,230	616,706,193	54,447,800	19,286,425
3	BCA	16,990,835	10,629,884	530,133,625	403,391,221	50,425,826	13,700,330
4	BRI	24,515,059	18,485,014	754,526,374	621,286,679	67,576,014	17,213,112
5	CIMB NIAGA	5,269,347	3,646,919	180,571,134	173,587,691	12,094,030	2,384,461

Appendix 4: Data Input and Output Foreign Bank 2014

No	Bank (Foreign)	Input (2014)			Output (2014)		
		I1	I2	I3	O1	O2	O3
		Fixed Asset	Labor Expenditure	Third Party's Fund	Credit	Interest Income	Non-Interest Income
1	SCHATERED BANK	1,388,760	9,511,660	28,137,592	29,966,238	2,418,706	7,892,960
2	BANK OF AMERICA	1,412,100	3,197,600	2,362,779	1,873,985	6,317,000	9,982,300
3	CITIBANK	1,942,810	1,148,368	42,170,881	38,188,361	3,215,251	1,475,574
4	BANK OF TOKYO	5,384,800	4,572,320	27,078,930	88,124,633	3,027,539	2,360,000
5	DEUTSCHE BANK	1,663,800	2,664,210	11,323,836	9,501,062	3,668,800	7,899,000

Appendix 5: Data Input and Output Foreign Bank 2015

No	Bank (Foreign)	Input (2015)			Output (2015)		
		I1	I2	I3	O1	O2	O3
		Fixed Asset	Labor Expenditure	Third Party's Fund	Credit	Interest Income	Non-Interest Income
1	SCHATERED BANK	1,117,740	1,003,391	25,391,058	26,278,098	2,475,650	8,308,190
2	BANK OF AMERICA	1,224,900	4,183,800	1,647,100	2,069,282	1,030,550	1,050,960
3	CITIBANK	2,481,170	1,190,304	49,539,588	38,494,618	3,369,981	1,226,192
4	BANK OF TOKYO	7,529,000	5,789,300	25,921,773	93,279,697	3,760,383	1,517,000
5	DEUTSCHE BANK	1,907,300	2,547,220	11,021,378	6,658,387	4,778,600	16,636,000

Appendix 6: Data Input and Output Foreign Bank 2016

No	Bank (Foreign)	Input (2016)			Output (2016)		
		I1	I2	I3	O1	O2	O3
		Fixed Asset	Labor Expenditure	Third Party's Fund	Credit	Interest Income	Non-Interest Income
1	SCHATERED BANK	8,944,600	9,422,550	28,961,551	24,518,789	2,492,336	8,187,630
2	BANK OF AMERICA	1,516,300	7,900,600	2,678,191	2,137,408	1,432,660	2,126,800
3	CITIBANK	4,912,270	1,218,558	49,977,555	38,831,196	3,938,107	1,783,032
4	BANK OF TOKYO	8,324,800	6,569,070	36,292,380	91,564,129	4,180,583	1,810,000
5	DEUTSCHE BANK	1,650,600	2,273,760	10,663,119	24,518,789	2,492,336	8,187,630

Appendix 7: Data Internal Factors of Domestic Bank

Bank's Name	Year	ROA	TOTAL ASSET	Ln Total Asset	CAR
BNI	2014	3.50%	416,573,708	19.8	16.22%
	2015	2.60%	508,595,288	20.0	19.50%
	2016	2.70%	603,031,880	20.2	19.40%
BCA	2014	3.39%	855,039,673	20.6	16.60%
	2015	2.99%	910,063,409	20.6	18.60%
	2016	1.96%	1,038,706,009	20.8	21.36%
BRI	2014	3.90%	552,423,892	20.1	16.09%
	2015	3.80%	594,372,770	20.2	18.70%
	2016	4%	676,378,753	20.3	21.90%
MANDIRI	2014	3.85%	801,955,021	20.5	18.31%
	2015	3.70%	878,426,312	20.6	20.59%
	2016	3.39%	1,003,644,426	20.7	22.91%
CIMB	2014	1.44%	233,162,423	19.3	15.58%
	2015	0.24%	238,849,252	19.3	16.28%
	2016	1.20%	241,571,728	19.3	17.96%

Appendix 8: Data Internal Factors of Foreign Bank

Bank's Name	Year	ROA	Total Asset	Ln Total Asset	CAR
STANDARD CHATERED	2014	1.55%	64,574,847	17.98	16.87%
	2015	-1%	63,805,420	17.97	16.06%
	2016	0.58%	64,586,001	17.98	16.59%
BANK OF AMERICA	2014	1.09%	4,363,410	15.29	66.23%
	2015	0.51%	5,590,650	15.54	60.71%
	2016	1.37%	6,496,028	15.69	45.40%
CITIBANK	2014	5.10%	65,033,411	17.99	25.50%

	2015	2.80%	74,557,501	18.13	28.20%
	2016	4.10%	72,845,871	18.10	30.00%
BANK OF TOKYO	2014	2.82%	118,944,510	18.59	78.01%
	2015	2.31%	138,849,374	18.75	81.16%
	2016	2.82%	141,301,247	18.77	84.68%
DEUTSCHE BANK	2014	4.20%	28,384,717	17.16	27.02%
	2015	3.24%	27,471,707	17.13	48.22%
	2016	3.83%	25,567,348	17.06	45.14%

Appendix 9: Result of Efficiency Score of Domestic Bank 2014

BANK	EFFICIENCY	EFFICIENCY (decimal)	EFFICIENCY (%)	INFORMATION	CONDITION
BNI	100	1	100%	Efficient	Green
MANDIRI	100	1	100%	Efficient	Green
BCA	100	1	100%	Efficient	Green
BRI	100	1	100%	Efficient	Green
CMB	100	1	100%	Efficient	Green

Appendix 10: Result of Efficiency Score of Domestic Bank 2015

BANK	EFFICIENCY	EFFICIENCY (decimal)	EFFICIENCY (%)	INFORMATION	CONDITION
BNI	97.1	0.971	97%	Inefficient	Amber
MANDIRI	100	1	100%	Efficient	Green
BCA	100	1	100%	Efficient	Green
BRI	100	1	100%	Efficient	Green
CMB	100	1	100%	Efficient	Green

Appendix 11: Result of Efficiency Score of Domestic Bank 2016

BANK	EFFICIENCY	EFFICIENCY (decimal)	EFFICIENCY (%)	INFORMATION	CONDITION
BNI	100	1	100%	Efficient	Green
MANDIRI	100	1	100%	Efficient	Green
BCA	100	1	100%	Efficient	Green
BRI	100	1	100%	Efficient	Green
CMB	100	1	100%	Efficient	Green

Appendix 12: Result of Efficiency Score of Foreign Bank 2014

BANK	EFFICIENCY	EFFICIENCY (decimal)	EFFICIENCY (%)	INFORMATION	CONDITION
CHATERED	100	1	100%	Efficient	Green
AMERICA	100	1	100%	Efficient	Green
CITIBANK	100	1	100%	Efficient	Green
TOKYO	100	1	100%	Efficient	Green
DEUTCHE	100	1	100%	Efficient	Green

Appendix 13: Result of Efficiency Score of Foreign Bank 2015

BANK	EFFICIENCY	EFFICIENCY (decimal)	EFFICIENCY (%)	INFORMATION	CONDITION
CHATERED	100	1	100%	Efficient	Green
AMERICA	33.4	0.334	33%	Inefficient	Red
CITIBANK	100	1	100%	Efficient	Green
TOKYO	100	1	100%	Efficient	Green
DEUTCHE	100	1	100%	Efficient	Green

Appendix 14: Result of Efficiency Score of Foreign Bank 2016

BANK	EFFICIENCY	EFFICIENCY (decimal)	EFFICIENCY (%)	INFORMATION	CONDITION
CHATERED	57	0.57	57%	Inefficient	Red
AMERICA	53.9	0.539	54%	Inefficient	Red
CITIBANK	100	1	100%	Efficient	Green
TOKYO	100	1	100%	Efficient	Green
DEUTCHE	100	1	100%	Efficient	Green

Appendix 15: Common Effect Model

Dependent Variable: EFF
Method: Panel Least Squares
Date: 02/24/18 Time: 16:17
Sample: 2014 2016
Periods included: 3
Cross-sections included: 10
Total panel (balanced) observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	1.794864	1.532529	1.171178	0.2521
SIZE	0.019151	0.016516	1.159492	0.2568
CAR	0.084003	0.112975	0.743556	0.4638
C	0.535166	0.320366	1.670480	0.1068

R-squared	0.141434	Mean dependent var	0.969333
Adjusted R-squared	0.042369	S.D. dependent var	0.112961
S.E. of regression	0.110543	Akaike info criterion	-1.443266
Sum squared resid	0.317711	Schwarz criterion	-1.256440
Log likelihood	25.64899	Hannan-Quinn criter.	-1.383499
F-statistic	1.427686	Durbin-Watson stat	2.030667
Prob(F-statistic)	0.257298		

Appendix 16: Fixed Effect Model

Dependent Variable: EFF
Method: Panel Least Squares
Date: 02/24/18 Time: 16:19
Sample: 2014 2016
Periods included: 3
Cross-sections included: 10
Total panel (balanced) observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	-2.169137	3.141235	-0.690536	0.4992
SIZE	-0.287056	0.093508	-3.069835	0.0069
CAR	0.186909	0.461796	0.404743	0.6907
C	6.377829	1.862809	3.423769	0.0032

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.629405	Mean dependent var	0.969333
Adjusted R-squared	0.367808	S.D. dependent var	0.112961
S.E. of regression	0.089816	Akaike info criterion	-1.683420
Sum squared resid	0.137138	Schwarz criterion	-1.076234
Log likelihood	38.25129	Hannan-Quinn criter.	-1.489176
F-statistic	2.406014	Durbin-Watson stat	1.959228
Prob(F-statistic)	0.048011		

Appendix 17: Random Effect Model

Dependent Variable: EFF
Method: Panel EGLS (Cross-section random effects)
Date: 02/24/18 Time: 16:21
Sample: 2014 2016
Periods included: 3
Cross-sections included: 10
Total panel (balanced) observations: 30
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	1.794864	1.245185	1.441443	0.1614
SIZE	0.019151	0.013420	1.427060	0.1655
CAR	0.084003	0.091792	0.915142	0.3685
C	0.535166	0.260299	2.055966	0.0500

Effects Specification		
	S.D.	Rho
Cross-section random	0.000000	0.0000
Idiosyncratic random	0.089816	1.0000

Weighted Statistics			
R-squared	0.141434	Mean dependent var	0.969333
Adjusted R-squared	0.042369	S.D. dependent var	0.112961
S.E. of regression	0.110543	Sum squared resid	0.317711
F-statistic	1.427686	Durbin-Watson stat	2.030667
Prob(F-statistic)	0.257298		

Unweighted Statistics			
R-squared	0.141434	Mean dependent var	0.969333
Sum squared resid	0.317711	Durbin-Watson stat	2.030667

Appendix 18: Chow-Test

Redundant Fixed Effects Tests
Equation: FE
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	2.487141	(9,17)	0.0505
Cross-section Chi-square	25.204597	9	0.0028

Cross-section fixed effects test equation:
Dependent Variable: EFF
Method: Panel Least Squares
Date: 02/24/18 Time: 16:24
Sample: 2014 2016
Periods included: 3
Cross-sections included: 10
Total panel (balanced) observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA	1.794864	1.532529	1.171178	0.2521
SIZE	0.019151	0.016516	1.159492	0.2568
CAR	0.084003	0.112975	0.743556	0.4638
C	0.535166	0.320366	1.670480	0.1068

R-squared	0.141434	Mean dependent var	0.969333
Adjusted R-squared	0.042369	S.D. dependent var	0.112961
S.E. of regression	0.110543	Akaike info criterion	-1.443266
Sum squared resid	0.317711	Schwarz criterion	-1.256440
Log likelihood	25.64899	Hannan-Quinn criter.	-1.383499
F-statistic	1.427686	Durbin-Watson stat	2.030667
Prob(F-statistic)	0.257298		

Appendix 19: Hausman-Test

Correlated Random Effects - Hausman Test
Equation: RE
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	18.681313	3	0.0003

** WARNING: estimated cross-section random effects variance is zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
ROA	-2.169137	1.794864	8.316871	0.1693
SIZE	-0.287056	0.019151	0.008564	0.0009
CAR	0.186909	0.084003	0.204830	0.8201

Cross-section random effects test equation:
Dependent Variable: EFF
Method: Panel Least Squares
Date: 02/24/18 Time: 16:27
Sample: 2014 2016
Periods included: 3
Cross-sections included: 10
Total panel (balanced) observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.377829	1.862809	3.423769	0.0032
ROA	-2.169137	3.141235	-0.690536	0.4992
SIZE	-0.287056	0.093508	-3.069835	0.0069
CAR	0.186909	0.461796	0.404743	0.6907

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.629405	Mean dependent var	0.969333
Adjusted R-squared	0.367808	S.D. dependent var	0.112961
S.E. of regression	0.089816	Akaike info criterion	-1.683420
Sum squared resid	0.137138	Schwarz criterion	-1.076234
Log likelihood	38.25129	Hannan-Quinn criter.	-1.489176
F-statistic	2.406014	Durbin-Watson stat	1.959228
Prob(F-statistic)	0.048011		