Productivity and Efficiency of Domestic and Foreign banks in Malaysia

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INTRODUCTION

In general, efficiency is a measure of the deviation between actual performance and desired performance. In other words, it is concerned with the optimal allocation of resources. Hence, the higher the ability of the banks in properly identifying the quality borrowers, and optimizing the allocation of financial resources, the more efficient is the regional banking system [11]. The efficiency of a banking system can be considered as a measurable indicator of its success, implying how crucial it is to the general improvement of productivity and economic growth of a country. On the other hand, the productivity measurements also help to evaluate the efficiency of the resources applied in the institution. In addition, productivity measurements and improved monitoring optimizes overall profitability [17].

Although, studies about efficiency and productivity of banking industry is important, most empirical works in the subject matter only focus on the conventional banks in Europe and the US, and only a little attention is paid to operation domestic and foreign banks and comparison efficiency and productivity these.

In Malaysia, the Bank Negara, which is the national central bank, was basically interested in having an efficient Islamic banking industry that provides financial service according to shariah law. With the establishment of Islamic banking system, which made Malaysia the first country to have a dual banking system, Malaysia had some successes in Islamic banking industry whereby the Islamic banking system activates with the conventional banking system side by side [3]. Therefore, the central bank in Malaysia, for increase competition in banking industry first, issued licenses to conventional foreign bank to entrance in Malaysia and after that issued licenses to full-fledged foreign Islamic banks, as part of the plans for further financial liberalization of Islamic banking in Malaysia. The concept of interest-free banking has been in existence since the 1960s; however, its impact on the global financial market has been largely deemed insignificant until the recent explosive growth in Islamic banking. Islamic banking can be defined as a system of banking activities that is conducted in accordance with the Islamic law (Sharia) [1]. Islamic banking has experienced a double digit growth in the last few years. For instance, the number of Islamic financial institutions has increased to over 500 in more than 79 countries, thereby increasing the total market value of the sector’s assets to over $ 850 billion globally. Islamic banks survived and have been largely protected from the global financial crisis of 2008-2009. In fact, the crisis presents a growth opportunity for Islamic banks where the stability of the Islamic banking during the turbulent times demonstrates its strength as a viable alternative to the conventional banking. This
policy is chosen by the central bank for two reasons, to increase competition between the banks and to utilize learned skills and knowledge from established full-fledged foreign Islamic banks.

Previous research on the efficiency of the Malaysian Islamic banking tend to focus more on the comparisons between the Islamic banks and local conventional banks or between local Islamic banks and foreign Islamic banks. Therefore, in this study, we choose to emphasize on the impact of central bank policies, the entrance of full-fledged foreign Islamic banks on their performance and efficiency for the period 1997-2008. Our study covers one foreign and two domestic full-fledged Islamic banks, as well as eight domestic and four foreign banks offering Islamic windows.

**Related Literature:**

The measurement of efficiency is an outlook of appraising a firm’s performance. As a general definition, efficiency is a measure of the difference between the real and the requested performance. Its measurement is achieved through profit and output maximization, as well as the minimization of costs. The ratio between the output produced by the financial unit and the total of resources used in the production process is known as the efficiency of production.

There are some studies which focus on examining the efficiency of conventional banks versus Islamic banks across countries

Despite the growing interest in the development of the Islamic banking sector in Malaysia, there are only few studies done on the productivity of local Islamic banks. For example, Mokhtareet al [13,14,15] measured the efficiency of Islamic banks during the period from 1997-2003 using the SFA and DEA. The findings of each of the three studies depict similar results which is summarized as follows: a) the efficiency of the overall Islamic banking industry has increased during the period, b) the full-fledged Islamic banks are found to be more efficient than Islamic windows, but less efficient than the conventional banks, c) the Islamic windows of the foreign banks are found to be more efficient than the Islamic windows of the domestic banks. Similarity, Sufian (2006) made a comparative investigation of the efficiency of domestic and foreign Islamic banks during the period 2001-2004 using DEA. The findings of the study indicated that the scale inefficiency dominates pure technical inefficiency in the Islamic banking sector in Malaysia, implying that Malaysian Islamic banks have been operating at the wrong scale of operation. Contrary to the finding by Mokhtareet al, Sufian argued that the domestic Islamic banks are more efficient than the foreign Islamic banks, even though the foreign Islamic banks are more efficient in controlling their operating costs. In another study however, Sufian (2007) made an investigation into the efficiency of Malaysian Islamic banking compared to foreign Islamic banks for the period (2001-2005) and found that the foreign Islamic banks are more efficient than the domestic Islamic banks and that the rest of the result is the same as the previous studies done by him.

Based on the reviewed literature as mentioned above, researches into the efficiency and productivity of the Malaysian Islamic banking industry tend to focus more towards productivity and efficiency comparisons between the Islamic banks and local conventional banks or between local Islamic banks and foreign Islamic banks. However, the effect of central bank policies on the performance of the Islamic banking system in Malaysia has largely not been considered in the literature.

**Measurement of Productivity and Efficiency:**

*Efficiency Measurement Approaches:*

There are two major approaches in estimating production frontiers and measuring efficiency, namely, parametric approaches, employing techniques known as econometric, and non parametric approaches, devising the linear programming method. The three approaches marked as parametric are stochastic frontier approach (SFA), thick frontier approach (TFA) and distribution free approach (DFA). SFA is famous as the econometric frontier approach, in which a practical form of the relationship between the profit and cost or production in the output and input data, as well as the environmental factors is specified. In this approach random error is allowed. The DFA approach makes use of more flexible practical forms and does not base itself on strong assumptions about the specific distributions of inefficiency or random error. Finally the TFA approach, states a practical method where the assumption is that, deviations from expected values of performance in the upper and the lower quartiles of observations present random error, while deviations in expected performance between the upper and the lower quartiles present inefficiencies [12]. The two main non-parametric approaches or linear programming techniques are called Free Disposal Hull (FDH) and Data Envelopment Analysis (DEA). The mathematical programming approach does not allow the banks any random deviation from the frontier. Any deviation will be measured as inefficiency. The dominant observations are considered 100% efficient. The major approach in parametric method is SFA, while DEA is the most widely employed non parametric method Berger and Mester [12].
Discuss on the Best Approach to Use:
Both of the approaches defined above have strengths and weaknesses. Resty [16] employed both approaches to measure the same thing, and showed that the result of cost efficiency from both SFA and DEA methods do not differ significantly. In a research conducted by Tavares [23] 3,203 publications (including 50 books and 1,259 journal articles) on DEA written between 1978 and 2001 were found, which is indicative of DEA to be popular as a method to measure efficiency. In this study DEA is accepted, due to the scale of the Islamic banking sector in Malaysia which is comparatively small. In contrast, parametric approaches need a large sample in estimating efficiency, DEA allows the use of a small sample to estimate the frontier. Furthermore, the process of DEA has the flexibility to incorporate a multitude of inputs and outputs variables in measuring efficiency, and the main advantage of DEA approach is that no functional form needs to be specified for the cost function.

Data Envelopment Analysis (DEA):
DEA is a method of analyzing performance which is not based on a pre-defined functional form and is devised to analyze the data related to cost, production, profit and revenue in the entities known as Decision Making Units (DMU), measuring the relative productivity of the said units [8]. DEA approach is based on two main DEA models known as BCC and CCR, which are based on variable return to scale (VRS) and constant return to scale (CRS) respectively. The CCR model assumes a constant return to scale technology that an increase in any input will result in an increase in output, while the BCC model allows for (VRS) such that the scale of operation affects the input-output relationship.

The two formulations i.e. CCR and BCC are used to measure the Technical Efficiency (TE) and Pure Technical Efficiency (PTE) respectively. The technical efficiency is estimated as the ratio of virtual output produced to virtual input used. The CCR model was chosen for this study. This study uses this model to estimate technical efficiency:

\[
\min_{w_p, \theta_p, \lambda_p} \text{Subject to: } \sum_{j=1}^{N} \lambda_j y_j \geq y_p, \lambda_p x_p \geq \sum_{j=1}^{N} \lambda_j x_j \text{ and } \lambda_j \geq 0 \ j=1,2...N
\]

Where:
- \( N \) is the number of banks,
- \( x_p \) is the \( k \times 1 \) input vector of the \( p^{th} \) Banks,
- \( y_p \) is the \( M \times 1 \) output vector of the \( p^{th} \) Banks,
- \( X \) is the \( K \times N \) input matrix,
- \( Y \) is the \( M \times N \) output matrix

And \( \lambda \) is an intensity \( N \times 1 \) vector of constant.

In this model, \( \theta_p \) is the measure of the Technical Efficiency (TE) of the bank \( P \). Bank \( P \) is the most Technical Efficiency if \( \theta = 1 \) and if \( \theta \) it is technically inefficient. In this study we want to minimize input in getting the same amount of output. The BCC model assume VRS (variable returns to scale) and \( \theta_p \) in BCC model measure pure technical efficiency (PTE).Then if add, this subject, \( \sum \lambda_j = 1 \) to above model, CCR convert to BCC and the solution \( \theta \), is the estimated amount for Pure Technical Efficiency.

To estimate the Scale Efficiency (SE) of a bank \( P \), this study uses the ratio of the Efficiency measure \( \theta \), obtained from the CRS and VRS models. So,

\[
SE = \frac{\theta_{\text{CRS}}}{\theta_{\text{VRS}}} = \frac{TE}{PTE}
\]

if \( SE = 1 \), so the bank is running at Constant Returns to Scale, which is socially and economically optimal. if \( SE > 1 \) It means that the bank is running at increasing Returns to Scale and if \( SE < 1 \) it is running at Decreasing Returns to Scale. Note that Scale Efficiency cannot be negative and therefore should always be positive, because both Technical and Pure Technical Efficiency are always positive quantities.

For determines the Cost Efficiency (CE) of bank \( P \) we solve the cost-minimization problem:

\[
\min w_p x_p \text{ Subject to: } \sum_{j=1}^{N} \lambda_j y_j \geq y_p, x_p \geq \sum_{j=1}^{N} \lambda_j x_j \text{ and } \lambda_j \geq 0 \ j=1,2...N \text{ and } \sum_{j=1}^{N} \lambda_j = 1
\]

Where: \( w_p \) is a vector of input prices for the \( p^{th} \) bank and for observed vectors of input prices and output quantities, the solution vector \( x_p \) is scaled to calculate the cost efficiency of each bank:

\[
CE_p = \frac{w_p x_p}{w_p x_p}
\]

Cost efficiency estimations can further be analyzed to Technical efficiency (TE), Scale efficiency (SE), and Allocative efficiency (AE). The Allocative efficiency of bank \( P \) is derived by taking the ratio of the cost efficiency and technical efficiency measure: \( AE_p = CE_p/TE_p \)

The basic difficulty in the measurement of the efficiency of a bank is identifying the output and input of the bank, such as the production approach, the intermediation approach, the asset approach. Following Sufian [19] and Hassan and Hussein [9], the intermediation approach is employed, in the present study, to define the inputs and outputs of Islamic banks for two reasons. Firstly, this approach is widely used [10]. Secondly, the intermediation service offered in the Islamic bank is the result of gathering deposits and other liabilities and investing the gathered funds in the sectors of economy believed to be productive, bringing about economic returns which are not polluted by usury (riba”). In addition, the DEA technique can be measured in two oriented, namely, input oriented and output oriented based on objective. The present study adopts the input-oriented models. Because Islamic banking works on the basis of principles prohibiting interest, the variables here are chosen as the equivalent of the two inputs and two outputs which follow the documented literature [22,15].
Inputs: the input vector consists of the following two variables. The first input is total deposits (x1) including deposits from customers and the ones acquired from other banks, and the second input is labor and capital (X2) which represented by the personnel expenses or staff cost and other operating expenditures. The money quantities expressed for the said variables in this study are all expressed in millions of Malaysian currency (Ringgit).

Outputs: The two types of outputs used in this analysis are the total amount of loans (y1), including loans allocated to customers and other banks; and represented by financing of customers; income (y2), including dealing and investment securities and other items of income from Islamic banking operations. For the measurement of Cost Efficiency (CE), two input prices are needed as well.

\[ P_1 = \text{price of total deposit} = \frac{\text{total deposits}}{\text{price paid to depositors}} \]

\[ P_2 = \text{price of labor and capital} = \frac{\text{personnel and other overhead expenses}}{\text{the total assets}} \]

In the present study two inputs and two outputs under the intermediate approach are selected. The measurement of the efficiency of Islamic bank by DEA in Malaysia is chosen to be input oriented. The DEA analysis of efficiency for this study was processed using the computer software DEAP version 2.1, developed by Coelli [6].

**Measurement of Productivity:**

Productivity can be assessed by measuring the Total Factor Productivity (TFP) growth, which is the ratio of total output to total input applied in production or the shift in the production function. Fare et al. (1994) believed that the Malmquist Productivity Index (MPI) is the best method to measure TFP growth and several advantages has made this method popular in empirical studies. The MPI measures the TFP growth from the defined distance function, and allow the decomposition of TFP into technical efficiency change (TEC) and technical change (TC). The MPI can be defined as either an input quantity index or an output quantity index and it can measure productivity where there are multiple inputs and multiple outputs. Another advantage is that this method only requires a panel data without the assumptions on the behavior of producers.

**The Malmquist DEA Method:**

The use of MPI was first proposed by Caves, Christensen and Diewer [5] in the parametric frontier framework. The index measures the TFP between two periods, \( t \) and \( t+1 \), by calculating the distance functions per data point, relative to technology. This distance function examines the maximum change in proportion to output needed to gain feasibility in correlation to the technology at \( t \). An index that is bigger than one shows that TFP increases from the period \( t \) to \( t+1 \); however, an index that is less than one shows that TFP declines from \( t \) to \( t+1 \). The index can also be applied under Constant Return to Scale (CRS) or Variable Return to Scale (VRS).

Based on the MPI, the output set is defined as the output set \( P(x) \) that shows all output vectors \( y \) that can be produced by using an input vector \( x \). The feasible output set or \( P(x) \) is designated as:

\[ P(x) = \{ y: \text{x can produce y} \} \]

Following Shephard [18], the output distance function at time \( s \), can be explained as:

\[ D_0(x,y) = \min \{ \theta : (y/\theta) \in P(x) \} \] (2)

Where \( y/\theta \) is the maximized feasible output calculated by distance function when \( \theta \) is minimized. We can use it to estimate technical efficiency and explain a distance function in correlation to the technical methods in time \( t \). \( \theta \) represents the smallest distance that the output requires to become possible to be produced in the time \( t \) technology [7]. \( D_0 \) equals output oriented technical efficiency, where \( 0 \leq D_0 \leq 1 \). Equation 3 calculates the Malmquist Productivity Index as explained by Caves, Christensen and Diewer, [5], with result of the technology in the first period:

\[ m_{ccd}^s = \frac{d^s(x^t, y^t)}{d^s(x^s, y^t)} \] (3)

In Equation 3, CCD calculates TFP changes between two data points as distance functions ratio for per \( (x, y) \), proportionate to a joint technology. A value of \( m_{ccd}^s > 1 \) indicates that the productivity has increased and a value of \( m_{ccd}^s < 1 \) indicates that the productivity has decreased. Alternatively, we can also use this methodology in period \( t \):

\[ m_{ccd}^t = \frac{d^t(x^t, y^t)}{d^t(x^s, y^t)} \] (4)

Avoiding absolutism in selecting a benchmark, Fare, Lindgren and Roos (1992) showed that the MPI as the geometric mean of the two indexes,
He change in \(\text{ indication the technical efficiency. Efficiency change represents}
\]

The ratio of outside brackets measures the variation of technical efficiency for the years, \(s\) and \(t\). The two ratios inside the square brackets represent the changing in technology between the two periods appraised at \(x'\)and \(x\).

The two parts of the Malmquist Index as in Equation (6) is symbolized by:

\[
\text{Efficiency change} = \frac{y'/y^c}{y^s/y^a};
\]

and

\[
\text{Technical change} = \left[\frac{y'/y^b}{y'/y^c} \times \frac{y'/y^a}{y^s/y^b}\right]^{1/2}
\]

\[x \in \mathbb{R}^m, y \in \mathbb{R}^n, \theta \in \mathbb{R}^m, z \in \mathbb{R}_+^m, \]
\[\theta^{k_y} y_m^{k_y} \leq \sum_{k=1}^{K} z^k y_m^k, \quad m = 1, \ldots, M,
\]
\[\sum_{k=1}^{K} z^k x_n^k \leq x_n^{k_y}, \quad n = 1, \ldots, N,
\]
\[z^k \geq 0, \quad k = 1, \ldots, K.
\]

The variable \(z^k\) shows the forces at which a special activity is used in constructing the frontier of the production set. When \(i = i' = s\) (similarly, \(i = i' = t\)), solving the over linear programming produces the technical efficiency in period \(t\).

The results for TFP obtained through the Malmquist index are presented in next section. The change in TFP, shown as \(\text{fpch}\) is decomposed into two parts, efficiency change (\(\text{effch}\)) and technological change (\(\text{techch}\)). Technological change is measured as the shift in the production function and some researcher take it as synonymous with TFP. The TFP also involves the change of technical efficiency. Efficiency change represents changes in scale efficiency that is shown as \(\text{sech}\) or pure efficiency change (\(\text{pech}\), or both. There are two important notes to consider in this analysis. Firstly, a value of TFP < 1 indicates that the firm is regressing where a value of \(\text{sech} > 1\) for scale efficiency exhibits an increasing return to scale (IRS), \(\text{sech}<1\) indicates a decreasing return to scale (DRS), and \(\text{sech} = 1\) indicates a constant return to scale (CRS). Secondly, all Malmquist index averages are geometric means as productivity is measured in percentage changes.

**Results and Discussions:**

**The Result of the Efficiency of Foreign and Domestic Banks:**

The results of the comparison made between the efficiency of foreign and domestic banks in Islamic banking industry in Malaysia is presented in table 1.4 of the 3 fully-fledge Islamic banks, two are domestic and one is foreign. While in Islamic window section, there are 8 domestic banks and 4 foreign banks.

The results show that in fullfledge Islamic banks the average technical efficiency for domestic banks is 72% and for the foreign bank is 78%. So, the foreign bank is technically more efficient than the domestic banks. Also, the average cost efficiency ranged from 52% for domestic banks to 68% for foreign bank which means the foreign bank in this section is again more cost efficient than domestic banks. The results also show that for Islamic window the average technical and cost efficiency for domestic banks are respectively 0.64 and 0.45, and for foreign banks are respectively 0.60 and 0.44 meaning Islamic windows of the domestic banks are more efficient than foreign banks with regard to cost and technical efficiency.
The previous policies of central bank, which increased competition among Malaysian Islamic banks. Sufian [20] who found that domestic Islamic banks have exhibited higher productivity growth than their foreign counterparts.

Conclusion and Policy Recommendation:
This study is set out to provide empirical evidence of Islamic banks in Malaysia from 1997 to 2008. For the analysis of efficiency with respect to ownership, the foreign banks are found to be more efficient than Islamic banks in full fledge banking system; however, in Islamic windows, the domestic banks are found to be more technical and cost efficient than foreign banks. For the analysis of productivity with respect to ownership, in both systems (full fledge and Islamic windows) the domestic banks are found to be more efficient than foreign banks. The summary of results in this study offers some policy implications or recommendations to bank managers and financial policy makers and also to future researchers. These recommendations are summarized as follows: Since in this study the findings indicate that the previous policies of central bank, which increased competition in Islamic banking system was a way to make better, more efficient Islamic bank’s the central bank of Malaysia should maintain policies that increased competition among Malaysian Islamic banks. Since, the findings show the technical and cost efficiency of Islamic banks in Malaysia could be improved further, the management of Islamic banks in Malaysia should try to optimize the utilization of resources.

The Result of the Productivity of Foreign and Domestic Banks:
The results of the comparison made between the productivity of foreign and domestic banks in Islamic banking industry in Malaysia is presented in table 4.2 and 4.3. Of the 3 fully-fledge Islamic banks, two are domestic and one is foreign. While in Islamic window section, there are 8 domestic banks and 4 foreign banks. The results show that in full fledge Islamic banks the geometric means of productivity for domestic banks is 1.118 and for foreign bank is 0.889. So, the mean productivity of the domestic full fledge Islamic banks is more than the foreign full fledge banks. The results also show that the mean productivity for domestic and foreign Islamic windows is 1.039 and 0.957 respectively. Then, the domestic Islamic windows are also more productive than foreign Islamic windows. Therefore, in both systems, full fledge Islamic banks and Islamic windows; the productivity of the domestic banks is higher than the productivity of the foreign banks which is consistent with Sufian [20] who found that domestic Islamic banks have exhibited higher productivity growth than their foreign counterparts.

### Table 4.1: Efficiency Islamic Banks by Ownership, 1997-2008.

<table>
<thead>
<tr>
<th>Years</th>
<th>Full fledge Islamic banks</th>
<th>Islamic window</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Domestic banks</td>
<td>Foreign banks</td>
</tr>
<tr>
<td></td>
<td>TE</td>
<td>CE</td>
</tr>
<tr>
<td>1997</td>
<td>0.40</td>
<td>0.35</td>
</tr>
<tr>
<td>1998</td>
<td>0.33</td>
<td>0.16</td>
</tr>
<tr>
<td>1999</td>
<td>0.71</td>
<td>0.02</td>
</tr>
<tr>
<td>2000</td>
<td>0.76</td>
<td>0.69</td>
</tr>
<tr>
<td>2001</td>
<td>0.72</td>
<td>0.62</td>
</tr>
<tr>
<td>2002</td>
<td>0.85</td>
<td>0.74</td>
</tr>
<tr>
<td>2003</td>
<td>0.54</td>
<td>0.47</td>
</tr>
<tr>
<td>2004</td>
<td>0.66</td>
<td>0.68</td>
</tr>
<tr>
<td>2005</td>
<td>0.59</td>
<td>0.64</td>
</tr>
<tr>
<td>2006</td>
<td>1.00</td>
<td>0.60</td>
</tr>
<tr>
<td>2007</td>
<td>0.93</td>
<td>0.84</td>
</tr>
<tr>
<td>2008</td>
<td>0.84</td>
<td>0.45</td>
</tr>
<tr>
<td>Mean</td>
<td>0.72</td>
<td>0.52</td>
</tr>
</tbody>
</table>

Note: TE (Technical Efficiency) and CE (Cost Efficiency)

### Table 4.2: Productivity Full Fledge Islamic Banks, by ownership, 1997-2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic full fledge banks</th>
<th>Foreign full fledge banks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Effch</td>
<td>Techch</td>
</tr>
<tr>
<td>1997-1999</td>
<td>1.168</td>
<td>0.641</td>
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<tr>
<td>2000-2004</td>
<td>0.868</td>
<td>1.277</td>
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<tr>
<td>2005-2008</td>
<td>1.820</td>
<td>0.925</td>
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<tr>
<td>Mean</td>
<td>1.227</td>
<td>0.911</td>
</tr>
</tbody>
</table>

### Table 4.3: Productivity Islamic windows Banks, by ownership, 1997-2008

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic Islamic windows</th>
<th>Foreign Islamic Windows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Effch</td>
<td>Techch</td>
</tr>
<tr>
<td>1997-1999</td>
<td>0.976</td>
<td>0.701</td>
</tr>
<tr>
<td>2000-2004</td>
<td>1.128</td>
<td>1.149</td>
</tr>
<tr>
<td>2005-2008</td>
<td>1.223</td>
<td>1.035</td>
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<td>Mean</td>
<td>1.104</td>
<td>0.941</td>
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