



Measurement of Bank Efficiency using DEAP Analysis in Bank Central Asia

Putra Teja

College of Economics and Management, Nanjing University of Aeronautics and Astronautics.

Abstract

This paper aim is to using the DEAP analysis to measure the efficiency value of Bank Central Asia, which is the largest bank private owned bank in Indonesia. By since nowadays the higher efficient of the one company is means the more profits gained from the business. DEA is a computer program to conduct linear programming methods to create a non-parametric piecewise surface over data to calculate the efficiency relative to the surface. The concept of efficiency according to business dictionary efficiency is the comparison of what is actually produced or performed with what can be achieved with the same consumption of resources or inputs (money, time, labor, etc.)

Keywords Efficiency: Data Envelopment Analysis; Bank Central Asia; Efficiency.

1. Introduction

The banking industry plays a very strategic role because the activities of the economy cannot be separate from the cash flow of the country. This role can be assumed that the banking industry as the pulse of the economy system. Banking services are very important in economic development of a country. Bank provide the efficient payment mechanism and instrument for customers. Therefore, bank providing cash, saving and credit cards. Without the provision of a payment instrument this means that goods can only be traded in a bartering way that require longer time. Bank and other finance institutions are expected to guarantee investment financing and productive activities, as well they mobilize and allocate financial resources as well as through the creation of their specific money process through bank credit at the same time, markets and finances are functioning well institutions can lower transaction costs and asymmetric information problems. In addition, they should play an important role in identifying investment opportunities, choose the most profitable projects, mobilize deposits, facilitate trade and diversify risks, and improve corporate governance mechanisms. Since banks plays the important role in financial intermediaries. Bank need to pay more attention at its efficiency. The higher level of technical efficiency of banks to operate, the bank tends to more profitable (Jackson, Fethi 2002). The efficiency concept is measured and determined using output ration to total input. Data Envelopment Analysis (DEA) model able to perform such measurement.

BCA bank is the biggest private owned bank in Indonesia and was founded in 21 February 1957 also part of the Salim group. According to Indonesian Financial Service Authority (OJK) (2016), BCA bank in the third biggest bank with total assets more than 662 trillion Rupiah in 2016 and it still count as the biggest private owned bank because in the first and second position is state-owned banks. Due to the bank's GCG commitment, BCA bank receive many awards and acknowledgement, including most committed to corporate governance Indonesia from the FinanceAsia, and recognition from the Indonesian Banking Award 2016 hosted by the Economic Review Magazine and the Perbanas Institute. this paper objective is to estimate the efficiency of this private-owned bank BCA. According to seasia.co Bank Central Asia is the second largest bank in southeast Asia with the market value of \$32.1 Billion provides both commercial and personal banking services. Bank Central Asia is partly controlled by the Indonesian largest conglomerates Djarum Group, who own cigarette manufacturing to property development and management (Salikha, Adelaida 2017).

2. Review of Literature

2.1 DEA (Data Envelopment Analysis)

DEA is a computer program to conduct linear programming methods to create a non-parametric piecewise surface over data to calculate the efficiency relative to the surface. The concept of efficiency according to business dictionary efficiency is the comparison of what is actually produced or performed with what can be achieved with the same consumption of resources or inputs (money, time, labor, etc). It is the comparison between present situation and ideal situation. The closer efficiency value to 1, it means the closer between what is happening in production system now compared to ideal situation. Efficiency is an important factor in determine of productivity. Coelli, Rao, O'Donnell, Battesse (2005) defines productivity as the ratio of output(s) that it produces to the input(s) that it uses. Farrell (in Coelli, et al., 2005) proposed that the efficiency of a firm consists of two components. First is technical efficiency which reflects the ability of a firm to obtain maximal output from a given set of inputs. Second is allocative efficiency. It reflects the ability of a firm to use the inputs in optimal proportions, given their respective prices and the production technology. The combination of technical efficiency and allocative efficiency provide a measure of total economic efficiency. These are usually input-oriented measures, calculating how much input quantities can be proportionally reduced without changing the output quantities produced. Data Envelopment Analysis is a technique that can be used to measure firm-level inefficiency. It involves the use of linear programming methods to construct a non-parametric piecewise frontier over the data, so it can be able to calculate efficiencies relative to these surfaces. DEA does not require the user to prescribe weights to be attached to each input and output, as in the usual index number approaches, and it also does not require prescribing the functional forms that are needed in statistical regression approaches (Cooper, Seiford, Tone, 2007). Charnes, Copper, and Rhodes proposed Constant Returns to Scale (CRS) model in 1978 (Coelli, et al., 2005; Cooper, Seiford, Tone, 2007). CRS has an input orientation and assumed constant returns to scale. For each Decisions Making Unit (DMU), it is formed the input and output by (yet unknown) weights (v_i) and (u_r).

To determine the optimal weights may (and generally will) vary from one DMU to another DMU because the "weights" in DEA are derived from the data instead of being fixed in advance. Each DMU is assigned a best set of weights with values that may vary from one DMU to another. The CRS assumption can be used when all firms are operating at an optimal scale. However, in reality there are imperfect competition, government regulations, constraints on finance, etc., which cause a firm to be not operating at optimal scale. The use of the CRS specification when not all firms are operating at the optimal scale, results in measures of TE that are confounded by scale efficiencies (SE). Some authors, such as Afriat (1972), Fare, Grosskopf and Logan (1983) and Banker, Charnes and Cooper (1984) suggested adjusting the CRS DEA model to account for variable returns to scale (VRS) situations. The use of the VRS specification permits the calculation of TE devoid of these SE effects. Scale efficiency measures can be obtained for each firm by conducting both a CRS and a VRS DEA, and then decomposing the TE scores obtained from the CRS DEA into two components, one due to scale inefficiency and one due to "pure" technical inefficiency (ie. VRS TE). If there is a difference in the CRS and VRS TE scores for a particular firm, then this indicates that the firm has scale inefficiency. Coelli, et al. (2005) stated the advantages of DEA which are its ability to identify sources and amounts of inefficiency in each input and each output for each entity (hospital, store, furnace, etc.), and its ability to identify the benchmark members of the efficient set used to affect these evaluations and identify these sources (and amounts) of inefficiency. According to Maletic and Krec (2013) DEA is designed special for measured the complex entities of the inputs and outputs. Also, being used for many evaluation and improvement the operation of many business. The result of the DEA analysis provides inefficient compared to efficient units. If the result is equal to 1 it means the it is reached the efficiency and if the value did not reach 1 than it means inefficient. The smaller value of efficiency, the less efficient is the units.

3. Methodology

3.1 DEA (Data Envelopment Analysis)

Table 1: Input And Output Data From 2012 To 2016					
Year	Input			Output	
	Total Asset	Operating Expense	Total Equity	Total operating Income	Earnings per Share
2012	442,994	12,907	51,898	28,092	480

2013	496,849	14,790	62,332	34,622	579
2014	553,156	18,393	75,726	41,373	669
2015	594,373	21,714	89,625	47,876	731
2016	676,739	23,379	112,715	53,779	836
*In Billion Rupiah					

Source: 2016 Annual report of Bank Central Asia.

This paper objective is to estimate the efficiency of Bank Central Asia based on DEA (Data Envelopment Analysis) from within the period that lies between 2012 until 2016. The research will be conducted based on a set of inputs which are total assets (x_1), operating expense (x_2), total equity (x_3) and a set of output which are total operating input (y_1), Earning per Share (y_2). This data will be analyze using the Constant Return to Scale (CRS), Variable Return to Scale (VRS) and Scale Efficiency (SE). The slacks will be computed using the DEA multi-stage method.

In order to compute the efficiency of each year within 2012 until 2016, the production technology set is defined as follows:

$$T = (x_1, x_2, x_3, y_1, y_2) : (x_1, x_2, x_3) \text{ can produce } (y_1, y_2)$$

For the output oriented DEA,

$$\max \eta_m = \sum_{j=1}^j V_{jm} Y_{jm}$$

Subject to,

$$\sum_{i=1}^I U_{im} X_{im} = 1$$

$$\sum_{j=1}^j V_{jm} Y_{jm} - \sum_{i=1}^I U_{im} X_{im} \leq 0$$

$$V_{jm}, U_{im} \geq 0 \quad \forall \quad i = 1, 2, \dots, I \text{ and } j = 1, 2, \dots, J$$

Where,

η_m is the efficiency of c.

Y_{jm} is the jth output of mth DMU.

V_{jm} is the weight of jth output.

X_{im} is the ith input of the mth DMU.

U_{im} is the weight of the ith input.

Y_{jn} and X_{in} are the jth output and ith input of the nth DMU.

4. Result

The empirical result was conducted by using DEAP 2.1 software, which was created by tim coelli. the DEA method is capable to handle the multiple inputs-outputs producer such as bank and it is also not required the specification of an explicit functional form for the production frontier or an explicit statistical distribution for the inefficiency terms

unlike the econometric methods. Data sample collected from the 2016 annual report of BCA bank and obtained from the official website of the bank. The following table will be the result from operating the DEA software.

Table 2: Efficiency Value Obtained Using DEA				
Year	CRSTE	VRSTE	SCALE	
2012	1.000	1.000	1.000	-
2013	1.000	1.000	1.000	-
2014	1.000	1.000	1.000	-
2015	1.000	1.000	1.000	-
2016	0.996	1.000	0.996	IRS
Mean	0.999	1.000	0.999	

The table shows the technical efficiency scores for all the decisions making units under constant return to scale (CRS) assumption it is output oriented. The scores are including CRS, VRS and Scale efficiency of the bank BCA. From the table it is shown that the following year from 2012 to 2015 this bank manages to operate in efficient way because the efficiency scores equals to one. But in 2016 the CRS shows inefficiency value because the bank output increase more

5. Conclusion

The aim of this paper is to evaluate the performance of BCA bank whether this bank operate in efficient way or not by using the DEA software. Researcher conclude that this particular Bank Central Asia perform their job really well because they manage to maintain the efficiency from 2012 to 2015, since this particular bank is the largest private-owned bank and the third largest bank in Indonesia (first and second largest bank in Indonesia is state-owned banks), it means this bank maintain high level of quality of performance to reach highest possible goals.

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