THE INFLUENCE OF SATISFACTION TOWARD LOYALTY AND BUSINESS BUILDING OF MULTILEVEL MARKETING SALESPERSON IN ORIFLAME SURABAYA
Mei Retno A, Nuruni Ika

GIS FOR BANKING: THE DEVELOPMENT OF SPATIAL MODEL FOR LAND VALUATION IN SURABAYA
Hening Widi Oetomo

TECHNICAL AND SCALE EFFICENCY OF SYARIAH BANKING IN INDONESIA: DATA ENVELOPMENT ANALYSIS APPROACH
Endri Piliang, Hanny Ritha, Puji Hadiyati

THE INFLUENCE OF SUPPORT AND INFORMATION SYSTEM TOWARD THE USE OF WORK INFORMATION IN BUDGETING WITH DEVELOPMENT FACTOR AS INTERVENING VARIABLE
Pepie Diptyana, Hardo Basuki

STUDY OF THE TAXPAYERS’ COMPLIANCE IN BANKING INDUSTRIES IN SURABAYA
Kautsar Riza Salman, Mochammad Farid

THE INFLUENCE OF INDIVIDUAL RANK AND WORKING EXPERIENCE ON PROFESSIONALISM OF INTERNAL AUDITORS
Gunaranto

ANTECEDENTS AND CONSEQUENCES OF INTERNAL QUALITY OF PRODUCTS IN THE MANUFACTURING COMPANIES HOLDING SNI IN EAST JAVA
Rovila El Magviroh

Volume 13, No.1, April 2010

ISSN 2085-7381
TECHNICAL AND SCALE EFFICIENCY OF SYARIAH BANKING
IN INDONESIA: DATA ENVELOPMENT ANALYSIS APPROACH

Endri
Henny Ritha
Puji Hadiyasti
ABFI Institute Perbanas Jakarta
E-mail: endri67@yahoo.com, henny@perbanas.ac.id, puji310@yahoo.co.id
Jl. Perbanas, Karet Kuningan, Setiabudi Jakarta DKI Jakarta - Indonesia

ABSTRACT
So far, efficiency tends to be a very important issue for discussion. Therefore, such a topic needs attention. This is crucial when it is related to syariah banking industry development. In that case, the best performance of shariah banking can be reached so that it has high competitive power in national banking industry. Besides that, it is also expected to be able for expanding the market share. Using the non-parametric method of Data Envelopment Analysis (DEA), this study investigates the recent efficiency of the Islamic Banking operations in Indonesia over the period 2005 to 2007. The attributions of technical efficiency (utilization of capacity) and scale efficiency (optimality of scale achieved) are identified. The principal findings for the period under study indicate that technical and scale efficiency scores are improving but not optimal 100% during research period. The findings provide useful guidelines for policy implications and may also assist banks concerned with their strategic planning with regard to the future of Islamic banking.

Key words: Efficiency; Data envelopment analysis; Islamic banking

INTRODUCTION
Efficiency should get serious attention especially by the bank management in terms of pushing syariah banking industry development. In that case, the best performance of shariah banking can be reached so that it has high competitive power in national banking industry. Besides that, it is also expected to be able for expanding the market share. This is because of the efficiency in operational of syariah banking which has not run optimally yet. Although systematically syariah banking has showed better financial performance, syariah banking system still gives lower return level to the customers compared to the conventional one. The low return level is caused by high cost of bank operational activities, particularly the cost that is in fact burdening the customers.

Berger and Mester (1997) argue that efficiency for a bank or banking industry is the most important aspect that needs to be taken into account for creating a healthy and sustainable financial performance. In this respect, efficiency can be viewed from micro and macro perspective. From micro perspective, for example, it can be viewed specially in tight competitive situation. In this condition, a bank must grow efficiently in its operation. Inefficient banks possibly will be naturally excluded from the market since, they are not able to compete with their competitors, either in pricing, quality of products, and services. Inefficient banks will have trouble in maintaining customer loyalty and also difficult to attract the prospective customers in order to enlarge the customer base.

Meanwhile in macro perspective, efficient banking industry can effect financial intermediation cost and financial system stability in general. This is because the strategic role of banking industry is considered intermediary and financial service producers. With higher level efficiency, banking performance might be better in allocating financial resources, and in the end, will increase the investment acti-
tivity and economic growth (Weill 2003).

Efficiency betterment can be done if syariah bank is able to operate in the minimum cost. The decreasing of operational cost results in betterment of return to the customers. In addition, it will stimulate the investors to be partner with syariah bank, since they not only expect the financial service that complies to syariah, but also expect the better level return. Improving efficiency in the syariah banking is also important to face the global competition era where the business competitors do not only come from the same industry, but also from other industries which are able to give the same service.

There is a fundamental question that arises after reviewing a brief literature on Islamic banking and efficiency measurement techniques. The question is that “Do Islamic banks perform efficiently?” Although the phenomenon of Islamic banking and finance has developed significantly in recent years, only very few studies have tackled this central question. This paper provides evidence on the performance of 15 Islamic banks over the period 2005-2007. Unlike previous studies, this paper is based on efficiency measurement in which the nonparametric approach, data envelopment analysis, is utilized to analyze the technical and scale efficiency of Islamic banking. In specifying input-output variables of Islamic banks, the intermediation approach is selected as it is in line with the principle of Islamic financial system.

THEORETICAL FRAMEWORK
Efficiency measuring concept was firstly introduced by Farrel (1957) which is a follow up of model sounded by Debreu (1951) and Koopmans (1951). According to Farrel, efficiency measuring concept can measure plural input (bigger than 1). In addition, in this concept a company consists of two components, they are technical efficiency and allocative efficiency. The former hows the ability of company to reach maximum output and number of input. The latter shows the ability of company to use input in optimum proportion to a certain input price level. These two components combined to get total efficiency or economic efficiency. On the contrary, Chen (2001) with his research about efficiency in banking institution gives a different concept. Based on Chen’s concept, banking efficiency can be divided into four, they are scale efficiency, scope efficiency, pure technical efficiency, and allocative efficiency.

a. Scale efficiency
Measuring efficiency level is related to the business scale of a bank which was figured by its assets. The bigger the asset held by a bank, the higher its efficiency level, since the average cost that is possessed gets smaller. Humfrey (1992) in his research it is stated, that average cost of banking industry forms U-shape quite flat, where bank groups of middle scale have higher efficiency level. But, this research can not show precisely, that the minimum point of the U-shape curve is the scale efficient point.

b. Scope efficiency
Scope efficiency measures the efficiency level of bank relates with scope of business bank. Efficiency level is measured based on scope economies and scope diseconomies. If there is scope economies means bank has multiple product, more efficient than specialist bank. Otherwise in scope diseconomies, specialist bank operates more efficiently than multiple products.

c. Pure technical efficiency
Pure technical efficiency is related to maximizing output or minimizing input. This interpretation is the same as the previous technical efficiency noted by Farrel (1957). Mostly, researchers use the efficiency concept of a company which is based on that interpretation.

d. Allocative efficiency
Allocative efficiency relates with choosing right input combination.

Empirical studies about efficiency of syariah bank in other countries have been conducted. However, in Indonesia it is relatively still limited. Some of studies related to effi-
ciency of syariah bank overseas have been conducted by Yudistira (2003), Hasan (2003), Brown and Skully (2003), and Abdul Majid et al. (2003). Yudistira (2003), conducted a research on 18 syariah banks recently in the period 1997-2000 by using DEA approach and input output specification based on intermediation approach. The result show that entirely the efficiency of 18 syariah banks observed is a bit inefficient in the of level 10%, when compared to conventional banks. This is because in 1998-1999, those banks had undergone global crisis that effects their performance. Middle scale syariah banks tend to be not economical. Therefore, it is suggested that those banks make merger or acquisition.

Hasan (2003) conducted a study on Islamic bank in Pakistan, Iran, and Sudan in period 1994-2001 using parametric and non parametric technique. The result shows the main resource of efficiency in Islam bank is scale efficiency, not technical efficiency. This research also proves that big scale and big profit banks have higher efficiency. This result goes along with research conducted by Brown and Skully (2003). Studies among countries for 35 Islamic bank using DEA technic, Brown and Skully (2003) summarize that bigger Iran bank is more efficient, while Sudan bank which gives financial agriculture, the cost efficiency is lower. This result of Brown and Skully (2003) also shows that cost efficiency of Middle East banks is higher.

Abdul Majid et al. (2003) test the efficiency cost of Malaysia comercial bank in period 1993-2000 by comparing efficiency pre and post financial crisis. Empirical result shows that statistically there is no difference in efficiency of Malaysia bank before and after financial crisis. This study also found that banks owned by foreign company is more efficient than the local ones.

Some research in efficiency of banks in Indonesia had also been conducted by Hadad et.al (2003), Rustam (2005), Ascarya and Yumanita (2006), Hidayat (2006), and Abidin (2007). Hadad et.al (2003), did research on public national bank in period 1995-2003 using DEA approach. There are three main points from the result of this research, such as; first, credit related with the bank and marketable securities has very high potential development to increase efficiency entirely, second, merger of bank do not always make bank more efficient, and third, non devisa national private bank groups can be claimed as the most efficient for 3 years (2001-2003) analyzes in 8 year (1996-2003) compared to other banks. Foreign mix bank has ever been the most efficient in 1997, compared to other foreign private national exchange banks in 1998 and 1999.

Rustam (2005) conducts research which was based on data in 1993 representing data before crisis. The data in 1997 represent data after crisis, uses DEA method to 72 national foreign exchange banks. The result shows that before crisis there is 62,5% foreign exchange national banks(45 banks) that reach the relative optimal efficiency level, 100%. After crisis, the number of banks that reach optimal efficiency level decrease to 37,5%. However, on the average, technical efficiency of the national foreign exchange banking is relatively still high in the second period, in which the score rises up to 70% (in 1993 before crisis 98,61% and in 1997 is 83,33%).

Ascarya dan Yumanita (2006) conducted research using DEA approach to syariah banking in the period 2000-2004. The result shows that efficiency is relatively technical in syariah banks with intermediation approach (100%) and production (85%) in 2004. Efficiency is also relatively in scale from intermediation approach (87%) and production (97%). In general, syariah approach has decreased in technical efficiency, but has increased in scale efficiency. It is because at that time, syariah banks were quite aggressive to expand by opening new offices.

Hidayat (2006) conducted technical efficiency research on syariah banking and commercial banks in Indonesia, also Indonesia syariah bank with Malaysia in 2005 with
The result shows that syariah bank is less efficient than conventional bank, while Malaysia syariah bank is more efficient compared to Indonesia syariah bank. Abidin (2007) conducted research to evaluate efficiency performance of 93 commercial banks in Indonesia in period 2002 to 2005 uses DEA method. The results shows that foreign bank group and state bank more efficient compared to other group bank.

**RESEARCH METHOD**

**Data and Resources**

It is common that data availability is one of a major challenge in banking industry research. Bank’s secrecy and many strict rules which regard to observation of the bank and the customer affect the access to data and information. Thus, this condition makes it difficult and difficult to get them. Hence, studies of banking industries entirely use published secondary data. In that case, this research also uses published secondary data in period 2005-2007 as the main data, such as balance sheet report, profit-loss report, productive asset quality report, and information of some of financial ratio. The main data were achieved from the Indonesia Central Bank’s (BI) publication, thus, there is different levels of completeness from year to year.

The obstacles faced in this research are such as the number of syariah bank is relatively still so small and many of them don’t have complete financial report in the period 2005-2007. From 22 of syariah banks recorded until December 2005, only 15 of syariah banks have complete financial report (see Table 1). This number fulfills the property of using DEA method, which need at least 3 Decision Making Units (DMU) for each input and output variable used in the model to ensure the degrees of freedom of usefull analysis. In this research, 3 input variables and 2 output variables (total DMU 15).

Commercial Syariah Bank is the bank that the business activities are based on syariah principle. This principle is agreement rule based on Islamic Law between bank and other party for depositing and financing business activity, or other activity that is proved to comply with syariah. Syariah division unit is the work unit of Head quarter Conventional Bank purposed as parent office of syariah branch office and or syariah unit.

**Data Envelopment Analysis (DEA)**

**Method**

DEA Method is a frontier non parametric method which uses linier program model to count output and input ratio comparison.

<table>
<thead>
<tr>
<th>Group of Syariah Bank</th>
<th>Syariah Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Syariah Bank/</td>
<td></td>
</tr>
<tr>
<td>Bank Umum Syariah (BUS)</td>
<td>1. Bank Muamalat</td>
</tr>
<tr>
<td>Syariah Division Unit/</td>
<td>2. Bank Syariah Mandiri (BSM)</td>
</tr>
<tr>
<td>Unit Usaha Syariah (UUS)</td>
<td>3. Bank Syariah Mega Indonesia (BSMI)</td>
</tr>
<tr>
<td></td>
<td>1. Bank Negara Indonesia (BNI)</td>
</tr>
<tr>
<td></td>
<td>2. Bank Rakyat Indonesia (BRI)</td>
</tr>
<tr>
<td></td>
<td>3. Bank Tabungan Negara (BTN)</td>
</tr>
<tr>
<td></td>
<td>4. Bank Danamon Indonesia</td>
</tr>
<tr>
<td></td>
<td>5. Bank Bukopin</td>
</tr>
<tr>
<td></td>
<td>6. Bank Internasional Indonesia (BII)</td>
</tr>
<tr>
<td></td>
<td>7. Bank Niaga</td>
</tr>
<tr>
<td></td>
<td>8. Bank Permaita</td>
</tr>
<tr>
<td></td>
<td>9. BPD Sumatera Utara</td>
</tr>
<tr>
<td></td>
<td>10. BPD Aceh</td>
</tr>
<tr>
<td></td>
<td>11. BPD DKI</td>
</tr>
<tr>
<td></td>
<td>12. BPD Jabar</td>
</tr>
</tbody>
</table>

Table 1: Number of Research Sample of Syariah Bank
different. The main difference between CRS (CCR model) and VRS (BCC model) is that the first model produces evaluation to overall efficiency but second model already separates technical efficiency with scale efficiency. So, BCC model is the extension of CCR model to fulfill the research assessment which needs to separate technical efficiency from scale efficiency.

**Specification of Input and Output**

According to Leong et al. (2003) and Barr et al. (2002), there are 3 approaches used to measure banking efficiency, namely production approach, intermediate approach, asset approach. Kwan (2002) and Berger and Humphrey (1997) view intermediate approach used more often in research of bank’s efficiency. They suggest this approach to evaluate efficiency of all banks since there is interest burden, half of the two thirds of the total cost. This research also uses intermediate approach because this approach suits to reflect characteristic of syariah bank where syariah bank as intermediate institution that channels funding from the surplus party to the deficit party who need fund.

Specification of Input and Output used in this research is DEA model with the same variable. Output Variable of syariah bank consists of Total financing (Y1) and Total Income (Y2), and input variables consists of Total Deposits (X1), Labor cost (X2), and fixed asset (X3).

**RESULT AND STUDY**

Technical Efficiency of Syariah Bank

Table 4 shows the growth of technical efficiency level from 15 syariah bank in the period 2005-2007. Generally, technical efficiency level from 15 syariah bank in period 2005-2007 tends to increase though it decreases in 2006, that is it becomes 85, 20% from 87, 60% in 2005. But, in 2007 increases again and becomes 88, 40%. If we refer to optimal efficiency level 100%, syariah banking is still not efficient. This is a challenge for management and regulator of syariah banking to keep improving the performance and increase the technical efficiency level.

In general, there are 5 banks that can be a reference for other banks because their technical efficiency is relatively good (VRS) for three continual years (2005-2007), they are Bank Muamalat, BSMI, DPD Sumut, DKI and Jabar. And, the bank is technically and relatively efficient (VRS) for two continual years (2006-2007) are BSM, BNI, and Bank Niaga, while BRI is technically and relatively efficient for 2 continual years in 2005 and 2006.

If compared to the syariah bank group between BUS and UUS, it shows that efficiency level of BUS is much higher than

| Table 2 |
| Spesification of Input and Output Variable with Intermediate Approach |

<table>
<thead>
<tr>
<th>Input</th>
<th>Definition</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>Total Deposits</td>
<td>Balance Sheet</td>
</tr>
<tr>
<td>X2</td>
<td>Labor cost</td>
<td>Profit Loss Report</td>
</tr>
<tr>
<td>X3</td>
<td>Fixed Asset</td>
<td>Balance Sheet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th>Definition</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1</td>
<td>Financing</td>
<td>Balance Sheet</td>
</tr>
<tr>
<td>Y2</td>
<td>Income</td>
<td>Profit Loss Report</td>
</tr>
</tbody>
</table>
Table 3
Comparison of Scale Efficiency of BUS and UUS
In 2005-2007

<table>
<thead>
<tr>
<th>Year</th>
<th>BUS</th>
<th>UUS</th>
<th>Total Syariah Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>0.986</td>
<td>0.849</td>
<td>0.876</td>
</tr>
<tr>
<td>2006</td>
<td>1</td>
<td>0.815</td>
<td>0.852</td>
</tr>
<tr>
<td>2007</td>
<td>1</td>
<td>0.855</td>
<td>0.884</td>
</tr>
</tbody>
</table>

Source: processed data

Table 4
Results of DEA VRS Output-Oriented 2005 – 2007

<table>
<thead>
<tr>
<th>Syariah Bank</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masyarakat</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>BSM</td>
<td>0.959</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>BSMI</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>BNI</td>
<td>0.568</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>BRI</td>
<td>1.000</td>
<td>1.000</td>
<td>0.730</td>
</tr>
<tr>
<td>BTN</td>
<td>1.000</td>
<td>0.989</td>
<td>1.000</td>
</tr>
<tr>
<td>Danamon</td>
<td>0.408</td>
<td>0.553</td>
<td>0.554</td>
</tr>
<tr>
<td>Bukopin</td>
<td>0.888</td>
<td>0.702</td>
<td>0.723</td>
</tr>
<tr>
<td>BII</td>
<td>0.396</td>
<td>0.498</td>
<td>1.000</td>
</tr>
<tr>
<td>Niaga</td>
<td>0.977</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Permastra</td>
<td>0.946</td>
<td>0.783</td>
<td>1.000</td>
</tr>
<tr>
<td>BPD Sumut</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>BPD Aceh</td>
<td>1.000</td>
<td>0.250</td>
<td>0.248</td>
</tr>
<tr>
<td>BPD DKI</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>BPD Jabar</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Rata-rata</td>
<td>0.876</td>
<td>0.852</td>
<td>0.884</td>
</tr>
</tbody>
</table>

Source: Processed data Software DEAP 2.1 (Coelli,1996)

Figure 1 DEA Technical Efficiency
UUS (see Table 3). Efficiency level of BUS except in 2005 reaches to 100%, but UUS in period 2005-2007 about 84% still far from optimal efficiency level 100%. This condition can push UUS become BUS immediately to reach the optimal efficiency level that has been achieved by BUS recently.

**Scale Efficiency of Syariah Bank**

Scale efficiency of 15 syariah banks tends to increase in the period of 2005-2007. In 2005, the scale efficiency of syariah bank is 74, 5%, thus, it has increased very high in 2006 because it becomes 90, 9%. But, in 2007 decreases again becoming 88,1%. It is different from the technical efficiency level, where BUS is more efficient than UUS. It is the otherwise; the scale efficiency UUS is more efficient than BUS (see Table 6). Except in 2005, the scale efficiency of UUS is higher than BUS and total general syariah bank has not achieved optimal level of 100%. This result shows that BUS which has bigger asset than UUS does not mean to have more scale efficiency than UUS which has smaller asset.

The reason is because those three BUSes are relatively still new and it spends big expenditure to invest in many supporting operational activities of the bank. So, it has not achieved economic scale. On the other side, UUS itself has not done much investment because its operational activity is still much to depend on the parent bank.

If related to the kind of banks, BUS and UUS, in the scale of BSIMI, it represents that among BUS and BPD DKI and Jabar, the most efficient is UUS in the research period. Thus, it can be a benchmark for other Syariah Bank. However, if related to possession asset, it can be explained that the number of possessed asset can not guarantee that the efficiency of the banks in running of their intermediate function. It can be proved by the result of the scale efficiency reached by 3 Syariah Banks which have scale efficiency for 3 continual years. BSIMI has asset smaller than the others: BUS, BMI and BSM, but its efficiency score is better compared to the others. It is the same in UUS group, 2 Banks have scale efficiency, BPD DKI and Jabar, their asset tends to be smaller than the asset of other UUS. This condition proved that the bank with bigger asset cannot be guaranteed to be more efficient in running its intermediate function. Thus, efficiency can be achieved if the bank optimizes the reached output such as financing, income and minimizing the used input, for examples total deposit, labor cost, and fixed asset.

Based on the explanation above (by considering the relative technical efficiency and the scale efficiency), there are only 3 banks in 3 continual years and can be used as a reference or benchmark for other syariah banks. They are BSIMI, BPD DKI and Jabar. This means those 3 syariah banks are efficient in VSR and CRS. It can be proved by the scale efficiency in which the score is 1,00 for 3 continual years, from 2005-2007.

**CONCLUSION AND SUGGESTIONS**

This research measures efficiency level of 15 syariah banks that consists of 3 BUS and 12 UUS every year in the period 2005-2007 by using DEA method. This method is based on output oriented to maximizing output, with assumption VRS analysis (Variable Return to Scale). Syariah bank is said to be efficient,  

**Table 5**

<table>
<thead>
<tr>
<th>Year</th>
<th>BUS</th>
<th>UUS</th>
<th>Total Syariah Bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>0.781</td>
<td>0.736</td>
<td>0.745</td>
</tr>
<tr>
<td>2006</td>
<td>0.860</td>
<td>0.921</td>
<td>0.909</td>
</tr>
<tr>
<td>2007</td>
<td>0.793</td>
<td>0.903</td>
<td>0.881</td>
</tr>
</tbody>
</table>
when it is close to 100% and inefficient if it is smaller than 100%. Based on the technical efficiency using DEA method, it shows that the 15 Syariah Banks in the period of 2005-2007 are not yet efficient.

The description above can be seen from the relative average number (PTE/BCC), that is under 100%. Yet, when viewed in each year, the number of Syariah Bank which has relative technical efficiency increases from 8 banks in 2005, to 9 banks in 2006, and 11 banks in 2007. If compared to other syariah bank group, between BUS and UUS, the result shows that efficiency level of BUS is much higher than UUS. Efficiency level of BUS, except in 2005 reaches 100% and UUS in period 2005-2007, is about 84%. Thus, it is still far from optimal efficiency level of 100%. This condition can push UUS to become BUS immediately to reach the optimal efficiency level that has been achieved by BUS recently.

Scale efficiency of 15 syariah banks tends to increase in the period of 2005-2007.
SUGGESTION

The result of counting efficiency level using DEA method can be an alternative for the comparison to other approach to see whether the management, regulator, supervisor, or auditor who analyze syariah bank performance individually or entirely. So, it can provide us information more completely in order to take future decision.

Analysis result of DEA, especially identifying inefficient sources, whether from input or output, can be used by individual bank to evaluate performance and decide better steps that increase the efficiency performance.

The scarcity of the number of syariah banks that will be observed and the scarcity of the availability of financial report in this research are the major problems. Thus, it is difficult to get optimum result in counting efficiency. Efficient frontier in DEA formed from DMU-DMU is more efficient than its peer group. Therefore, the bigger number for observation, the more efficient the frontier line. This reflects best practices. So, to get the best result in analyzing syariah banking industry needs to enlarge the number of observation of syariah banks.

The next actions need to be identified together by management, regulator, academician or syariah bank observer is the function and role of syariah bank in national economy so that the input-output specification which used in the research can be attained.

REFERENCES


Hassan, M.Kabir, 2003, *Cost, profit and x-efficiency of Islamic Banks in...*


Koopmans, T.C 1951, An analysis of production as an efficient combination of activities, In T.C.Koopmans (eds) Activity Analysis of Production and Allocation, Cowles Commission for

Kumbhakar, S.C dan Knox, Lovell, 2000, The Effect of Deregulation on performance of financial institutions: The Case of Spanish Saving Banks, Department of Economic University of Texas.


for all unit compared in a population. The purpose of this method is to measure DMU efficiency level of a bank relatively to the same bank when all units are in or under “the curve” of efficient frontier. So, this method is used to evaluate the relative efficiency of some objects (performance benchmarking). This method was firstly introduced by Charnes, Cooper dan Rhodes (CCR) in 1978 called CCR model. The model assumes that ratio between extra input and output is same (constant return to scale or CRS). This emans that, if there is extra input x times, the output will increase x times. Another assumption used in this model is each company operates in optimum scale.

The next CCR model was developed by Banker, Charnes, and Cooper in 1984 known as BCC model. This model assumes that company does not operate in optimum scale. Competition and financial obstacles can affect the company not to operate in its optimum scale. The assumption of this model is that the ratio between extra input and output is not the same (variable return to scale or VRS). It means that extra input x times does not make increasing output x times, can be smaller or bigger x times.

Technical Efficiency (TE) is counted by VRS assumption which is called as Pure Technical Efficiency. With frontier estimation CRS and VRS assumptions, we can decompose technical efficiency in CRS assumption (TECRS) become Pure Technical Efficiency (TEVRS) and Scale Efficiency (SE), mathematically:

\[ TECRS = TEVRS \times SE \]  \hspace{1cm} (1)

Efficiency score DEA with VRS assumption is achieved by finding this equal system solution, which apparently same with this equation (1) but using connectivity constraint \[ N1' \lambda = 1, \text{ so: } \lambda \]

\[ \text{max} \lambda, \theta \]

\[ -y_i + \lambda \theta \geq 0 \]

\[ \theta_k - \theta \lambda \geq 0 \]

\[ N1' \lambda = 1 \]

\[ \lambda \geq 0 \]  \hspace{1cm} (2)

Where \( N1 \) is \( N \times 1 \) vector one. Specification of VRS is an approach which has used most in 1990s. The maximizing stated above is technical efficiency, \( x_{ij} \) is a number of input type-i from DMU of j and \( y_{kj} \) is a number of output type-k from DMU of j. The score from that efficiency is always less or equal with 1. DMU with score less than one means inefficient, but DMU with score equals one means the DMU is efficient.

Many studies that decompose TE score got from CRS-DEA become 2 components. These are the scale efficiency (SE) and pure technical efficiency (TEVRS). This is done by running CRS-DEA and VRS-DEA by the same data. If there is difference of TE scores of a company with those two assumptions, it indicates that company is still not efficient in the scale. This decomposition correlation of the weaknesses of efficiency scale measurement from equation (1) is the disability to explain whether the company operates in Increasing Return to Scale (IRS) or Decreasing Return to Scale (DRS). For this purpose, the constraint \( N1' \lambda = 1 \) in equation (2) must be replaced with \( N1' \lambda = 1 \) that shows Non-Increasing Return to Scale (NIRS) constraint, so VRS-DEA Model with NIRS constraint is:

\[ \text{max} \lambda, \theta \]

\[ -y_i + \lambda \theta \geq 0 \]

\[ \theta_k - \theta \lambda \geq 0 \]

\[ N1' \lambda \leq 1 \]

\[ \lambda \geq 0 \]  \hspace{1cm} (3)

Whether a company goes to IRS or DRS can be seen by whether the NIRS-TE score is the same with VRS-TE score. If those two scores are the same, the company is considered in DRS condition. Otherwise if those two scores are different the company is said to be in IRS condition. So far, it has been described the difference between CRS-DEA and VRS-DEA Model using input approach, as an alternative. As such, we can use output approach. With CRS assumption, TE score will be the same, whether using input approach or output approach, while in VRS assumption, TE score using those two approaches will be